



Nutrition In Lao PDR

Causes, Determinants, And Bottlenecks

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ACRONYMS AND ABBREVIATIONS

ANC	Antenatal care
BMI	Body mass index
CNP	Community Nutrition Project
CLTS	Community-led total sanitation
DHO	District Health Office
FGD	Focus group discussion
GDP	Gross domestic products
GMP	Growth monitoring and promotion
IDI	In-depth interviews
IMCI	Integrated management of childhood illness
IYCF	Infant and young child feeding
MCH	Maternal and child health
MDG	Millennium development goals
LAK	Lao Kip
LBW	Low birth weight
LECS 5	Lao Expenditure and Consumption Survey 5
LSIS	Lao Social Indicators Survey
ORS	Oral rehydration salts
ORT	Oral rehydration therapy
PDR	People's Democratic Republic
PHO	Provincial Health Office
PNC	Postnatal care
RMNCH	Reproductive, Maternal, Neonatal, and Child Health
SBCC	Social and behavior change communication
UFGE	Umbrella Facility for Gender Equality
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Regional Vice President :	Victoria Kwakwa
Country Director :	Ulrich Zachau
Senior Practice Director :	Timothy Grant Evans
Country Manager :	Sally Burningham
Practice Manager :	Toomas Palu
Primary Authors :	Sutayut Osornprasop Obert Pimhidzai

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CONTENTS

Executive Summary	7
Part I: Introduction & Background	11
Part II: Causes of Child Undernutrition	16
Inadequate Diet	18
Burden of Infectious Disease and the Environment	25
Intergenerational Factors	27
Culture and Beliefs	29
Part III: Key Challenges and Bottlenecks in Nutrition Service Delivery	31
Nutrition Service Delivery	37
Health and Nutrition Workforce	39
Nutrition Equipment and Supplies	44
Part IV: Conclusions, Policy Implications, and Recommendations	46
References	51
Annex: Additional Tables	55

LIST OF TABLES

Table 1: Summary of national prevalence and public health significance of child (0-59 months of age) anthropometric status, Lao PDR	14
Table 2. Household dietary intake by macro-nutrients	19
Table 3. Breastfeeding and Complementary Feeding Practices	21
Table 4. Food access, infant and child feeding practices by age group	22
Table 5. Comparison of maternal, infant and child feeding practices by mothers' awareness of growth monitoring/nutrition education	23
Table 6. Diarrheal incidence and management	25
Table 7. Access to improved water and sanitation	26
Table 8. Low birthweight in Lao PDR	28
Table 9. Nutrition-Related Service Availability Indicators	38
Table 10. Nutrition-Related Service Availability and Readiness: Staff and Guidelines Readiness	39
Table 11 WHO SARA Nutrition-Related Indicators: Equipment Diagnostics, Medicines, and Commodities	44
Table 12. Micronutrient Distribution	45
Table 13: Regression results of stunting (HAZ) for 6 to 59 months children	55
Table 14: Regression results of stunting (HAZ) for 6 to 23 month old children	56
Table 15: Determinants of household diet and agricultural production	57
Table 16: Determinants of child diet and agricultural production	58

LIST OF FIGURES

Figure 1. Persistence of undernutrition in Lao PDR in spite of rapid poverty reduction, 1990-2012 13

Figure 2. Lao PDR ranks poorly on stunting compared to other countries at similar levels of income 13

Figure 3: Stunting rates by province: 2011/12 14

Figure 4: Stunting rates by wealth status: 2011/12 14

Figure 5: Household dietary diversity by socio-economic quintiles 20

Figure 6: Predicted probability of stunting by cause for 6 – 23 months old children 30

Figure 7. Normalized mean scores for the nutrition case by health worker cadre 40

Figure 8: Percent of health center workers who mention taking critically important growth promotion actions 41

List of Boxes

Box 1: What is social and behavior change communication? 32

EXECUTIVE SUMMARY

1. Undernutrition levels in Lao PDR remain among the highest in the world, despite both rapid economic growth and a significant decline in poverty over the past years.

Concerns about the slow progress in reducing undernutrition have triggered intense policy discussion and several analytical reports have been produced over the last few years on the Lao PDR nutrition crisis and its drivers. This report adds to this knowledge base and better informs the broad discussion by using evidence grounded in rigorous analysis using Lao PDR data, to identify constraints specific to the country rather than relying only on international or descriptive evidence. In particular, multivariate analysis is used to pull together all the determinants of stunting using more complete data, which controls for the correlation between interrelated determinants of undernutrition, thus helps identify the most important determinants in Lao PDR. This sets apart this analysis from previous work which has mainly relied on univariate and descriptive analysis. Furthermore, new evidence from an analysis of a recent survey of health facilities and health workers, and a qualitative-based rapid assessment of nutrition counseling and growth monitoring conducted in Lao PDR is brought in to highlight specific gaps in skills and behaviors of health workers in delivering nutrition counseling and growth monitoring. This combination of qualitative and comprehensive quantitative analysis is a novel approach in Lao PDR and brings up useful insights and call for action.

Key Findings

2. The causes of undernutrition in Lao PDR are multi-faceted and multi-sectoral.

They range from factors that are determined before the child is born - such as mother's stature, education, health, care, diet and age during pregnancy - to factors affecting the child after birth, like inadequate breastfeeding as well as low macro- and micronutrient intake due to low dietary diversity, and poor hygiene and sanitary environment, especially open defecation. Most factors are influenced by the lack of appropriate knowledge as well as social, gender, and cultural norms and practices. The main insights from the analysis are highlighted below:

3. While food insecurity is widely assumed to be a major determinant of stunting in Lao PDR, our analyses show that access to food is less of a concern, but rather the poor quality of the diet is the main source of inadequate nutrient intake in children.

Analysis of the LECS 5 shows that a typical household in Lao PDR has sufficient access to food to cover their required calorie intake. However, diversity in diet is low, with rural households consuming an average of 3 out of 9 major food groups. Poor feeding practices for infants and young children compound this problem, as children under 2 year old are less likely to be fed certain important food groups even when they are available in the household. We find for example that 6-23 months old children are not fed vitamin A rich vegetables even when their mothers consume them. However, no such intra-household gaps are observed for 24-59 months old children, pointing to sub-optimal infant and young child feeding practices among the 6-23 months old children.

4. Due to poor infant and young child feeding practices, an increase in agriculture diversity alone, as usually recommended, may have little impact on child dietary intake. The analysis finds a positive correlation between agriculture diversity and household dietary diversity, but no correlation with individual child dietary diversity and stunting is found. This again highlights that poor feeding practices are a weak link between access to food and adequate diet for infant and young children since children are not fed important food items that households have access to already.

5. Intergenerational factors, driven by social and gender norms, are shown to have a substantial influence on undernutrition. Children born to young girls, to mothers with less than complete primary education and to mothers who are themselves stunted, are much more likely to be stunted. The likelihood of being stunted is at least 10 percentage points higher among children conceived by women below the age of 17. As nearly all teenage pregnancies are a result of early marriages and mostly prevalent among less educated girls, this finding highlights how gender and cultural norms impact child undernutrition.

6. Multivariate analysis suggests that tropical/environmental enteropathy - a sub-clinical disorder of the small intestine - is the channel through which poor sanitation and hygiene affects stunting. High chronic exposure to large quantities of fecal bacteria results in anatomical changes to the structure of the small intestine which affects a child's ability to both absorb and utilize nutrients. Estimates show that the probability of stunting among 6 – 23 months old children is 14 percentage points higher when the share of the population practicing open defecation in the village increases from 25 percent to 100 percent, but no correlation is found between incidence of diarrhea and stunting.

7. On the supply side, the analysis reveals significant gaps in skills and behaviors around nutrition counseling, indicating how the health service delivery system is inadequately prepared to perform core nutrition related interventions. Nationally, 67 percent of health center staff have not received training on nutrition, yet 87 percent of staff had provided these services in the three months prior to the survey. This was confirmed during focus group discussions with health workers which revealed their lack of confidence in providing nutrition counseling (i.e. growth promotion) and the majority reported not having received any training on nutrition counseling. Health centers have the primary responsibility for identification of children who are – or are at risk of becoming undernourished, as well as the health sector's nutrition response, but they lack sufficient tools, nutrition supplies, and human resources to provide an adequate diagnosis and response. Only 66 percent of health centers surveyed had the equipment to measure weight and height in children.

8. Poor knowledge about nutrition among health workers is demonstrated in practice. First, surveyed health center staff tend not to recognize stunted children, with many regarding stunting as normal, particularly in localities where stunting is highly prevalent. Second, while 98 percent of health center workers would take measurements and correctly interpret growth charts, only a moderate number actually offered critical recommendations through nutrition and growth promotion counseling. For example, only 34 percent of health workers in the Northern region provide counseling on breastfeeding while only 24 percent of health center workers in the Southern region provide advice on hygiene and sanitation.

9. The qualitative study finds that growth monitoring is mainly done as a statistical exercise, and often not accompanied by nutrition and growth promotion counseling. To most health workers, the purpose for growth monitoring is primarily to report children's nutrition status to District Health Offices (DHOs) and Provincial Health Offices (PHOs). Thus, if children are found to be stunted or underweight during growth monitoring, health center staff oftentimes do not inform mothers of the results, investigate the causes of growth faltering, or subsequently counsel on how to improve the situation and make an appointment for follow-up. Furthermore, PHOs and DHOs also rarely follow up on submitted nutrition status reports.

Policy recommendations

10. Reducing maternal and child undernutrition in Lao PDR requires a combination of interventions that address the identified immediate, underlying and basic causes of undernutrition. As mentioned in the Lao PDR National Nutrition Strategy, causes of undernutrition are interdependent, hence requiring a holistic, multi-sectoral approach. This should include interventions in agriculture (e.g. increasing agriculture income and diversity), education (keeping girls in school longer both to increase knowledge and to delay age of marriage), social protection (e.g. conditional cash transfer), legislation (e.g. 6 months maternity leave to encourage exclusive breastfeeding and the Code of Marketing of Breastmilk Substitutes) and the health sector. Acknowledging the importance of these multi-sectoral interventions, this note focuses on recommendations about interventions implemented in the health sector (including water, sanitation, and hygiene) in Lao PDR, drawing on findings from the analysis.

11. Scaling up of social and behavior change communication directed at mothers, child caregivers, as well as influential family members (grandmothers, husbands). This can be done through regular face-to-face village-level nutrition education group sessions as well as interpersonal communication during home visits by health workers and village health volunteers/facilitators targeting pregnant mothers and lactating mothers with children under 2 years. Individual nutrition counseling provided by well-trained health workers will be a cornerstone of an effective and efficient program for behavior change, especially on infant and young children feeding practices.

12. Addressing weaknesses in the growth monitoring and promotion exercise by health workers, particularly in strengthening the skills and confidence among health workers in providing nutrition and growth promotion counseling. To achieve this, there is a need to (i) develop adequate growth monitoring and nutrition counseling curriculum for pre-service and in-service training; (ii) develop competent trainers both at central and provincial levels to roll out nutrition counseling training at all levels, from the district, health centers to village health volunteers/facilitators; (iii) regular supervision and monitoring of health worker growth monitoring and counseling skills.

13. Allocating more staff, especially female midwives and nurses to the health centers to provide enough workforce to deliver necessary health and nutrition services to villagers in respective catchment areas. This should also ensure diversity of ethnic groups among staff at the health facilities to help reduce language barriers with major ethnic minority groups, as has been revealed in qualitative studies.

14. Increasing effort to improve household sanitary environment is necessary, and a dedicated rural sanitation and hygiene program. To improve hygiene measures, hygiene and sanitation behaviors would need to be improved, but also the infrastructure would need to be developed. A dedicated budget line for the behavior change programs for sanitation and hygiene, such as intensive social mobilization through Community Led Total Sanitation (CLTS) approach is required for the scale-up of such programs outside of patchy areas where development partners support.

15. The new initiative to develop the National SBCC Strategic Action Plan for improved health and nutrition in Lao PDR shows greater commitment from the government on SBCC, but dearth of knowledge about nutrition and lack of counseling skills to promote behavior change among health workers remains a major obstacle. A perfect opportunity exists for government agencies and development partners to join forces in strategizing and developing key messages, tools, communication channels, and implementation plans to promote SBCC among target populations as well as to identify and fill existing knowledge gaps. Health center workers as well as village-level facilitators/volunteers (e.g. village health volunteers, members of Lao Women's Union, etc.) will be the backbone and the most important agents in the implementation of SBCC interventions at the community level. However, given the limited knowledge about nutrition among health workers, strengthening knowledge and capacity of these health workers and volunteers as well as introducing innovative tools (e.g. mobile phone applications) to deliver effective nutrition-related SBCC, is a top priority.



Part I: Introduction & Background

16. This policy note provides an overview of the size, severity, and key determinants of child undernutrition in Lao PDR and proposes recommendations for the scale-up of programs and interventions to strengthen the overall response to undernutrition in the country. The note draws from a multivariate analysis of determinants of stunting in addition to descriptive statistics of nutrition-related behaviors and outcomes in the country, using recent surveys.¹ These analyses are complemented with findings from the recent qualitative-based rapid assessment of nutrition counseling and growth monitoring conducted during the early months of 2016 in selected provinces, to contextualize findings within the health sector's capacity to deliver preventive and curative nutrition services.

17. Poverty reduction in Lao PDR over the past two decades has been impressive, but economic growth has been heavily concentrated in urban areas.² Lao PDR is a landlocked country with a population of 6.4 million and with a GDP per capita of US\$ 1,800 in 2015, it is a lower middle income country. The country's population is still predominantly rural (72 percent), and the majority of its inhabitants are engaged in agricultural activities. Nationally, the proportion of the population living below the national poverty line fell by nearly 50 percent, from 45 percent to 23 percent in the twenty years between 1992 and 2012. However, with the incidence of poverty estimated at 40 percent in rural areas without roads compared to 10 percent in urban areas, poverty, along with lack of access to social services, remain entrenched in remote and highland areas even though improvements have been observed. Infrastructure in remote areas is particularly limited, and many communities are inaccessible during the annual rainy season. These areas continue to be characterized by poor access to sanitation and publicly provided social services, especially secondary schools, hospitals, and health centers. About 60 percent of households in remote rural villages did not have a toilet, for example.

