



**Economic Consequences  
of Malnutrition in Lao PDR**  
A Damage Assessment  
Report (DAR)



ສະຫະພາບ ເອີຣົບ  
European Union

unicef   
for every child

Centre for Socio-Economic Science and Policy Research (CSPR)  
National Institute of Economic Research (NIER)  
2021

Cover photo: ©UNICEFLaos

# Contents

1. Introduction .....	7
1. NIPN in Lao PDR .....	7
2. Rationale and Objective of Assessment .....	7
3. Methodology and Activities .....	7
4. Limitations .....	10
2. Background .....	11
3. Socio-Economic Development in Overview and Nutrition Situation in Lao PDR .....	14
1. Socio-Economic Development in Overview .....	14
2. Nutrition Situation in Lao PDR .....	15
3. Food Security and Food Consumption .....	18
4. Economic Impact/Consequences of Malnutrition in Lao PDR .....	19
1. Pathway #1 Evidence of Mortality Risk by Nutrition Indicator .....	19
2. Pathway #2 Losses of Future Productivity and Potential Earnings of Malnourished Children 6-24 months ....	24
3. Pathway #3 Impact of Anaemia on Adult Productivity .....	25
4. Pathway #4 Financial Burden on the Health Care System .....	26
5. Conclusion and Recommendations .....	29
1. Conclusion .....	29
2. Recommendations .....	31
References .....	32

## Tables:

Table 1: List of indicators and comparison between 2013 and 2020.....	9
Table 2: DAR algorithm to project economic losses from individual indicators.....	10
Table 3: Nutrition indicators used for the assessment.....	19
Table 4: Mortality rates Lao PDR.....	20
Table 5: Attributed death individuals related to nutrition indicators and comparison of 2013 and 2020.....	21
Table 6: Estimates of attributed economic loss.....	23
Table 7: Losses of future productivity.....	25
Table 8: Anaemia in labour force.....	26
Table 9: Relative risk (RR) of diarrhoea by breastfeeding status 2013 and 2020.....	27
Table 10: Relative risk (RR) of ARI by breastfeeding status 2013 and 2020.....	27
Table 11: Cost associated with low-birth-weight deliveries.....	28
Table 12: Nutrition indicators excess health care cost.....	28
Table 13: Summary of four pathways 2013.....	29
Table 14: Summary of four pathways 2020.....	29

## Figures:

Figure 1: Negative cycle of malnutrition & poverty.....	12
Figure 2: Conceptual framework for understanding the economic impacts of malnutrition in all its forms.....	13
Figure 3: Stunting pathways to productivity.....	24
Figure 4: Comparison and overview of the four pathways in 2013 and 2020.....	30

## Graphs:

Graph 1: Annual growth rate of real GDP, Lao PDR.....	14
Graph 2: Undernutrition rates among children under five years in Lao PDR.....	16
Graph 3: Prevalence of stunting in Lao PDR.....	17

# Abbreviations

ANC	Antenatal Care
ARI	Acute respiratory infection
CDR	Centre for Development Policy Research
CSPR	Centre for Socio-Economic Science and Policy Research
CU2	Children under two years
CU5	Children under five years
DAR	Damage Assessment Report
ECE	Early Childhood Education
EU	European Union
FCDO	Foreign, Commonwealth & Development Office
GDP	Gross Domestic Product
GPI	Gender Parity Index
GoL	Government of Lao PDR
Lao PDR	Lao People's Democratic Republic
LSIS	Lao Social Indicator Survey
MAF	Ministry of Agriculture and Forestry
MCH	Maternal and Child Health
MOH	Ministry of Health
MNCH	Maternal, Newborn and Child Health
MPI	Ministry of Planning and Investment
NIER	National Institute for Economic Research
NIPN	National Information Platforms for Nutrition
NNC	National Nutrition Committee
NNP	National Nutrition Policy
NNS	National Nutrition Strategy
NNSPA	National Nutrition Strategy and Nutrition Plan of Action
NPAN	National Plan of Action for Nutrition
NPV	Net Present Value
NSEDP	National Socio-Economic Development Plan
NTD	Neural tube defects
PAR	Population Attributable Risk
RR	Relative Risk
SD	Standard Deviation
SDG	Sustainable Development Goals
UNICEF	United Nations Children's Fund
WASH	Water Sanitation and Hygiene
WB	World Bank
WHA	World Health Assembly
WHO	World Health Organization

# Acknowledgement

The Centre for Socio-Economic Science and Policy Research (CSPR) of the National Institute for Economic Research (NIER) would like to acknowledge the collaboration with Centre for Development Policy Research (CDR), Ministry of Planning and Investment (MPI), who made this analysis possible.