18. Overall, Lao PDR has made significant progress on several key population-based health outcomes over the past few decades. Life expectancy has increased steadily to almost 66 years in 2014, up from 49 years in 1990. There have been significant declines in under-five mortality rates from 201 per 1,000 live births in 1980 to 71 per 1,000 live births in 2013. This sharp reduction in child mortality meant Lao PDR largely met the child health Millennium Development Goals (MDGs).^{3,4,5} However, these improvements have been largely

¹ Lao Expenditure and Consumption Survey 5 (LECS 5) (2012/13), Lao Social Indicator Survey (LSIS) (2011/12), Umbrella Facility for Gender Equality (UFGE)-funded Health Center Workers Survey (2013/4), Community Nutrition Project (CNP) Baseline Survey (2010), CNP Endline Survey (2013).

² World Bank. 2014. Poverty Profile in Lao PDR: Poverty Report from the Lao Consumption and Expenditure Survey 2012-3, World Bank, 2014.

³ MDG 4 to reduce child mortality calls for a two-thirds reduction in under-five mortality over the period 1990-2015. MDG 5 to improve maternal health calls for a 75% reduction in the maternal mortality ratio over the same time. Lao PDR largely met the target of child health MDG, but not that of maternal health MDG.

⁴ Government of the Lao PDR & UN (2013). The Millennium Development Goals Progress Report for the Lao PDR.

⁵ WHO/UNICEF/UNFPA/World Bank (2014). Trends in maternal mortality: 1990 to 2013. Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division.

concentrated among the wealthier segments of the population and a recent assessment of 54 developing countries ranked Lao PDR fifth lowest in terms of equity of access to maternal, newborn and child health interventions.⁶

19. Despite these improvements in both poverty reduction and child health outcomes, Lao PDR has had little success in addressing widespread undernutrition rates (Figure 1), particularly in stunting. The country did not meet all of its MDG 1c targets of halving the proportion of people living in hunger, as the prevalence of stunting among children under 5 years of age (44 percent) fell short of the target (34 percent). According to WHO classification, undernutrition in Lao PDR is a critical public health problem and child growth outcomes reflect this challenge. About 44 percent of children under five are estimated to be stunted, 27 percent are underweight, and 6 percent are wasted (see Table 1).⁷ These percentages have changed little over time (Figure 1), and Lao PDR performs poorly when compared to other countries with similar levels of income and to other ASEAN countries (Figure 2). In fact, Lao PDR compares poorly with low income countries and lower middle income countries on all nutrition status indicators other than wasting.

Figure 1. Persistence of undernutrition in Lao PDR in spite of rapid poverty reduction, 1990-2012

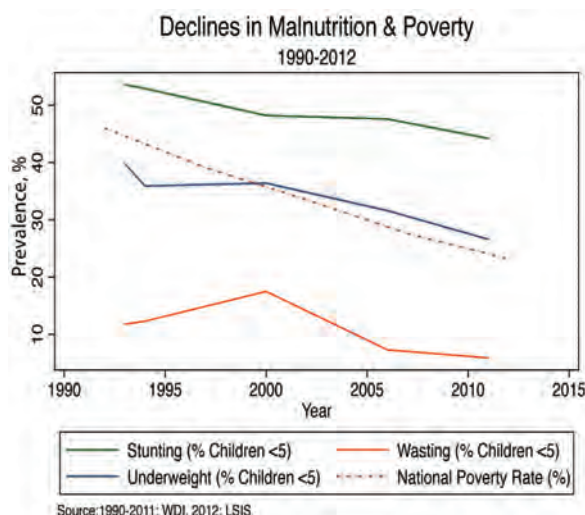
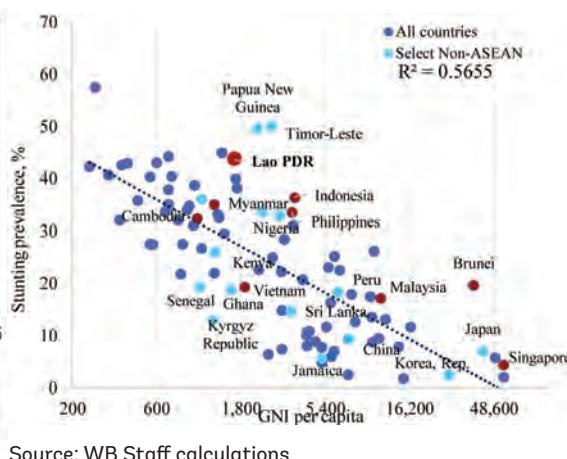


Figure 2. Lao PDR ranks poorly on stunting compared to other countries at similar levels of income



⁶ Barros AJ, Ronsmans C, Axelson H, Loaiza E, Bertoldi AD, Franca GV, Bryce J, Boerma JT, Victora CG. 2012. Equity in maternal, newborn, and child health interventions in Countdown to 2015: a retrospective review of survey data from 54 countries. *Lancet*;279:1225-1233.

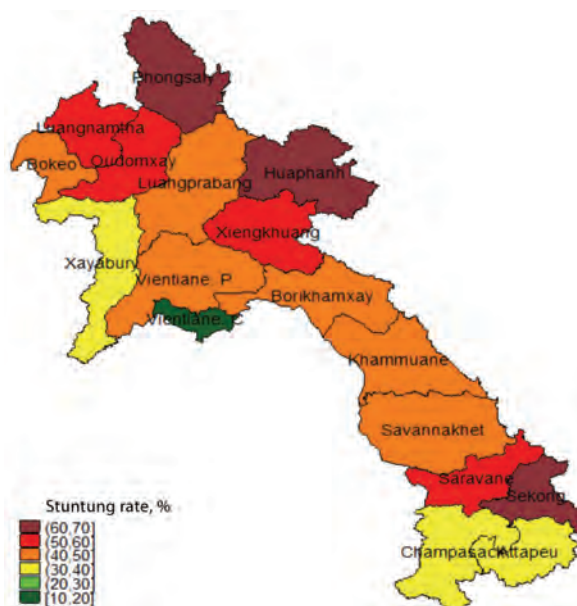
⁷ Lao PDR Child Anthropometry Assessment Survey 2015 (tag-on to the National Immunization Coverage Survey), which is unpublished, provides unofficial updated data on nutritional status in Lao PDR (underweight 25.5%, stunting 35.6%, and wasting 9.6%). However, unlike the 2015 survey, LSIS 2011/12 (which is official and published) provides significantly more extensive data and allows for cross-analysis of nutritional status, infant and young child feeding behaviors, sanitation behaviors, and nutrition service delivery during the same period. Hence, this policy note applies nutritional status data from LSIS 2011/12 for consistency.

Table 1: Summary of national prevalence and public health significance of child (0-59 months of age) anthropometric status, Lao PDR

WHO classification of child undernutrition	Prevalence (%) of Undernutrition			
	Low	Medium	High	Very High
Stunting	<20	20–29	30–39	>=40
Wasting	<5	5–9	10–14	>=15
Underweight	<10	10–19	20–29	>=30
Classification of undernutrition based on WHO classifications				
Stunting (44%)				Very High
Wasting (6%)				
Underweight (27%)				

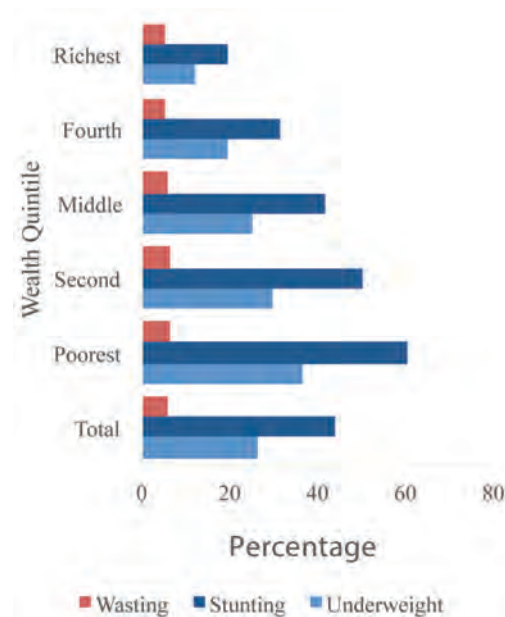
Source: LSIS 2011/12

Figure 3: Stunting rates by province: 2011/12



Source: LSIS 2011/12

Figure 4: Stunting rates by wealth status: 2011/12



Source: LSIS, 2011/12

20. Even, these aggregate numbers hide substantial spatial variations with far worse outcomes in some provinces. Stunting rates are higher than 60 percent in Sekong and Phongsaly, for example - far higher than the national average (see *Figure 3*). There is also significant variation across income levels with both stunting and underweight among children in the poorest wealth quintile being close to three times than the rates for children in the richest quintile (see *Figure 4*). The absolute number of stunted children may actually have increased due to population growth given that since the early 1990s, stunting has declined at an average annual rate of 0.8 percent⁸, which is less than the average population growth rate. Without a change in these trends, the number of stunted children could increase.

⁸ For context, the average annual reduction rate worldwide is 2.1 per cent. UNICEF, WHO and World Bank (2012).

21. These poor child growth outcomes are not just a public health problem, but also carry an economic cost, and these are perpetuated in the long term. Undernutrition during pregnancy and the first two years of life (“The First 1,000 Days”) affects physical growth, impairs cognitive development, and affects educational performance, thus reducing the accumulation of human capital, hence the productive potential and lifelong trajectory of the earnings of affected children.⁹ Poor child nutrition outcomes also contribute to child mortality and morbidity. So there are also costs associated with lost potential workforce due to early mortality and excess costs of care for otherwise preventable illness. These have economy-wide effects. Adding them together, a 2013 analysis estimated that the burden of undernutrition may cost the country up to US\$199 million annually (approximately 2.4 percent of GDP).¹⁰

22. Recognizing the importance of the challenge undernutrition poses in Lao PDR, a number of published and unpublished work on nutrition has been done in Lao PDR.¹¹ This policy note makes a specific contribution by grounding the analysis on Lao PDR specific data to identify constraints that are binding Lao PDR and not just rely on international evidence. In particular, the use of multivariate analysis pulling together all the components of the determinants of stunting sets apart this analysis from previous work in Lao PDR that have mainly employed descriptive or univariate analysis in looking at this issue, or when multivariate analysis is done, limited components have been included in the analysis. Yet it is well known that determinants of undernutrition are interrelated, thus multivariate analysis using a complete set of components that are known to drive undernutrition controls for the correlation between these variables and helps identify the most important determinants, while also grounding the evidence on Lao PDR specific data rather than merely following international evidence. Furthermore, the policy note uses qualitative and quantitative studies that reveal specific gaps in skills and behaviors of health workers in delivering nutrition services, including nutrition counseling and growth monitoring. These aspects of the analyses are novel in Lao PDR. In so doing, the note comes up with some new findings or clarifies other issues. These will be highlighted in the rest of this document, starting with findings on the causes of child undernutrition in the next section (Part II), followed by an assessment of the key challenges and bottlenecks in nutrition service delivery in Part III. Conclusions drawn from these findings are presented in Part IV, which also presents policy recommendations.

⁹ SUN, 2012. Scaling Up Nutrition (SUN) Movement Strategy [2012-2015], September 2012. <http://scalingup-nutrition.org/wp-content/uploads/2012/10/SUN-MOVEMENT-STRATEGY-ENG.pdf> and The Lancet Maternal and Child Nutrition Series, June 2013.

¹⁰ Bagriansky, J. et al (2013), The Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, UNICEF.

¹¹ Lao PDR National Nutrition Strategy to 2025 and Plan to Action 2016-2020, December 2015; Draft Recommendations for Multi-sectoral Food and Nutrition Security Action Plan 2014-2020, United Nations, December 2013; Country Note – Lao PDR: Accelerating progress towards improved nutrition for women and children, United Nations and World Bank, 2014.

Part II: Causes of Child Undernutrition

23. The causes of undernutrition in children are multi-faceted, multi-sectoral and interdependent. According to the widely used Lancet 2013 conceptual framework,¹² undernutrition is an outcome of immediate, underlying and basic causes. At the immediate level, nutritional status is ultimately determined by the availability of nutrients to the body in order to meet its requirements and a healthy status as well as by diseases (incidence, duration, severity); while the underlying causes are related to food security (access, availability and utilization of food), maternal and child caring practices, water and sanitation and personal hygiene. The basic causes driving these determinants include institutional/organizational, political and ideological, economic, social (e.g. social status of women) as well environmental constraints. In addition, human-made disasters such as conflicts and wars as well as natural disasters such as recurrent floods and droughts exacerbate the situation.



¹² The Lancet Maternal and Child Nutrition Series, June 2013.

24. Given the interdependence of these causes, a multi-variate analysis of the determinants of stunting was undertaken to identify factors that are likely to matter most for influencing child growth outcomes in Lao PDR. The multivariate analysis uses a probit model to test the relationship between three groups of underlying factors and the probability of stunting in Lao PDR using data from Community Nutrition Project (CNP), 2010 baseline survey – the only available data with all three groups of factors together that met recommended variable definitions. The first factor is dietary intake, using a dietary diversity score constructed using WHO guidelines¹³ as an indicator of nutritional adequacy¹⁴. Second, are factors related to adequate childcare activities, which include appropriate home-based care practices and access to health care services, placing a particular emphasis on intergenerational elements in the analysis. The analysis include mothers' education and maternal body mass index (BMI) or height, in addition to younger age pregnancy^{15,16} and child birthweight^{17,18} as important intergenerational determinants of child growth. The third type of factors are related to the physical environment in water and sanitation, which affects child health directly via morbidity and indirectly via reduced nutrient absorption due to environmental enteropathy.¹⁹ Results of this estimation are presented in **Table 13** and **Table 14** in the annex. To investigate whether greater access to diverse foods is necessarily associated with improved child growth outcomes, this multivariate model was also extended to test the relationship between agriculture, dietary diversity and the probability of stunting (see **Table 15** and **Table 16**).

¹³ World Health Organization. 2008. "Indicators for Assessing Infant and Young Child Feeding Practices." Part 1-Definitions: Conclusions of a Consensus Meeting Held 6-8 November 2008.

¹⁴ Ruel, Marie T. 2003. "Animal Source Foods to Improve Micronutrient Nutrition and Human Function in Developing Countries Interventions for Micronutrient Deficiency Control in Developing Countries: Past, Present and Future 1." *Journal of Nutrition* 133: 3911S – 3926S.

¹⁵ Arimond, Mary, and Marie T. Ruel. 2004. "Dietary Diversity Is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys." *The Journal of Nutrition* 134 (10): 2579–85. doi:0022-3166/04.

¹⁶ Disha, AD, R Rawat, A Subandoro, and P Menon. 2012. "Infant and Young Child Feeding (IYCF) Practices in Ethiopia and Zambia and Their Association with Child Nutrition: Analysis of Demographic and Health Survey Data." *African Journal of Food, Agriculture, Nutrition and Development* 12 (2): 5895–5914. doi:10.4314/ajfand.v12i2.

¹⁷ Alderman, H. and Behrman, J., Reducing the Incidence of Low Birth Weight in Low-income Countries has Substantial Economic Benefits, *World Bank Research Observer* 21(1): 25-48, 2006.

¹⁸ Yamauchi, C., Children's Health and Parental Labour Supply, *Economic Record*, Version of Record online: 8 APR 2012, DOI: 10.1111/j.1475-4932.2012.00794.x.

¹⁹ Humphrey, Jean H. 2009. "Child Undernutrition, Tropical Enteropathy, Toilets, and Handwashing." *The Lancet* 374 (9694). Elsevier Ltd: 1032–35. doi:10.1016/S0140-6736(09)60950-8.

25. A detailed discussion of the analysis of the key determinants of undernutrition is presented below. The discussion starts with a careful examination of inadequate dietary intake, focusing first on its correlation with stunting, then an analysis of factors contributing to inadequate dietary intake, evaluating the relative importance of access to food and feeding practices or intra-household allocation. Analysis of the impact of the burden of diseases is discussed next, establishing the channel through which it affects undernutrition, followed by an examination of the household and physical environment which are the main cause of diseases, highlighting the importance of underlying? factors on stunting. The multivariate analysis reveals a magnified influence of predetermined factors, those that are determined before the child is born, hence a separate discussion of the role of intergeneration determinants of undernutrition is also made. All these factors are influenced by culture, social and gender norms, thus the discussion of determinants of undernutrition will be concluded by looking at these norms.

Inadequate Diet

26. Adequate dietary intake – both in terms of quantity and diversity of foods consumed - is essential for the provision of nutrients required for the normal growth and development of a child. The quality of the diet appears to be the most limiting aspect of adequate nutrient intake in Lao PDR, where dietary diversity is low throughout the country. A survey conducted in six provinces in the central and southern regions (CNP baseline survey, 2010) shows that on average, over-6-months-old breastfed children only consume two food groups and that only 30 percent met the minimum dietary intake requirements. Another survey, (National Institute of Public Health (NIoPH), 2010 survey) found that 30 percent (in Vientiane Province) and 5 percent (in Sekong) of children aged 6-23 months achieved the minimum dietary diversity, defined as consuming at least four food groups over a 24-hour recall period. Evidence from the multivariate analysis of determinants of stunting in Lao PDR²⁰ shows that such low dietary diversity intake is a significant predictor of stunting, with the likelihood of stunting being five percentage points lower for 6-59 months old children consuming at least three food groups in a day (see Table 13 and Table 14 in the annex) compared to children consuming fewer food groups. This finding is similar to other studies across the world, which have shown that low dietary diversity is associated with low nutrient intake and is an important predictor of stunting.^{21,22,23,24}

²⁰Takamatsu, Pimhidzai and Osornprasop. 2016. Determinants of nutrition in Lao PDR, Background Paper. World Bank.

²¹Arimond, Mary, and Marie T. Ruel (2004) "Dietary Diversity Is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys." *The Journal of Nutrition* 134 (10): 2579–85. doi:0022-3166/04.

²²Kennedy, Gina L, Maria Regina Pedro, Chiara Seghieri, Guy Nantel, and Inge Brouwer. 2007. "Dietary Diversity Score Is a Useful Indicator of Micronutrient Intake in Non-Breast-Feeding Filipino Children." *The Journal of Nutrition* 137 (2): 472–77. doi:137/2/472 [pii].

²³Moursi, Mourad M, Mary Arimond, Kathryn G Dewey, Serge Trèche, Marie T Ruel, and Francis Delpeuch. 2008. "Dietary Diversity Is a Good Predictor of the Micronutrient Density of the Diet of 6-to 23-Month-Old Children in Madagascar 1–3." *J. Nutr* 138 (September): 2448–53. doi:10.3945/jn.108.093971.

²⁴Steyn, N P, J H Nel, G Nantel, G Kennedy, and D Labadarios. 2006. "Food Variety and Dietary Diversity Scores in Children: Are They Good Indicators of Dietary Adequacy?" *Public Health Nutrition* 9 (5): 644–50. doi:10.1079/PHN2005912.

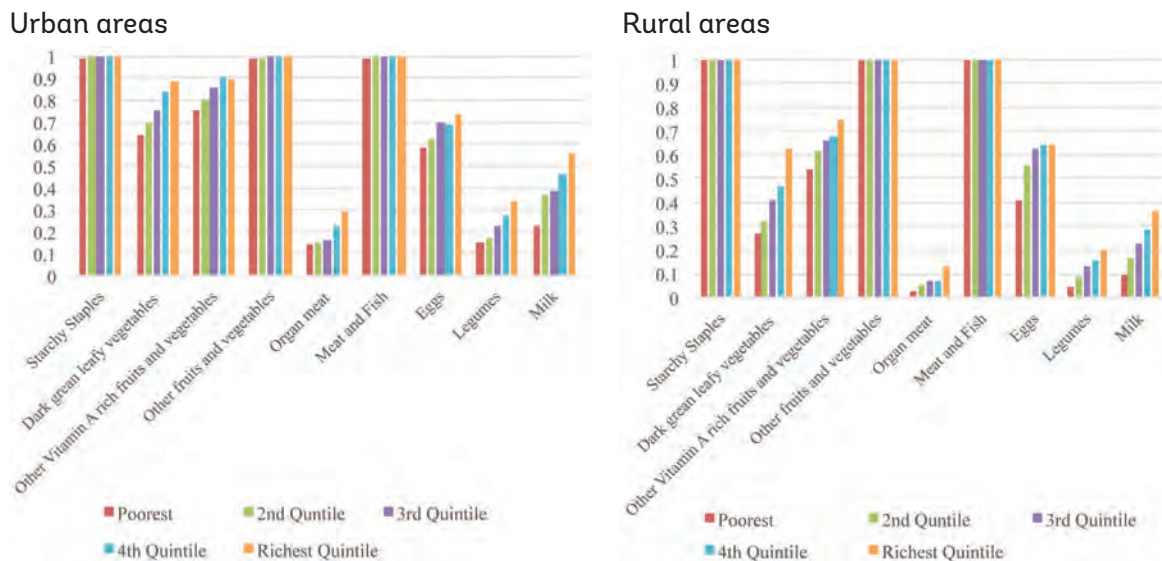
27. The observed low dietary diversity among children mirrors broad consumption behaviors at the household level in general, which are further aggravated by poor infant and young child feeding (IYCF) practices, especially among children younger than two years. Thus in digging deeper at the issue of inadequate dietary intake, we first look at the issue of food insecurity at the household level focusing on access to food and overall consumption patterns, and then turn to intra household allocation of food, especially as it regards to dietary intake for children.

28. Analysis of household consumption patterns suggests that food insecurity at the household level is of a lesser concern as a driver of inadequate dietary intake among children. Nationally, calorie deficiency is less of a challenge. The LECS 5 survey shows that in 2012/13, the average calorie intake per capita per day was 2,751 kcal and this is well beyond 2,100 kcal that is an adequate calorie intake deemed to meet the daily needs of an average Lao person (see [Table 2](#)). The average calorie intake per person at the household level also exceeded the daily minimum calorie intake requirements in both rural and urban areas and across all welfare quintiles. Thus, a typical household in Lao PDR, even a typically poor one, is not food insecure, hence food insecurity explains a smaller aspect of inadequate dietary intake: what households lack is a balanced diet.

Table 2. Household dietary intake by macro-nutrients

	Dietary energy consumption (kcal/person/day)	Protein		Fat		Carbohydrates+ Fiber	
		Calorie Share %	Bench mark	Calorie Share %	Bench mark	Calorie Share %	Bench mark
National	2751	12	OK	11	OK	77	OK
Rural	2842	12	OK	9	LOW	79	EXCESS
Urban	2526	13	OK	15	OK	72	LOW
Poorest quintile	2112	11	OK	6	LOW	82	EXCESS
Second quintile	2414	11	OK	8	LOW	81	EXCESS
Third quintile	2674	12	OK	10	LOW	78	EXCESS
Fourth quintile	2922	12	OK	12	OK	76	OK
Richest quintile	3631	13	OK	16	HIGH	71	LOW

Source: Authors calculations from LECS 5

Figure 5: Household dietary diversity by socio-economic quintiles

Source: Authors calculations from the LECS, 2012/13 survey

29. Inadequate dietary diversity among children broadly reflects low dietary diversity in the household in general. As evidence from the LECS 5 shows, this is especially acute in rural areas where most households consume only three of the nine food groups identified by FANTA and FAO.²⁵ Dark leafy green vegetables are under-consumed in rural areas, especially among the poorest. Only 27 percent of households in the poorest socio-economic quintile in rural areas consumed them. Legumes, dairy products and eggs are consumed by a much smaller share of households. In all cases, urban households tend to consume more of these items than rural households (see Figure 5). This same pattern is observed among children. The CNP Baseline Survey (2010) that has individual-level dietary intake for children, for instance, showed that eggs, dairy products and legumes and nuts are consumed by less than 14 percent of both under-five children and their households in general. The low consumption of milk results in low calcium intake that can cause stunting while undesirably low intake of fat hinders the absorption of fat-soluble nutrients. A controlled study in India found a smaller increase in serum levels of vitamin A in children supplemented with spinach compared to children who also had 10g of groundnut oil sprinkled to the spinach curry, for example.²⁶

²⁵FANTA, and FAO. 2014. "Introducing the Minimum Dietary Diversity - Women (MDD-W) Global Dietary Diversity Indicator for Women," 2014-15. <http://www.fantaproject.org/monitoring-and-evaluation/minimum-dietary-diversity-women-indicator-mddw>. The nine food groups identified are Starchy staples, Dark green leafy vegetables, Other vitamin A rich fruits and vegetables, Other fruits and vegetables, Organ meat, Meat and Fish, Eggs, Legumes, nuts and seeds, Milk and milk products.

²⁶Jayarajan, P., V. Reddy, and M. Mohanram (2013) "Effect of Dietary Fat on Absorption of Carotene from Green Leafy Vegetables in Children." *Indian Journal of Medical Research* 137 (5): 53-56.

30. But a substantial portion of low dietary diversity for children in Lao PDR is also linked to poor infant and young child feeding (IYCF) practices. Even though continued breastfeeding beyond one year of age is relatively high (nearly 75 percent of children aged 12-15 months still receive breast milk at one year), complementary feeding practices for 6 to 23 months old babies in the country are poor overall (**Table 3**) and mostly late, with only one-third of children aged 6 to 23 months receiving both breast milk and appropriate complementary foods. Early initiation of breastfeeding remains sub-optimal, with less than half of all children reportedly breastfed within one hour of birth. One-third of all infants receive a pre-lacteal feed, a food other than mother's breast milk, that presents a barrier to exclusive breastfeeding and exposes infants to environmental pathogens.

Table 3. Breastfeeding and complementary feeding practices

Province	Children <2 breastfed within one hour of birth %	Children < 6 months exclusively breastfed %	Children 6-23 months currently breastfeeding + receiving solid, semi-solid or soft foods %	Children 12-15 months, continued breastfeeding at 1 year %	Children age 20- 23 months, contin- ued breastfeeding at 2 years %
Phongsaly	60.4	59.7	38.7	70.6	45.0
Luangnamtha	35.2	73.8	46.4	74.5	52.2
Oudomxay	22.2	61.6	25.2	88.9	51.1
Huaphanh	36.4	77.2	27.3	82.2	35.3
Xiengkhuang	58.8	73.7	30.4	82.2	28.9
Saravane	54.5	28.0	48.6	74.5	69.1
Xekong	43.9	62.3	27.0	89.1	58.1
Bokeo	41.0	41.7	43.7	81.8	54.0
Luangprabang	44.9	44.9	43.9	70.6	47.7
Khammuane	30.0	13.4	57.9	77.2	54.9
Savannakhet	21.9	16.4	26.4	69.2	45.2
Attapeu	48.7	42.5	27.2	91.7	61.1
Vientiane Capital	45.8	30.4	22.9	58.8	15.6
Xayabury	66.4	61.7	29.0	72.2	13.0
Vientiane	51.3	55.9	47.6	58.2	32.1
Borikhamxay	23.8	45.0	42.6	60.8	21.7
Champasack	23.2	20.0	31.5	69.7	27.0
Lao PDR	39.1	40.4	35.4	73.0	40.0

Source: Authors calculations from LECS 5

31. Crucially, a significant proportion of children are not fed important food groups even when the household consumes them or the food is available at the household level, suggesting low levels of nutrition knowledge and awareness. This is particularly the case for 6 – 23 months old children who are fed fewer food groups than 24 – 59 months old children. For instance, the CNP Baseline Survey (2010) shows that while 74 percent of mothers in the sample consumed vitamin A rich foods and vegetables, only 45 percent of 6 – 23 months old babies did. More concerning is that only 60 percent of 6 – 23 months old children consumed vitamin A rich foods and vegetables even when their mothers consumed them, while the corresponding share is 90 percent for 24 – 59 months old children. The same applies to flesh foods, other fruits and vegetables, eggs and legumes and nuts (see Table 4), reflecting an inappropriate practice of late and sub-optimal complementary feeding for under two year olds. Highlighting the importance of feeding practices, both bivariate and multivariate analysis from the same survey shows that agricultural diversity is only associated with increased dietary diversity at the household level but not for children (Table 15 and Table 16 in Annex) and no statistically significant relationship is observed between an index of agricultural diversity and the likelihood of stunting. This is similar to findings in other international studies.^{27,28,29} It signifies the importance of nutrition-related behaviors and practices, rather than just access to food, as an important contributor to stunting.

Table 4. Food access, infant and child feeding practices by age group

Food group:	6-23 months children			24-59 months children		
	Share of mothers consuming %	Share of children consuming %	Share of children consumed if mother consumed %	Share of mothers consuming %	Share of children consuming %	Share of children consumed if mother consumed %
Starchy staples	99.1	92.6	93.1	98.6	98.5	99.1
Vitamin A rich fruit and vegetables	73.5	44.7	60.3	76.3	70.9	91.8
Other fruit and vegetables	82.3	49.0	58.2	82.3	76.8	90.9
Flesh foods (meat, fish, poultry and organ meats)	73.1	56.1	74.5	69.8	68.9	95.8
Eggs	15.1	13.0	66.1	12.3	13.8	81.6
Legumes and nuts	3.0	4.1	34.6	2.8	4.1	67.1
Dairy products	3.0	10.5	75.6	1.1	6.3	83.9

Source: Authors calculations from the CNP Baseline survey, 2010

²⁷Kumar, Neha, Jody Harris, and Rahul Rawat (2015). "If They Grow It, Will They Eat and Grow? Evidence from Zambia on Agricultural Diversity and Child Undernutrition." *The Journal of Development Studies* 51 (8): 1060–77. doi:10.1080/00220388.2015.1018901.

²⁸Ruel, Marie T., and Harold Alderman (2013). "Nutrition-Sensitive Interventions and Programs: How Can They Help Accelerate Progress in Improving Maternal and Child Nutrition?" *Lancet* 382 (9891), pp 536-51.

²⁹Shively, Gerald, and Celeste Sununtnasuk. 2015. "Agricultural Diversity and Child Stunting in Nepal." *The Journal of Development Studies* 51 (8): 1078–96. doi:10.1080/00220388.2015.1018900.

32. Separately, home gardening is not a panacea to the low dietary diversity challenges in Lao PDR; it has to be linked with changes in young child feeding practices. As highlighted above, there is a lack of a strong relationship between agricultural diversity and child nutrition outcomes, even though there is a positive correlation between household-level dietary diversity and agricultural diversity. This suggests a weak link for translating higher agricultural diversity into higher dietary diversity for children, namely that improved food availability at the household in many cases does not translate into improvements in the diet of children in Lao PDR. As shown (in table 4) 6 – 23 months olds are unlikely to be fed some foods even when such foods are available in the households. Thus, increasing diversity in production alone without educating or changing behaviors of children’s caregivers about proper ways of feeding children will not have any meaningful impact. According to an earlier World Bank-supported study of infant and young child feeding in Lao PDR, there remains a widespread belief that young children know when and how much to eat. This results in the absence of engaged and interactive feeding behaviors, and low overall dietary diversity in children.³⁰

Table 5. Comparison of maternal, infant and child feeding practices by mothers’ awareness of growth monitoring/nutrition education

Food group	Mothers did not received growth monitoring/nutrition education			Mothers received growth monitoring/nutrition education		
	Share of mothers consuming %	Share of children consuming %	Share of children consuming if mother consumed %	Share of mothers consuming %	Share of children consuming %	Share of children consuming if mother consumed %
Starchy staples	96.5	91.8	94.9	99.1	95.1	95.4
Vitamin A rich fruit and vegetables	76.0	55.6	72.1	74.4	54.7	72.7
Other fruit and vegetables	65.5	50.0	71.2	83.9	60.6	70.7
Flesh foods (meat, fish, poultry and organ meats)	50.9	41.8	78.5	73.8	62.8	82.7
Eggs	7.3	4.0	37.6	14.7	14.2	73.0
Legumes and nuts	1.4	1.0	0.0	3.1	4.4	48.7
Dairy products	1.4	7.7	48.1	2.3	9.0	78.9

Source: Authors calculations from the CNP Baseline Survey, 2010

³⁰Gillespie, A, H Creed-Kanashiro, D Sirivongsa, D Sayakoumanne, and R Galloway (2004), “Consulting with Caregivers: Using Formative Research to Improve Maternal and Newborn Care and Infant and Young Child Feeding in the Lao People’s Democratic Republic,” HNP Working Paper, World Bank, Washington, DC, and World Bank (2013), Maternal Health, Child Health and Nutrition in Lao PDR: Evidence from a Household Survey in 6 provinces, World Bank.

33. A focus on raising awareness as well as changing inappropriate practices and social norms in order to influence nutrition behaviors and habits is clearly needed in Lao PDR and can be successful. That access to food at the household level does not necessarily lead to higher consumption of some important food groups among children (particularly 6 – 23 months olds) is a clear indication of this. It is also observed from the surveys that mothers who received nutrition education and growth monitoring and promotion services for their children are significantly more likely to feed them with eggs, dairy products and legumes and nuts (*Table 5*). This suggests that raising child nutrition awareness and providing behavioral change communication, are important interventions in helping improve child nutrition outcomes, as part of a set of broader necessary interventions on nutrition.

34. Agriculture sector's potential impacts on improved nutrition are not only due to household production of diverse food for own consumption (e.g. home gardens and raising small animals) but also a result of increased income through the sales of agricultural products, which enable the households to use the increased incomes to purchase diverse food, assuming that they are available and affordable in local markets. An asset index used as a proxy of wealth in the multivariate analysis, has a robust relationship with stunting and accounts for some of the variation in child dietary diversity. Indeed, richer households have been found to have a higher dietary diversity in Lao PDR even among those predominantly relying on rice production – although rural households in general have lower dietary diversity than urban households. Especially important to consider is that other major groups like dairy products are generally not part of food production system in Lao PDR production in Lao PDR but richer households have the means to acquire them and therefore consume them more.



Burden of Infectious Disease and the Environment

35. Infectious disease is an immediate cause of child undernutrition. The LSIS 2011/12 estimated that 10 percent of children were reported to have had diarrhea in the two weeks preceding the survey. However, there is large regional variation in both the incidence and care for diarrhea, with over 16 percent incidence rate in Phongsaly, Oudomxay, Bokeo, and Luangprabang compared to only 5 percent incidence rate in Vientiane area (*Table 6*). While the highest incidence of diarrhea is highest among provinces with the highest stunting rates, multivariate estimates of the probability of stunting show a statistically insignificant relationship between diarrhea and stunting. This has been found in other studies as children tend to grow at “catch-up” rates between episodes of diarrhea. Rather, it is hypothesized³¹ that a subclinical disorder of the small intestine known as tropical/environmental enteropathy, caused by high chronic exposure to large quantities of fecal bacteria resulting in anatomical changes to the structure of the small intestine, affects a child’s ability to both absorb and utilize nutrients, leads to stunting instead. Although both the diarrheal and the tropical/environmental enteropathy hypotheses are premised upon fecal-oral contamination.³²

Table 6. Diarrheal incidence and management

Province	Children 0-59 months, had diarrhea in last two weeks %	Percentage of children receiving ORS or any recommended Fluid %	Percentage of children receiving Zinc %	ORT with continued feeding %
Phongsaly	16.0	30.2	0.0	35.5
Luangnamtha	9.9	78.7	0.0	72.1
Oudomxay	16.7	50.7	0.0	64.2
Huaphanh	12.0	47.9	0.0	55.0
Xiengkhuang	12.3	26.9	1.4	41.4
Saravane	10.3	36.4	0.0	50.8
Sekong	12.1	30.9	0.0	40.0
Bokeo	23.8	54.5	1.3	58.7
Luangprabang	17.7	50.3	1.9	70.6
Khammuane	6.5	31.4	0.0	55.2
Savannakhet	8.8	34.5	0.0	50.6
Attapeu	1.0	75.6	0.0	75.6
Vientiane Capital	5.2	88.1	0.0	76.7
Xayabury	10.4	61.5	8.9	68.2
Vientiane	4.3	37.3	0.0	33.2
Borikhamxay	6.9	77.8	0.0	71.4
Champasack	6.0	62.3	2.7	66.1
Lao PDR	10.0	47.5	1.0	57.4

Source: Authors calculations from LECS 5

³¹Humphrey, Jean, H., 2009. Child undernutrition, tropical enteropathy, toilets, and handwashing. *The Lancet*, Vol. 374.

³²As the table suggests, continued feeding during illness is important for recovery and limiting negative consequences of diarrhea.

36. Given its influence on the burden of infectious disease, access to a healthy household environment—including appropriate water, sanitation, and hygiene practices—is a main underlying cause of child undernutrition. Unsafe drinking water is a common cause of several diseases, including trachoma, cholera, typhoid and schistosomiasis, while exposure to fecal contamination in the environment (due to unsafe disposal of infant and child feces, open defecation, exposure to soil contaminated with human and animal feces, and poor hand hygiene practices) increases the diarrheal disease burden.³³ Even when exposure to feces does not cause diarrhea, chronic exposure can still impair nutrient absorption and lead to undernutrition as a result of tropical/environmental enteropathy. In Lao PDR, access to sanitation is particularly lagging. While approximately 70 percent of the population has access to improved drinking water, only 60 percent of households have an improved toilet and as much as 38 percent of households practice open defecation (*Table 7*). There are large regional variations, with 77 percent and 61 percent of households in Saravane and Phongsaly respectively, practicing open defecation. Although areas with the lower level of access to improved sources of drinking water are not necessarily the areas with higher stunting rates, those provinces with limited access to improved sanitation clearly tend to have higher stunting rates.

Table 7. Access to improved water and sanitation

Province	Children 0-59 months, had diarrhea in last two weeks %	Use public tap %	Improved sources of drinking water %	Improved sanitation %	Unimproved facilities %	Open defecation %	Improved drinking water & improved sanitation %
Phongsaly	16.0	3.3	74.7	34.0	4.1	61.7	31.4
Luangnamtha	9.9	50.4	97.6	67.3	0.0	32.5	66.0
Oudomxay	16.7	55.8	78.2	44.2	8.8	46.8	40.3
Huaphanh	12.0	60.5	86.8	58.7	12.5	28.6	53.3
Xiengkhuang	12.3	21.9	75.8	54.1	12.6	33.2	45.9
Saravane	10.3	1.3	59.2	22.3	0.2	77.4	14.9
Sekong	12.1	1.8	75.1	37.7	10.1	52.1	31.2
Bokeo	23.8	3.1	76.6	69.3	0.1	30.4	52.2
Luangprabang	17.7	32.0	81.1	58.5	2.1	39.2	54.3
Khammuane	6.5	1.4	56.9	42.1	0.8	57.0	29.8
Savannakhet	8.8	0.2	48.3	43.0	0.4	56.5	29.3
Attapeu	1.0	0.5	60.4	37.2	5.1	57.6	25.6
Vientiane Capital	5.2	0.0	88.2	97.9	0.6	1.4	83.5
Xayabury	10.4	19.4	67.1	89.7	3.5	6.7	57.8
Vientiane	4.3	7.5	61.3	88.2	1.6	10.1	54.0
Borikhamxay	6.9	2.6	61.8	83.9	0.3	15.6	52.2
Champasack	6.0	3.0	72.7	43.2	1.0	55.7	33.8
Lao PDR	10.0	13.3	69.9	59.2	2.9	37.9	45.7

Source: LSIS 2011/2

³³Mara, D., Lane, J., Scott, B., Trouba, D. (2010) Sanitation and Health. PLoS Med 7(11): e1000363. doi:10.1371/journal.pmed.1000363.

37. The multivariate analysis shows that poor access to improved sanitation is an important predictor of stunting in Lao PDR. The predicted probability of stunting among 6 – 23 months old children is 6 and 14 percentage points higher when the share of the population practicing open defecation in the village increases from 25 percent to 50 and 100 percent coverage respectively. Children living in households with access to improved water have a statistically significant lower probability of being stunted, but the estimates are sensitive to children's age. The probability of stunting is estimated to be 5 percent lower among 6-59 months old children with access to an improved water source. However, there is no statistically significant change in the probability for a restricted sample of 6 to 23 months old, implying that a healthy environment affects age groups differently. A potential explanation for this finding is that water usage and exposure to unsafe water is higher among older children, resulting in a greater impact on stunting among older children relative to younger ones, but it could also mean that improving water quality does not adequately capture changes in hygiene behaviors like handwashing. Overall the analysis suggests that improvements in availability and use of sanitation amenities are important for reducing child undernutrition. Improving hygiene behaviors could be as important too. Although improved sanitation appears to have more direct contribution to reducing child nutrition, water access at home is reported to lead to increased use of water for hygienic purposes, making investments in better domestic water supplies important as part of a multi-sectoral approach.³⁴

Intergenerational Factors

38. Poor maternal nutrition has intergenerational consequences as maternal undernutrition is a root cause of inadequate fetal growth and ultimately can lead to child stunting. Low maternal body mass index (BMI), or maternal underweight, is associated with intrauterine growth restrictions,³⁵ and nearly one-third to one-half of all growth failure by age two occurs in utero.³⁶ The NloPH survey, 2010 found that approximately 14 percent of women aged 15-49 are underweight, putting women at increased risk of delivering low birth weight (LBW) infants.³⁷ Insufficient fetal growth and nutrition intake during pregnancy increases the risk of infant mortality and can have lifelong effects on the immune function and cognitive outcomes. The incidence of low birthweight (LBW) varies a lot across provinces in Lao PDR, being above 19 percent in Saravane, Attapeu, Bokeo and Khammuane, but less than 10 percent in Vientiane province and Phongsaly (see *Table 8*).

³⁴See <http://ehp.lshrm.ac.uk/water-supply-and-quality/> It is also important to note that availability of improved sanitation facilities is not always translated into use. According to LSIS 2011/2, a significant number of households who have access to improved sanitation do not use it to safely dispose child feces. Only 35% of households that have access to improved sanitation facilities disposed child feces using improved latrines on their premises. A significant proportion of households choose unsafe methods instead, such as leaving it in the open (21%) or throwing it into the garbage (9.2%).

³⁵Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, Egzati M, Grantham-McGregor S, Katz J, Martorell R, Uauy R and the Maternal and Child Group (2013) Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*;322: 427-51.

³⁶Dewey K and Huffman. 2009. Maternal, infant, and young child nutrition: combining efforts to maximize impacts on child growth and micronutrient status. *Food Nutr Bull*;32:S187-9.

³⁷2010, NloPH. The survey was conducted in nine provinces and included 4,600 women aged 15-49. As a reference, about 3-5% of a healthy population will have BMI <18.5 kg/m².

39. The analysis of determinants of stunting in Lao PDR finds that mothers' stature and low birthweight are determinants for higher rates of stunting, even after taking other factors into consideration. The probability of stunting is 10 percentage points higher when a baby is born small in size (self-reported) than average, for example, or if the mother is 5 cm shorter than the median height. Other attributes of mothers are important too. The probability of stunting is lower by 5 percentage points when a child has a mother who completed primary education. These estimates are all statistically significant. The contribution of these intergenerational determinants of child undernutrition not only highlight the need for urgency in dealing with child undernutrition to minimize the impact on future generations, but also show how proper maternal care, not just child care, is important for combating stunting.

Table 8. Low birth weight in Lao PDR

Province	Live birth weight below 2500 grams (%)
Phongsaly	6.4
Luangnamtha	12.4
Oudomxay	10.1
Huaphanh	11.3
Xiengkhuang	18.4
Saravane	22.7
Sekong	12.8
Bokeo	19.2
Luangprabang	19.4
Khammuane	22.0
Savannakhet	13.5
Attapeu	20.4
Vientiane Capital	12.5
Xayabury	10.2
Vientiane	8.9
Borikhamxay	9.9
Champasack	18.1
Lao PDR	14.8

Source: LSIS 2011/2

Culture and Beliefs

40. Food restrictions are prevalent across Lao PDR, and are especially common for pregnant and post-partum women. Beliefs are usually promoted and at times enforced by influential family members, including grandmothers and husbands. Mothers often report that they are encouraged to restrict food intake during pregnancy so they can have smaller babies and easier deliveries, and that food restrictions often continue through the delivery and breastfeeding period.³⁸ These food restriction practices can lead to an imbalanced and deficient diet among pregnant and lactating women, which in turn is a key determinant of maternal and child undernutrition. Beliefs also shape general child feeding behaviors, contributing to sub-optimal child complementary feeding practices.

41. Culture is also a driver of early marriage, the primary cause of the high teenage pregnancy rates in rural Lao PDR, which is an important determinant of stunting. About 19 percent of girls aged between 15 and 19 years olds were pregnant or had already given birth in 2012. Nearly all of girls who had pregnancy at this age (99 percent) were married, pointing to a culture of acceptances of early marriage, although poor education is also a contributing factor (22 percent of teenage girls who had been pregnant had never been to school and 50 percent had at most primary education, compared to 8 percent and 30 percent respectively, among girls who had never been pregnant). These teenage pregnancies contribute to stunting since adolescent girls, who are still growing when they become pregnant, end up competing with their fetus in order to meet their respective nutritional needs. The multivariate analysis finds that the probability of stunting is at least 10 percentage points higher among children conceived by women below the age of 17, for example.

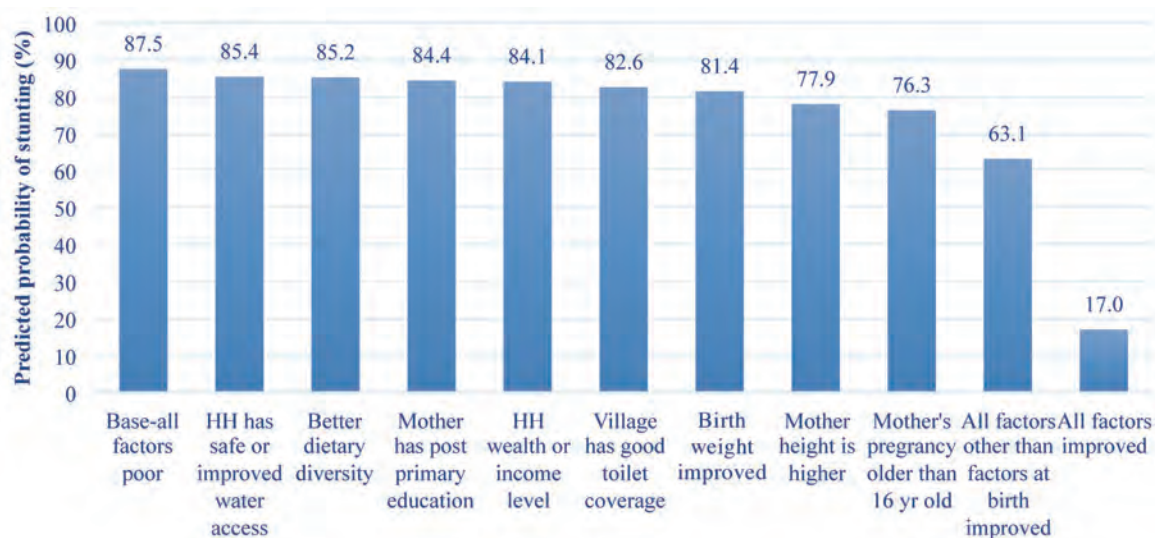


³⁸Phimmasone K, Douangpoutha I, Fauveau V, Pholsena P (1996) Nutritional status of children in the Lao PDR. *J Trop Pediatr* 421: 5–11. Holmes, W. et al, Influences on maternal and child nutrition in the highlands of the northern Lao PDR, *Asia Pac J Clin Nutr.* 2007;16(3):537-45.

A holistic, multi-sectoral approach to addressing causes of undernutrition will have greater impact

42. Causes of stunting are interrelated, thus requiring a holistic approach in designing and implementing interventions. A compelling representation of this is made in **Figure 6** which is based on predictions from the multivariate analysis model for the determinants of stunting. Other than addressing mothers' stature and teenage pregnancies, which are associated with the highest reduction in stunting by between 9 to 13 percentage points, individually improving the other factors is associated with only a 6 percentage point reduction in the likelihood of stunting at best. This is in contrast to a more holistic, multi-sectoral approach, where simultaneous improvement in water and sanitation, dietary diversity, and vitamin A intake is associated with a 22 – 24 percentage points reduction in the likelihood of a child being stunted. This implies that a holistic, multi-sectoral approach will provide better results than addressing individual factors and that adequately addressing key factors both before and after birth is necessary in order to accelerate the reduction of stunting.

Figure 6: Predicted probability of stunting by cause for 6 – 23 months old children



Source: Source: Authors calculations from the CNP Baseline survey, 2010

Part III: Key Challenges and Bottlenecks in Nutrition Service Delivery

43. As can already be seen from the above analysis, poor nutritional outcomes in Lao PDR have complex, multi-sectoral causes. While food insecurity is part of the problem, many causes of undernutrition in Lao PDR can be traced to people's behaviors and practices, delivery of health and nutrition services, and access to basic amenities. Improvements in nutritional outcomes require a holistic, multi-sectoral response aiming to educate families on the importance of the first 1,000 days of life focused on (i) increasing access and quality of essential health and nutrition services, (ii) appropriate feeding/consumption behaviors and care practices for infants, young children as well as pregnant and lactating mothers, (iii) increasing demand for consumption of diverse diets and (iv) increasing access and demand for improved water and sanitation facilities to reduce the prevalence of diseases.



44. The supply side plays an indispensable role in helping to generate demand for the adoption of optimal behaviors. This can be achieved through the delivery of social and behavior change communication (SBCC), including nutrition counseling, growth monitoring and promotion (GMP), provision of necessary micronutrient supplements and health care services, elimination of open defecation complemented by proper hygiene practices, provision of water services, increasing access to secondary education for women (to combat teenage pregnancies and because children of educated mothers have better outcomes, for example), and promoting agriculture commercialization to increase income, or diversification of crops among subsistence households with limited access to markets.

Box 1: What is social and behavior change communication?

Social and behavior change communication (SBCC) is the use of communication to change behaviors, including service utilization, by positively influencing knowledge, attitudes and social norms.

SBCC coordinates messaging across a variety of communication channels to reach multiple levels of society. Communication channels include, among others, interpersonal communication, mass media, community consciousness-building, group education/discussion, advertisement, social media, etc.

45. The health sector delivery system plays a critical role in addressing maternal and child undernutrition. Crucial intervention areas for the sector include:

(i) *Social and behavior change communication, including nutrition counseling and promotion of optimum maternal, infant, and young child nutrition and growth* - The above analysis of the causes of undernutrition suggests that SBCC is crucial for combating undernutrition, given that feeding behaviors and habits are largely responsible for poor dietary diversity, even in cases where the household has access to food. While nutrition-related SBCC strategy should encompass multiple communication channels, including interpersonal communication, mass media, community consciousness-building and group education that will help reinforce the same messages, individual nutrition counseling is the cornerstone of an effective and efficient program. Working with a mother to find one or two actions she can implement can be more effective tactic than the more traditional approach in which she participates in a group discussion from which she must extract recommendations relevant to her own child, for example.³⁹

³⁹Griffiths, M., Dickin, K. and Favin, M., 1996. Promoting the growth of children: what works. World Bank Nutrition Toolkit, Tool, 4.

Counseling is required for exclusive breastfeeding for 6 months, educating mothers/caregivers on complementary feeding starting at 6 months with continued breastfeeding for 2 years, educating mothers and family members about adequate and diverse diet for pregnant women and mothers themselves, as well as providing advice on appropriate hygiene and sanitation practices. The analysis highlighted that the gap between food access and complementary feeding is greatest for the under-2 year old children, indicating a particular need for raising awareness among caregivers of children at this age. Nutrition counseling should be provided by hospital and health center staff during antenatal care visits, post-natal care visits, well-baby/sick-child visits, and outreach visits. To reinforce the messages from hospital and health center staff, it is desirable that nutrition counseling also be provided at the village level by well-trained village health volunteers and village facilitators, particularly during their home visits to pregnant mothers, lactating mothers, and families with children under 2 years of age.⁴⁰

Nutrition SBCC needs to be multi-sectoral. While the health sector is responsible for SBCC delivery focusing on dietary diversity, sanitation, hygiene, eliminating open defecation and nudging behaviors to change beliefs and social norms that negatively affect child and maternal nutrition outcomes, the education sector can play a role in delivering nutrition SBCC at schools during health and nutrition education classes, as well as supporting key early childhood development activities including counseling and training of caregivers on early stimulation of their infants.⁴¹ The international evidence demonstrates long-term impact on later life cognitive development, school performance, and adult earnings from the combination of early stimulation and improved nutrition in the first years of life.⁴² The agriculture sector can also play an important role in promoting agriculture-related SBCC, e.g. promote home gardens among farmers to grow diverse crops and to keep small animals for child and household consumption.

⁴⁰In terms of political and legislative environment, the Government of Lao PDR has successfully passed legislation granting five months of maternity leave to working women in the formal sector to facilitate exclusive breastfeeding, although additional measures are needed to address working women in the informal sector. Furthermore, the Government can ensure the protection of breastfeeding through implementation of the Code of Marketing of Breastmilk Substitutes.

⁴¹Furthermore, the Government may consider financial incentive programs as a pathway to enable the poorest and most marginalized ethnic communities to access nutrition counseling as well as other health and nutrition services.

⁴²<http://www.ncbi.nlm.nih.gov/pubmed/24571216> and UNICEF's Care for Child Development at http://www.unicef.org/earlychildhood/index_68195.html provides the description, training materials, etc. for holistic, healthy young child growth and development that includes early stimulation and cognitive development in addition to nutrition and health interventions.

(ii) *Micronutrient supplementation* - Due to low consumption of micronutrient-rich foods, national efforts to address micronutrient deficiency in the short term should emphasize supplementation with key vitamins and minerals for pregnant mothers, infants, and young children. Evidence from the analysis shows that intake of vitamin A tablets and folate have the highest correlation with child height for age and the likelihood of stunting.⁴³ The likelihood of a child being undernourished was 11 percentage points lower if the child took vitamin A. Increasing coverage of vitamin A supplementation for children 6-59 months can contribute to reduce childhood morbidity and mortality and improving coverage of iron – folic acid supplementation for pregnant women can reduce risk of maternal anemia, maternal mortality, and low birth weight – which are all underlying determinants of undernutrition.

(iii) *Appropriate nutritional care of sick and malnourished children* – proper care and treatment of malnourished children remains an important function of the health sector nutrition service delivery. Conducting regular growth monitoring and nutrition counseling (including on child feeding during illness), providing treatment for all acute malnutrition cases, and promoting ORS with zinc for the treatment of acute diarrhea will be important. Growth monitoring and promotion, if conducted on a monthly basis, helps identify children who are falling off the curve,

(iv) *Water, Sanitation and hygiene promotion services* – the water and sanitation sector in Lao PDR, is part of Ministry of Health and Ministry of Public Works mandate, hosted with its Center for Environmental Health and Rural Water Supply, and its district branches. Integrated and linked to health sector nutrition intervention, a dedicated rural sanitation and hygiene program is essential to improving household sanitary environment. As an illustration, a World Bank supported district-wide program combining Community Led Total Sanitation (CLTS) approaches and a sanitation marketing program executed by district Nam Saat witnessed increases in access of around 20 percent annually. To improve hygiene measures, not only behaviors would need to be addressed, but also the infrastructure would need to be developed to increase access to water supplies at home, and to ensure the service is managed sustainably. Challenges to be addressed on this front relate to both expansion and sustainable management of community-water supplies, which will require technical backstopping and maintenance support from currently under resourced district Nam Saat staff and budgets. A dedicated budget line for the behavior change programs for sanitation and hygiene, such as intensive social mobilization through CLTS approaches is required for the scale-up of such programs outside of patchy areas where other development patterns support.

⁴³This information on specific prenatal activities is only available for the last children for mothers.

46. In light of the role of the health sector, this section presents an analysis of the current status of nutrition service delivery to identify challenges and bottlenecks that need to be addressed. The analysis utilizes data from the UFGE health center workers survey of 120 public health centers and 232 health center workers across the country conducted during 2013 and 2014 to assess nutrition service delivery,⁴⁴ workforce, and supplies.⁴⁵ Data was collected on a range of indicators, including infrastructure and stocking of facilities, as well as staff numbers, training and knowledge. This data provides an important lens for understanding the complexity of nutrition challenges in the country.

47. Findings from the survey are complemented with findings from a qualitative, rapid assessment of nutrition counseling and growth monitoring in Lao PDR. This was conducted in Xiengkhouang and Houaphanh provinces and Vientiane Capital. The rapid assessment included (i) 23 semi-structured in-depth interviews (IDIs) with Provincial Health Office (PHO), District Health Office (DHO), provincial hospital, district hospital and health center staff and (ii) 26 focus group discussions (FGDs) covering 175 participants across Lao-Tai, Hmong, and Mon-Khmer ethno-linguistic groups and targeting pregnant mothers, mothers with children aged 0-23 months old, as well as grandmothers and husbands. The qualitative study also included observations and case studies.

⁴⁴Including inpatient, outpatient and outreach services. Services include ANC, PNC and child wellness services.

⁴⁵Of the 120 health centers surveyed, 36 were in the North region, 36 were from the Central region; and 48 were from the South region. Of the 120, 81 were in rural areas and the remaining 39 were urban health centers. Sampling: of the 120 health centers, 80 health centers were randomly sampled with equal probability of selection from a register of all health centers in Lao PDR obtained from the Department of Health Care, and data collection was performed from May to June 2014. This sample was combined with an earlier sample, which used nearly identical survey instruments, of 04 health centers which were surveyed as a part of an impact evaluation of a project in the central and southern provinces. There were no significant differences in relevant parameters between the two samples. Data collection was performed from May to July 2013. For each health center, two health workers (all types and cadres) were sampled randomly without replacement, resulting in a total health worker sample of 232. Eight missing health workers are officially on the health worker roster but could not be located after three attempts or did not consent for an interview.



Nutrition Service Delivery

48. The distribution of health workers does not match the spatial pattern of maternal and child undernutrition-related health needs. Health centers are the primary health facilities responsible for delivering nutrition and primary health care services in the country, which are supposed to include antenatal care (ANC), postnatal care (PNC), growth monitoring and nutrition counseling, provision of micronutrient supplementation, immunization, outreach services, as well as provision of other preventative and curative child health services. Cases that are too complicated to be handled by health center staff are then referred to district and provincial hospitals. There are around 860 health centers in Lao PDR.⁴⁶ With slightly under 4,000 qualified health care professionals, the country had approximately 0.69 health workers per 1,000 population. In addition to being significantly lower than the 2.5/1,000 ratio recommended by the WHO, health workers were disproportionately concentrated in urban areas, away from the main burden of maternal and child undernutrition. Based on the Health Center Workforce Survey (2013/4), the median number of health workers per a health center was four. Most health center workers were either medical assistants (30 percent) or nursing professionals (37 percent). Midwives who provide critical antenatal and obstetric services comprised 15 percent of health center workforce, and only 4 percent were medical doctors. Where medical doctors are not available, medical assistants usually head the health centers. While in theory nurses and midwives have more direct responsibility in providing routine nutrition services and counseling, in practice all staff categories have been involved in providing nutrition services, given the small number of staff per health center.⁴⁷

⁴⁶World Health Organization (2014) Lao People's Democratic Republic Health System Review (Health Systems in Transition, Vol.4 No. 1 2014). Geneva: WHO.

⁴⁷World Bank (2015), Lao PDR Health Center Workforce Survey: Findings from a nationally-representative health center and health center worker survey. Vientiane: World Bank.

49. Opportunities to provide nutrition services at health centers are often missed even though antenatal care (ANC), child preventative and curative services are widely available. *Table 9* shows that nearly all surveyed health centers (98 percent) offer ANC and child preventive and curative health services (96 percent). Over a six-month period, most outpatient visits at the sampled health centers were for child health services, followed by ANC and postnatal care (PNC).⁴⁸ However, zinc supplementation to children - an important therapeutic intervention during treatment of diarrhea - is provided at only 68 percent of the facilities.⁴⁹ Notably, health centers in the Northern region are significantly less likely than those in the Central and Southern regions to offer iron or folic acid during ANC. Although MOH guidelines stipulate that ANC and PNC services be available through outreach, survey data indicate that less than 5 percent of ANC visits occur in the community.⁵⁰

Table 9. Nutrition-related service availability indicators

WHO SARA Nutrition-related service availability indicators						
	Region				Residence	
	Total %	North %	Central %	South %	Urban %	Rural %
ANC Service Availability, % of health centers offering						
Offers ANC services	98.7	98.6	97.2	100	97.4	99.4
Offers Iron OR Folate with ANC	97.5	91.7	100	100	100	96.3
Preventive and curative care services <5s	98.3	97.2	100	97.9	100	97.5
Diagnosis and/or treatment of child malnutrition	88.3	86.1	77.8	97.9	84.6	90.1
Vitamin A	98.3	94.4	100	100	100	97.5
Iron supplementation	75.0	63.9	72.2	85.4	76.9	74.1
ORS (for treatment of diarrhea)	100	100	100	100	100	100
Zinc to children	67.5	58.3	63.9	77.1	74.4	64.2
Growth monitoring	90.8	77.8	91.7	100	89.7	91.4

Source: UFGE Health Center Workers Survey (2013/4)

⁴⁸World Bank (2015) Government Expenditure on Health in Lao PDR: Overall trends and findings from a health center survey. Vientiane: World Bank.

⁴⁹Preventive zinc supplementation is also supported in the 2013 Lancet Maternal and Child Nutrition Series, though there is not currently a corresponding WHO recommendation.

⁵⁰World Bank (2013) Lao PDR: Maternal Health, Child Health, and Nutrition, Vientiane: World Bank.

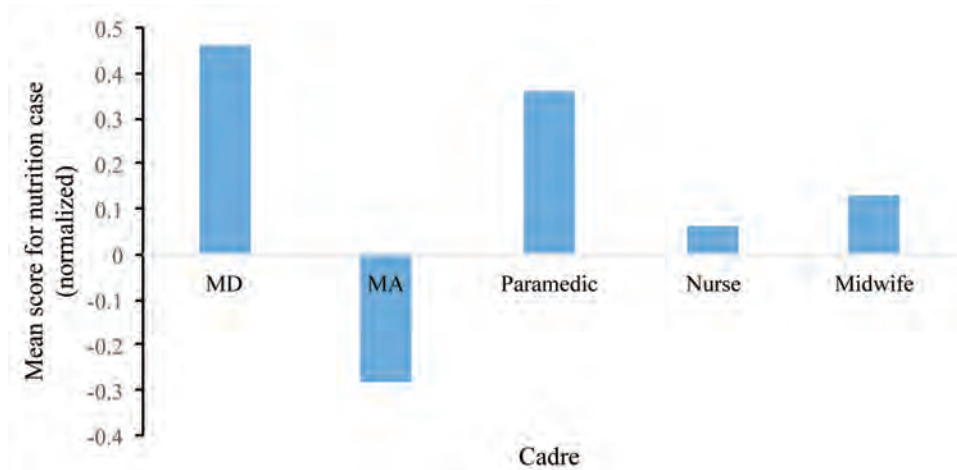
Health and Nutrition Workforce

50. General staff readiness to provide nutrition-related services is low. The problem is most acute in the Northern region, where only 43 percent and 37 percent of health centers had one or more staff with training in IMCI and growth monitoring respectively, in two years prior to the survey (*Table 10*). In all, two-thirds (67 percent) of individual health workers reported never having received training in nutrition, yet 87 percent of staff had provided these services in the three months prior to the survey. This was confirmed during focus group discussions (FGDs) of the qualitative study during which health workers revealed a lack of confidence in providing nutrition counseling and the majority reported not receiving any training on nutrition counseling.

Table 10. Nutrition-related service availability and readiness: staff and guidelines readiness

	Region				Residence	
	Total	North	Central	South	Urban	Rural
	%	%	%	%	%	%
% of facilities offering ANC with:						
ANC guidelines available in the facility	85.6	85.7	74.3	93.8	84.2	86.3
Formal in-service ANC training received by ANY provider in past 2 years	76.3	68.6	71.4	85.4	81.6	73.8
% of facilities providing child preventive and curative care services with:						
Guidelines for IMCI available in the facility	75.4	74.3	83.3	70.2	76.9	74.7
Guidelines for growth monitoring available in the facility	75.4	77.1	66.7	80.9	74.4	76.0
Any provider has formal in-service training for IMCI in past 2 years	65.3	42.9	69.4	78.7	69.2	63.3
Any provider has formal in-service training on growth monitoring in past 2 years	61.9	37.1	58.3	83.0	59.0	63.3
Never been trained in nutrition	67.2	67.6	71.4	63.7	66.2	67.6
Has provided growth monitoring and nutrition services	86.6	84.5	85.7	89	86.5	86.7

Source: UFGHE Health Center Workers Survey (2013/4)

Figure 7. Normalized mean scores for the nutrition case by health worker cadre⁵¹

Source: UFGE Health Center Workers Survey (2013/4)

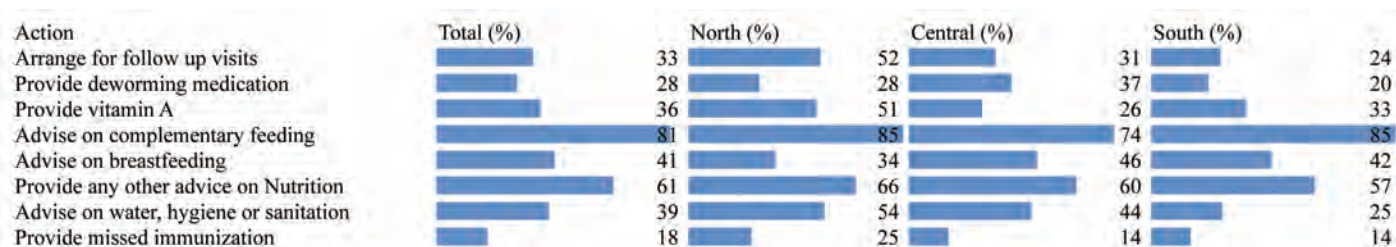
51. Knowledge tests show that cadres mainly responsible for delivering nutrition services at health centers only have limited knowledge about managing child undernutrition cases. When tested, the composite scores for oral examination, physical examination, and treatment recommendations for a child malnutrition case varied significantly by health worker cadre. As shown in *Figure 7*, medical doctors' mean scores were significantly higher than those of all cadres except paramedics, though only 4% of health centers are staffed by doctors and also they are not directly responsible for routine implementation of growth promotion and nutrition counseling.⁵² Nurses and midwives, who are responsible for providing these services, only exhibited average knowledge, while medical assistants, who often act as the heads of health centers (where there is no medical doctor), have much poorer knowledge about nutrition compared with other cadres.

⁵¹ MD = Medical Doctor, MA = Medical Assistant.

⁵² World Bank, 2015. Human resources for health in Lao PDR: findings from a nationally-representative health center and health center worker survey. Vientiane: World Bank. The authors describe in detail the survey and scoring methods for the Lao PDR health center workforce ability survey. In short, staff were presented with four clinical cases and asked to a detailed description of his/her response. National and international guidelines were consulted in order to construct the case and potential responses in a locally contextualized manner. A panel of national health staff were consulted and created a consensus score for the vignette, against which health worker responses were scored. The health worker's total score for the case has been normalized, with scores presented as standard deviations from the mean for each case. The results presented herein relate to the single vignette related to a routine growth monitoring and promotion visit.

52. This poor knowledge about delivering nutrition services among health workers is demonstrated in practice. Surveyed health center staff demonstrated a general lack of capacity to respond to child growth faltering as staff tend not to recognize stunted children, particularly in areas where stunting is common. When faced with a concerned mother, nearly all health center workers (98 percent) would take measurements and correctly interpret growth charts. However, only a moderate number of health center staff offered critical recommendations through nutrition and growth promotion counseling (*Figure 8*). Important regional differences were found. Only 34 percent of health workers in the North provide counseling on breastfeeding, compared with 46 percent in the Central region. In contrast, only 24 percent of health center workers in the South provided advice on hygiene and sanitation, compared with 54 percent of health center workers in the North.

Figure 8: Percent of health center workers who mention taking critically important growth promotion actions



Source: UFGE Health Center Workers Survey (2013/14)

53. Growth monitoring is mainly done as a statistical exercise, and oftentimes mothers do not receive the results nor nutrition counseling (i.e. growth promotion) following the growth monitoring exercise. To most health workers, the purpose for growth monitoring is primarily to report children's nutrition status to the higher level – Head of DHO (through the statistics unit) and DOH's MCH unit – on a monthly basis. Thus, if children are found to be stunted or underweight during the growth monitoring session, health center staff oftentimes do not inform mothers of the results of growth monitoring, investigate the causes of growth faltering, or subsequently counsel on how to improve the situation and make an appointment for follow-up. In addition, it appeared that many health center staff did not plot growth charts in children's pink books (a health record for children under 5 years kept by the family). The qualitative study team inspected 30 pink books belonging to children who received growth monitoring services, and found no record that growth measurements were plotted in the books.

54. Follow-up action on growth monitoring reports is weak. All health center staff from the study lamented that DHO and PHO have never taken any action on the reports on children's nutritional status from growth monitoring sessions that they submitted on a monthly basis. These health center staff indicated they would like to receive DHO's and PHO's guidance on what action they need to take after submitting nutritional status reports.

55. The qualitative study also revealed that many health staff did not regard “childhood stunting” as a problem. All health center staff and 90 percent of district hospital MCH staff interviewed by the study team were unable to correctly define the different forms of undernutrition (stunting, wasting, underweight). Only one out of ten MCH staff at Houaphanh provincial hospital could list and describe correctly the different types of undernutrition including stunting. Many health center staff commented on stunted children that “they still look okay” and that “they are not skinny”, thus do not provide appropriate counseling.

56. Among those health center staff who do provide nutrition counseling, it was found that the focus of the counseling was mainly on maternal, infant and young child feeding, few provide advice on hygiene, and sanitation. Also, most health center staff gave the same advice about complementary feeding for every child, regardless of his/her nutritional status. Proper nutrition and IYCF counseling requires in-depth probing and discussion to identify barriers to optimum nutrient intake (illness, insufficient food quantity, insufficient food quality, difficulty in feeding) and to support the mother in identifying appropriate solutions. However, the same advice was given for normal, moderately, and severely malnourished children, without understanding the specific circumstances and potential causes of growth retardation.

57. Growth monitoring and nutrition counseling services are rarely provided during outreach. Health center staff are supposed to conduct MCH outreach services to rural and remote villages on a quarterly basis. Such visits would offer an excellent opportunity to provide nutrition education to villagers who do not live close to health facilities. However, it was found that the main service provided during outreach is immunization. Staff reported that they could not conduct growth monitoring during outreach, as they could not bring along weighing scales and height boards for measurement. Also, they reported that they did not provide health and nutrition education or counseling during outreach, not only because of the time constraints but also that they have nothing to attract villagers’ attention (e.g. no posters, flipcharts or other communication materials).

58. The study also finds that weighing and height measuring sometimes was not conducted in a correct manner, leading to inaccurate results. Observations during the winter revealed that babies were weighed with their thick winter clothes and that weighing is generally performed outside on the terrace in the cold, even when the health facility was equipped with heaters and the temperature inside the facility was warm. Some infants were even wrapped in blankets during weighing and had hats on during height measurement. These practices lead to inaccurate weight/height measurement.

59. While non-Lao-Tai ethnic groups in rural areas generally bear a higher burden of child stunting, there are still linguistic barriers that prevent them from benefiting fully from nutrition services when these services are made available to them. The qualitative study finds that, unlike the Lao-Tai ethnic group, non-Lao-Tai ethnic groups often could not benefit as much from health and nutrition education/counseling due to linguistic barriers as the majority of the health center staff is of Lao-Tai origin and often do not speak other ethnic languages. Due to the lack of access to formal education, many Hmong and Khmu women could not understand Lao. Among those who could understand Lao, many were shy to speak Lao. Nearly all of the mothers from ethnic groups in the study reported that they were too shy to ask health center staff questions about health and nutrition, even if they could understand and speak Lao. They also reported that sometimes health staff do not quite understand them when they speak Lao.



Nutrition Equipment and Supplies

60. Despite dependence on revenues from drug sales, nutrition service readiness—as measured by the availability of essential medicines, equipment, and supplies—was generally poor, indicating problems with planning, budgeting, and/or supply chain management. **Table 11** summarizes the availability of nutrition-related equipment, diagnostics, medicines, and commodities recommended for ANC and child preventive/curative care. Though health centers are responsible for detection of pregnancy problems including anemia⁵³, very few health centers have diagnostic equipment and supplies available. Only 56 percent of health facilities had a length board and infant measuring scale; 66 percent had the equipment to measure wasting and stunting in children. Referring to **Table 9**, there is wide discrepancy between facilities officially offering essential micronutrient supplementation and those able to deliver them. Iron-folic acid supplementation is supposed to be offered by 97 percent of facilities, yet the commodities are available in only 60 percent of the facilities. Even with sufficient health worker capacity, there are severe supply constraints which inhibit providers from complying with guidelines for ANC, management of acute malnutrition, and growth monitoring and promotion.

Table 11 WHO SARA nutrition-related indicators: equipment diagnostics, medicines, and commodities

	Region				Residence	
	Total %	North %	Central %	South %	Urban %	Rural %
% of facilities offering ANC with:						
Blood pressure apparatus	94.0	94.2	91.4	95.8	100.0	91.2
Hemoglobin tests	8.4	20.0	2.8	4.1	7.8	8.7
Iron	44.9	40.0	60.0	37.5	47.3	43.7
Folic Acid	17.8	14.2	22.8	16.6	15.7	18.7
Iron/Folic Acid combined	55.9	62.8	42.8	60.4	53.7	60.5
Has Iron AND Folic Acid OR Iron/Folic Acid combined	60.1	62.8	51.4	64.5	65.7	57.5
Has adult scale	96.6	97.1	97.1	95.8	92.1	98.7
% of facilities child preventive and curative care services with:						
Child length board	66.9	60.0	47.2	87.2	66.6	67.0
Child scale (250 g increments)	70.3	65.7	58.3	82.9	79.4	65.8
Infant scale (100 g increments)	56.7	48.5	66.6	55.3	69.2	50.6
MCH Book	79.6	74.2	63.8	95.7	79.4	79.7
Any hemoglobin test	8.4	20.0	2.7	4.2	7.6	8.8
Hemocue						
Microscopy	7.6	5.7	8.3	8.5	10.2	6.3
Oral rehydration salt sachets	91.5	91.4	88.8	93.6	92.3	91.1
Zinc tablets	20.3	17.1	13.8	27.6	20.5	20.2
Vitamin A capsules	63.5	62.8	75.0	55.3	58.9	65.8
Mebendazole capsules/tablets	62.7	71.4	66.6	53.1	66.6	60.7
Iron tablets	44.9	40.0	58.3	38.3	46.1	44.3

Source: UFGE Health Center Workers Survey (2013/4)

⁵³ Ministry of Health, Lao PDR. Antenatal and Postnatal Care (ANC-PNC) Manual.

61. Low supply availability may contribute to low coverage of vitamin A and iron intake among high risk groups - women and young children. The programs have different modalities and distribution systems which contributed to variation in coverage. Vitamin A for children is a single capsule distributed semi-annually via mass distribution campaigns, while iron pills are provided to pregnant women at ANC visits. Children are most often supervised as they take their vitamin A. In contrast, women must take the pills daily on their own, often complaining of side effects, including nausea, thus in addition to availability of the pills for distribution, low compliance is also an issue. Therefore, iron distribution efforts have not reached coverage rates equivalent to those of vitamin A distribution campaigns. In the LSIS survey 2011/2, nearly 60 percent of children were reported to receive Vitamin A supplementation within the previous 6 months, but almost half of all eligible women reported having taken no iron pills at all during the most recent pregnancy, and only a quarter reported consuming 90 or more pills (see [Table 12](#)).

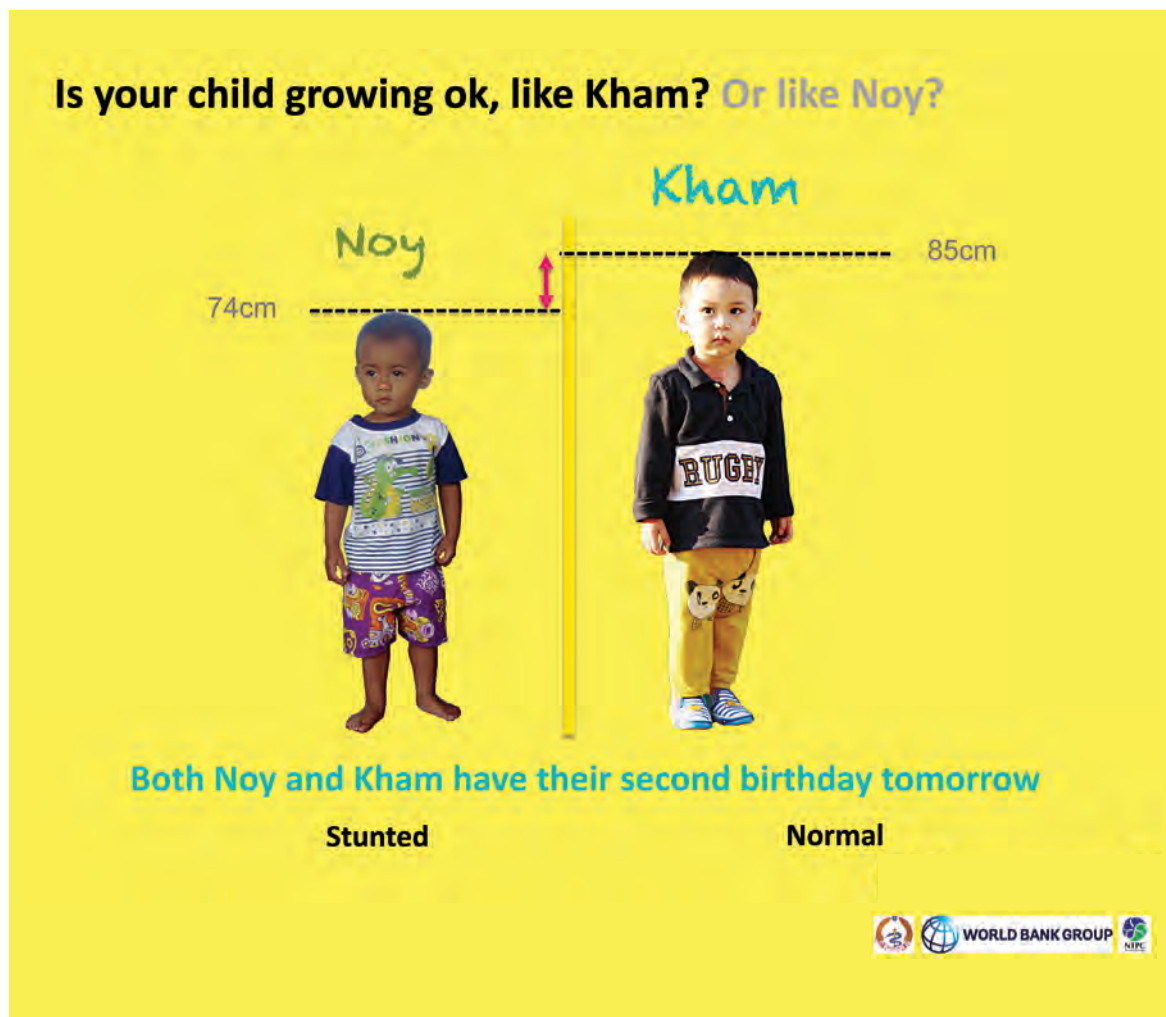
Table 12. Micronutrient distribution

Province	Percentage of children who received vitamin A in the last 6 months (%)	No iron pills during pregnancy (last 2 years) (%)	<90 iron pills during pregnancy (last 2 years) (%)	90+ iron pills taken during pregnancy (last 2 years) (%)
Phongsaly	48.4	75.2	14.1	9.1
Luangnamtha	80.9	35.0	16.2	47.1
Oudomxay	54.0	70.4	12.1	16.4
Huaphanh	51.9	59.5	20.1	17.3
Xiengkhuang	52.9	53.6	7.7	35.8
Saravane	81.4	50.9	23.8	18.4
Sekong	40.0	64.1	25.7	8.2
Bokeo	73.3	61.1	9.1	25.2
Luangprabang	75.0	50.6	27.9	18.6
Khammuane	70.5	59.5	18.7	15.8
Savannakhet	32.0	55.0	23.4	19.0
Attapeu	50.4	52.8	23.2	15.7
Vientiane Capital	60.0	16.4	33.1	49.5
Xayabury	88.1	18.2	64.4	16.5
Vientiane	64.2	28.4	29.0	42.4
Borikhamxay	48.1	37.3	17.7	44.9
Champasack	64.3	46.9	23.7	24.1
Lao PDR	59.1	47.7	24.1	25.4

Source: LSIS 2011/2

Part IV: Conclusions, Policy Implications, and Recommendations

62. Reducing maternal and child undernutrition in Lao PDR will require a combination of interventions that address the identified immediate, underlying and basic causes of undernutrition. As shown through the multivariate analysis, these causes are multi-faceted and multi-sectoral, ranging from factors that are determined before the child is born – like mother’s stature, mother’s education, teenage pregnancy and maternal nutrition, to factors affecting the child after? they are born – like inadequate dietary diversity intake, micronutrient intake, and poor hygiene and sanitary environment, especially open defecation. Social norms, including gender norms, and behaviors often drive these factors.



63. Improving sub-optimal behaviors, especially infant and young child feeding practices, is important for reducing undernutrition going forward. Analysis suggests that deficiencies in the quality of diet are a more important determinant of nutrition than just access to food, and this can be traced to poor nutrition behaviors. Efforts to change mother's behaviors alone may not always work. In Lao PDR, mothers tend to be young and often follow advice from influential family members, particularly grandmothers and husbands. It is not uncommon for pregnant women in rural areas to receive advice from influential family members that they eat less so they can give birth to smaller babies, contributing to easier delivery. Social and behavior change communication, including nutrition counseling, are needed to change current maternal, infant/child feeding and care, as well as hygiene and sanitation behaviors, practices, increase health and nutrition-related service utilization, and increase demand for required facilities and infrastructure related to water, sanitation, and hygiene. Interventions are required at two fronts in this regard.

64. The first front is scaling up social and behavior change communications directed at mothers, child caregivers, as well as influential family members (grandmothers, husbands) at the village level. This can be done through regular face-to-face village-level nutrition education group sessions as well as interpersonal communication during home visits by health workers and village health volunteers/facilitators targeting pregnant mothers and lactating mothers with children under 2 years. This can be further supported by mass media campaigns.

65. The second front is addressing weaknesses in the growth monitoring and promotion exercise by health workers, particularly in strengthening the skills and confidence among health workers in providing nutrition and growth promotion counseling. Presently some health workers cannot identify stunting, put it into context or communicate such information to mothers. Rather, many primary health care workers capture child growth information for statistical purposes. This should be changed by providing intensive training to health center staff to effectively communicate nutrition and growth monitoring information with mothers as well as to effectively provide nutrition counseling that covers not only IYCF issues but also maternal nutrition, hygiene and sanitation, focusing on behavior change. To achieve this, there is a need to (i) develop nutrition counseling curriculum for pre-service and in-service training; (ii) develop competent trainers both at central and provincial levels to roll out the training for the district, health centers and village health volunteers/facilitators; (iii) nutrition counseling training needs to be rolled out at all levels with specific focus on different types of undernutrition; (iv) regular supervision and monitoring of health worker counseling skills. The current Reproductive, Maternal, Neonatal, and Child Health (RMNCH) package also needs to be revised to include growth monitoring and nutrition counseling in outreach activities, as well as include a requirement for village health workers to conduct growth monitoring and nutrition counseling in remote villages with difficult access to health facilities.

66. Community-based delivery mechanisms are needed to complement facility-based nutrition service delivery. Health center utilization is low due not only to physical and financial factors, but also personal preference, cultural, behavioral, and traditional factors. This is likely to be especially relevant for maternal, infant, and young child feeding practices. Efforts to reach women in their communities and provide services as well as social and behavior change communications there have the potential to increase the effectiveness and efficiency of existing facility-based nutrition investments.

67. The new initiative to develop the National SBCC Strategic Action Plan for improved health and nutrition in Lao PDR shows greater commitment from the government on SBCC, but dearth of knowledge about nutrition and lack of counseling skills to promote behavior change among health workers remains a formidable obstacle. A perfect opportunity exists for government agencies and development partners to join forces in strategizing and developing key messages, tools, communication channels, and implementation plan to promote SBCC among target populations as well as to identify and fill existing knowledge gaps. Health center workers as well as village-level facilitators/volunteers (e.g. village health volunteers, members of Lao Women's Union, etc.) will be the backbone and the most important agents in the implementation of SBCC interventions at the community level. However, given the limited knowledge about nutrition among health workers, strengthening knowledge and capacity of these health workers and volunteers to deliver effective nutrition-related SBCC, is a top priority.

68. There is also a need to allocate more staff, especially female midwives and nurses to the health centers to provide enough workforce to deliver necessary health and nutrition services to villagers in respective catchment areas. This should also ensure diversity of ethnic groups among staff at the health facilities to help reduce language barriers with the villagers from major ethnic minority groups⁵⁴.

69. The identified gap in low micronutrient intake can also be addressed in the short term with micronutrient supplementation programs. Distribution of vitamin A as well as iron/folic acid should be improved to increase coverage. While there is little systematic data collection on nutrition-specific indicators, the UFGE Health Center Workers Survey (2013-2014) demonstrates a significant lack of nutrition delivery capacity in government health centers. Health centers have the primary responsibility for the health sector nutrition response, yet they have insufficient nutrition supplies, commodities, and human resources to make significant improvements in nutritional status.

⁵⁴ Efforts are being made by the Ministry of Health to recruit large numbers of midwives to be posted at health centers, taking ethnicity into account.

70. Complementary investments in other areas will be necessary. Recent evidence has shown that children’s exposure to fecal matter (mainly as a result of open defecation) is strongly associated with stunting, meaning that interventions to improve child nutrition outcomes must include efforts to improve sanitation, hygiene, and water across the country. Community-led total sanitation is an example of an approach that should be promoted and expanded. Furthermore, increased household use of water for hygiene purposes needs to be promoted; this makes investments in rural water supplies important, and that investments in behavior change need to be complemented with infrastructure and post-construction management support to communities. Agriculture has an important role to play in combatting undernutrition, particularly through (i) household production of diverse food (e.g. home gardens and raising small animals) and (ii) increased income through agriculture and for the households to use the increased incomes to purchase diverse food, assuming that they are available and affordable in local markets. Nevertheless, it is important to note that increasing diversity in agriculture production does not necessarily improved children’s diet, and it is crucial that the efforts to diversify household agricultural production is combined with social and behavior change communication interventions to change infant and young child feeding practices.

71. Tackling social, gender, and cultural factors that drive intergenerational causes of undernutrition is also required. Children born to teenage mothers have a higher likelihood of being stunted, even when taking into account other factors, suggesting that dealing with teenage pregnancies can also be instrumental in combating under nutrition. This also requires interventions outside the health sector, e.g. focusing on keeping girls in secondary school and conducting social and behavior change campaigns aimed at delaying the acceptable age of marriage.

72. Overall, no single intervention on its own will be a silver bullet. A holistic, multi-sectoral approach of “plan multi-sectorally, implement sectorally, and monitor multi-sectorally” is called for. The analysis clearly demonstrated that addressing each factor individually has a limited impact on undernutrition as opposed to simultaneously addressing multiple factors. Causes of undernutrition are interdependent, hence requiring this holistic, multi-sectoral approach.



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Annex: Additional Tables

Table 13: Regression results of stunting (HAZ) for 6 to 59 months children

Est. method= Sample= Dep var=	(1) Regress	(5) Dprobit
1<=DDS7<=2	0.535*** (0.155)	-0.165*** (0.0581)
DDS7>=3	0.703*** (0.165)	-0.217*** (0.0588)
Breast fed now	-0.416*** (0.115)	0.0837** (0.0368)
Mother's weight(kg)	0.0102** (0.00463)	-0.00273 (0.00225)
Mother's height(cm)	0.0499*** (0.00588)	-0.0202*** (0.00255)
Mother's age at pregnancy<=16	-0.268** (0.115)	0.102** (0.0461)
Mother's education completed	0.196*** (0.0672)	-0.0528** (0.0259)
Age in month for kids	-0.308*** (0.0593)	0.136*** (0.0249)
Age squared	0.0113*** (0.00368)	-0.00610*** (0.00157)
age^3	-0.000188** (8.84e-05)	0.000121*** (3.85e-05)
age^4	1.15e-06 (7.21e-07)	-8.73e-07*** (3.18e-07)
Boy	-0.163*** (0.0545)	0.0863*** (0.0202)
Prenatal visit 1-3	-0.0500 (0.0725)	0.0143 (0.0296)
Prenatal visit 4-	-0.00369 (0.0797)	0.00587 (0.0360)
Asset index	0.0650* (0.0362)	-0.0590*** (0.0166)
ethnicity==Mon-Khmer	-0.0752 (0.0628)	0.0311 (0.0234)
ethnicity==Hmong-Mien	-0.288* (0.152)	0.141** (0.0592)
ethnicity==Others	-0.256*** (0.0916)	0.0762 (0.0947)
Number of children age 0-4yr	-0.0425 (0.0468)	0.0316* (0.0162)
Village-level toilet coverage	0.336*** (0.112)	-0.115** (0.0456)
Safe/improved water source	0.149** (0.0669)	-0.0498** (0.0234)
Constant	-7.403*** (0.927)	
Observations	3,043	3,043
R-squared	0.203	
Equality of 1<=DDS7<=2 & DDS7>=3	F(1, 205) =3.93 Prob > F =0.05	chi2(1) =5.18 Prob > chi2 =0.02

Table 14: Regression results of stunting (HAZ) for 6 to 23 months old children

Est. method= Dep var=	(1) Regress	(5) Dprobit
	HAZ	Stunted
1<=DDS7<=2	0.472*** (0.143)	-0.129** (0.0566)
DDS7>=3	0.585*** (0.159)	-0.165*** (0.0594)
Breast fed now	-0.118 (0.135)	0.0611 (0.0424)
Mother's weight(kg)	0.0142** (0.00568)	-0.00509 (0.00311)
Mother's height(cm)	0.0473*** (0.00722)	-0.0197*** (0.00316)
Mother's age at pregnancy<=16	-0.348** (0.162)	0.166** (0.0692)
Mother's education completed	0.206** (0.0795)	-0.0541* (0.0313)
Age in month for kids	-0.116*** (0.00945)	0.0347*** (0.00310)
Boy	-0.159** (0.0658)	0.0841*** (0.0268)
Prenatal visit 1-3	-0.0552 (0.0802)	0.00134 (0.0374)
Prenatal visit 4-	0.0330 (0.0942)	-0.0444 (0.0390)
Vitamin A taken for the last child	0.318*** (0.0822)	-0.105*** (0.0295)
Num avoided protein(meat, fish or eggs) during pregnancy	0.0138 (0.0857)	0.0198 (0.0311)
Num of avoided protein(meat, fish or eggs) after giving birth	-0.00278 (0.0284)	-0.0160 (0.0100)
Asset index	0.0267 (0.0380)	-0.0392** (0.0175)
ethnicity==Mon-Khmer	-0.0670 (0.0847)	0.0162 (0.0295)
ethnicity==Hmong-Mien	-0.0931 (0.231)	0.0619 (0.102)
ethnicity==Others	-0.312 (0.265)	0.0658 (0.100)
#child age 0-4yr	-0.206*** (0.0495)	0.0781*** (0.0218)
Village-level toilet coverage	0.472*** (0.150)	-0.160*** (0.0538)
Safe/improved water source	0.127 (0.0783)	-0.0355 (0.0320)
Constant	-8.263*** (1.072)	
Observations	1,808	1,808
R-squared	0.253	0.1751
Equality of 1<=DDS7<=2 & DDS7>=3	F(1, 205)= 4.90 Prob > F=0.03	chi2(1) = 3.30 Prob > chi2 =0.07

Table 15: Determinants of household diet and agricultural production

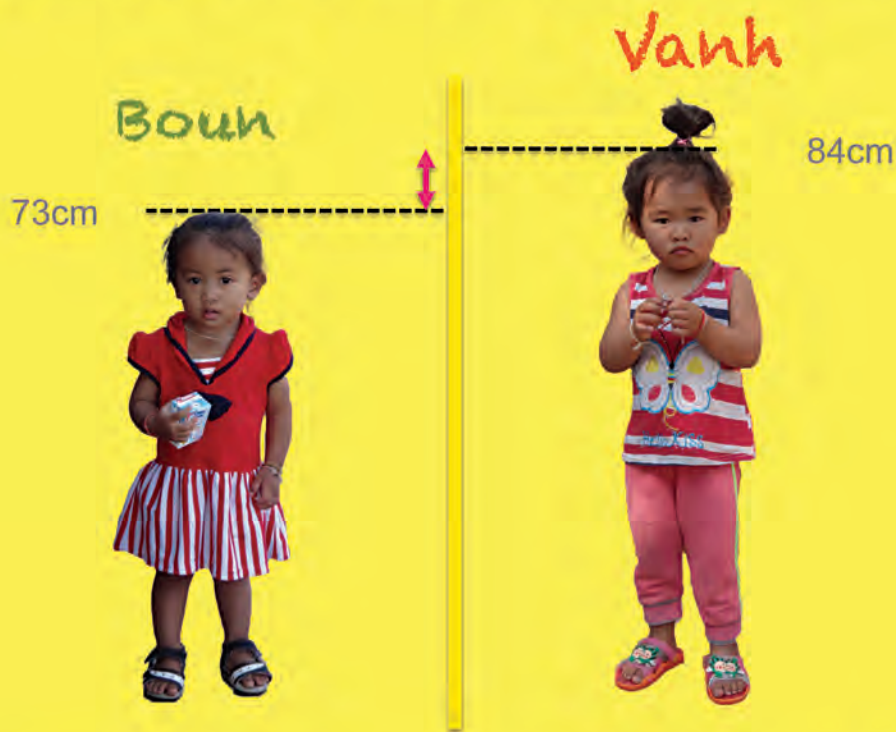
Est. method= Sample= Dep var=	Ordered Probit All households HH Dietary diversity score(1-12)				
Agric. production diversity score(0-7)	0.0232 (0.0192)				
Crop diversity score(0-4)		0.0474 (0.0318)			
Livestock diversity score(0-3)			0.00948 (0.0266)		
Num of crops grow (food)				0.0525*** (0.0117)	
Num of livestock					0.0133 (0.0184)
Highest level and class completed =Primary	0.189*** (0.0575)	0.188*** (0.0577)	0.193*** (0.0578)	0.183*** (0.0574)	0.192*** (0.0578)
Highest level and class completed =Lower secondary	0.312*** (0.0864)	0.308*** (0.0871)	0.316*** (0.0865)	0.309*** (0.0873)	0.315*** (0.0864)
Highest level and class completed =Upper secondary	0.416*** (0.0981)	0.418*** (0.0983)	0.416*** (0.0976)	0.420*** (0.0990)	0.416*** (0.0975)
Highest level and class completed =Post-secondary and higher	0.322*** (0.0998)	0.319*** (0.100)	0.326*** (0.101)	0.313*** (0.0984)	0.326*** (0.101)
Age	0.00695*** (0.00193)	0.00712*** (0.00190)	0.00715*** (0.00192)	0.00701*** (0.00194)	0.00707*** (0.00192)
Asset index2(inc. water, toilet)	0.310*** (0.0329)	0.310*** (0.0328)	0.309*** (0.0328)	0.312*** (0.0332)	0.308*** (0.0329)
Household size	0.0276* (0.0158)	0.0288* (0.0155)	0.0294* (0.0158)	0.0225 (0.0158)	0.0280* (0.0159)
#child age 0-14yr	-0.0770*** (0.0227)	-0.0774*** (0.0226)	-0.0777*** (0.0227)	-0.0752*** (0.0229)	-0.0765*** (0.0228)
Log(agricultural land area +1)	0.00445 (0.00673)	0.00459 (0.00668)	0.00558 (0.00656)	0.00101 (0.00689)	0.00525 (0.00654)
Log(irrigated land area +1)	0.0113 (0.0155)	0.0119 (0.0156)	0.0108 (0.0154)	0.0142 (0.0155)	0.0108 (0.0154)
Constant cut1	-2.558*** (0.176)	-2.519*** (0.182)	-2.615*** (0.165)	-2.433*** (0.167)	-2.615*** (0.165)
Constant cut2	-1.212*** (0.118)	-1.173*** (0.124)	-1.270*** (0.106)	-1.084*** (0.110)	-1.269*** (0.106)
Constant cut3	-0.171 (0.120)	-0.132 (0.126)	-0.230** (0.107)	-0.0391 (0.111)	-0.228** (0.107)
Constant cut4	0.600*** (0.121)	0.637*** (0.125)	0.541*** (0.107)	0.734*** (0.111)	0.542*** (0.106)
Constant cut5	1.197*** (0.123)	1.235*** (0.125)	1.138*** (0.108)	1.338*** (0.110)	1.139*** (0.107)
Constant cut6	1.669*** (0.117)	1.708*** (0.121)	1.609*** (0.105)	1.818*** (0.107)	1.610*** (0.104)
Constant cut7	2.086*** (0.119)	2.126*** (0.126)	2.025*** (0.104)	2.243*** (0.109)	2.027*** (0.104)
Constant cut8	2.541*** (0.128)	2.582*** (0.135)	2.480*** (0.112)	2.704*** (0.120)	2.482*** (0.111)
Constant cut9	3.116*** (0.156)	3.156*** (0.166)	3.056*** (0.144)	3.280*** (0.161)	3.057*** (0.143)
Constant cut10	3.669*** (0.204)	3.709*** (0.213)	3.609*** (0.201)	3.829*** (0.205)	3.611*** (0.201)
Constant cut11	4.089*** (0.241)	4.129*** (0.243)	4.029*** (0.241)	4.250*** (0.237)	4.030*** (0.242)
Observations	2,927	2,927	2,927	2,927	2,927

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 16: Determinants of child diet and agricultural production

Est. method= Sample= Dep var=	(1)	(2)	(3)	(4)	(5)
			Ordered probit 6-23 month olds Ind. dietary diversity score(1-7)		
Agric. production diversity score(0-7)	-0.0236 (0.0186)				
Crop diversity score(0-4)		-0.0409 (0.0305)			
Livestock diversity score(0-3)			-0.0174 (0.0258)		
Num of crops grow (food)				0.00820 (0.0121)	
Num of livestock					-0.00831 (0.0173)
Constant	-1.972** (0.845)	-1.962** (0.853)	-2.071** (0.850)	-2.145** (0.855)	-2.090** (0.854)
Observations	3,276	3,276	3,276	3,276	3,276
Other explanatory variables used in stunting regressions are not shown. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1					
Est. method= Sample= Dep var=	(6)	(7)	(8)	(9)	(10)
			Ordered probit 6-23 month olds Ind. dietary diversity score(1-7)		
Agric. production diversity score(0-7)	-0.0261 (0.0193)				
Crop diversity score(0-4)		-0.0403 (0.0319)			
Livestock diversity score(0-3)			-0.0237 (0.0299)		
Num of crops grow (food)				0.0152 (0.0132)	
Num of livestock					-0.0139 (0.0203)
Constant	0.581 (1.060)	0.560 (1.072)	0.460 (1.071)	0.286 (1.077)	0.420 (1.080)
Observations	1,861	1,861	1,861	1,861	1,861
Other explanatory variables used in Table XXX are not shown. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1					

Is your child growing ok, like Vanh? Or like Boun?



Both Boun and Vanh have their second birthday tomorrow

Stunted

Normal



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The World Bank Lao PDR
Patouxay Nehru Road
P.O Box: 345
Vientiane, Lao PDR
Tel : (856-21) 266 200
Fax : (856-21) 266 299
Website: www.worldbank.org/lao

The World Bank
1818 H Street, NW
Washington, D.C. 20433, USA
Tel: (202) 4731000
Fax: (202) 4776391
Website: www.worldbank.org