Appreciation goes to the following organizations and individuals who provided support, shared their expertise, time and effort for the development of these studies, as well as to those who provided invaluable input through participation in the consultation workshop held in January 2021:

We would like to acknowledge the leadership and support of Dr. Sathabandith Insyxiengmay Acting President of NIER, Dr. Saykham Voladet, Acting Director General of CSPR, Mr. Khamnang Kounpakdee, Deputy Chief of Division and Ms. Mali Sengkhamyong, Technical Officer, CSPR, NIER who dedicated their time and expertise and contributed to the preparation of data. We would also like to acknowledge the support from the NIPN Data Analysis Unit at CDR led by Dr. Sitthiroth Rasphone, Mr. Ouphachay Thongsamouth, National Data Consultant, Ms. Soulita Vansilalom, National Statistician and Dr. Alex Brito, International Data Analysis Advisor, who provided technical insights and validation of data.

We would like to gratefully acknowledge UNICEF for providing significant technical support in the process and the European Union for its financial support.

Finally, we would like to thank our team of policy experts at the Policy Analysis Unit; Mrs. Anne Christa Nielsen, International Policy Advisor and Dr. Pany Sananikhom, National Policy Consultant for leading the exercise.

# Executive Summary

The link between nutrition and economic development is well documented. Malnutrition, in all its forms, brings huge costs to individuals, families and to the entire nation. Lao PDR has made significant progress in reducing the levels of malnutrition and improving the economic well-being of its population over the years. It is estimated that about 1.8 million people were suffering from various forms of malnutrition in 2020 with wide disparities exist among provinces, ethnic groups, wealth quintiles and other social groupings. This micro-simulation estimates the economic loss due to malnutrition as part of evidence for increased attention and financing of nutrition in Lao PDR.

For this analysis a proven methodology was used on how to calculate the annual financial burden and cost of malnutrition in Lao PDR through four pathways and the following seven selected indicators: underweight, stunting, low birth weight, sub-optimal breastfeeding, anaemia, vitamin A deficiency and birth defects. The pathways are loss of future productivity, reduction of future productivity, reduction of current productivity, and excess health care costs. The analysis primarily used the data from the Lao Social Indicator Survey (LSIS) 1, 2011 & LSIS 2, 2017.

The analysis has showed that Lao PDR is losing approximately 481.66 million USD annually, representing 2.66% of GDP due to malnutrition. The biggest loss, just over half, is caused by anaemia in children and women of reproductive age. This accounted for a total economic loss of 241.7 million USD in 2020.

Out of the estimated economic loss due to malnutrition, stunting accounts from a loss of 28% in Lao PDR. If the target of 25% or less prevalence of stunting by 2025 as contained in the National Nutrition Strategy is to be met, Lao PDR must invest in stunting reduction strategies.

To reduce the economic loss, it is key to link with other sectors such as education, agriculture, sanitation to address malnutrition in all its forms through the implementation of nutrition specific and nutrition sensitive interventions in a synergetic and cost-effective way. Through joint interventions and effort Lao PDR can develop healthy citizens which will enable the labour force to increase economic development.

The assessment does not suggest easy ways for addressing malnutrition, but it suggests and urges the government of Lao PDR to undertake a thorough review of its current policies and directives to assess if they address malnutrition in the most optimal way. The government should rapidly expand a range of low-cost effective nutrition interventions to break the current cycle of increased mortality, poor health and ultimately lower work performance, productivity and earnings.



© UNICEF Laos

# 1 Introduction

## 1. NIPN in Lao PDR

The National Information Platforms for Nutrition (NIPN) is an international initiative of the European Commission with support from the Foreign, Commonwealth & Development Office (FCDO) of the UK Government and the Bill and Melinda Gates Foundation. This initiative is an integral part of the Government's nutrition programme, which is implemented jointly by the EU Delegation and UNICEF in the context of their Partnership for Improved Nutrition in Lao PDR in support of the National Nutrition Strategy 2016-2025 (NNS).

The NIPN programmatic approach is new, using complex steps to contribute to the global reduction of stunting for children under five years of age (CU5) in alignment with World Health Assembly (WHA) 2025 targets. The programmatic approach in NIPN is considered a flexible model to help guide the choice of activities, methodologies and tools in countries, where NIPN is being implemented.

The specific objective of NIPN is to build institutional capacities at both national and sub-national levels to manage and analyse information and data from all sectors which have an influence on nutrition, to track progress, disseminate and use information to better inform their policies and strategic decisions.

The NIPN initiative will raise awareness on the links between nutrition-related programme inputs, outputs and outcomes through stakeholder engagement, coordination with key line ministries and capacity strengthening activities.

## 2. Rationale and Objective of Assessment

Nutrition is highly prioritized in Lao PDR with high government and development partners support going into nutrition programming and interventions. Over the years, there has been increased funding from key development partners such as the European Union, World Bank, United Nations, USAID among others. Country stakeholders are however concerned that the nutrition results are not commensurate with the investments so far.

The overall objective of the assessment is to show in what ways, and to what extent, malnutrition affects the Lao economy, this is done by using the most recent data and by investigating trends since the last assessment was conducted in 2013 and thus attracting nutrition policy attention and discussions.

The objective of the analysis is to:

- Assess the economic loss due to malnutrition in Lao PDR
- Identify key intervention areas that require increased attention by nutrition stakeholders.

## 3. Methodology and Activities

The analysis is largely based on the data of the Lao Social Indicator Survey (LSIS) 1, 2011 and on LSIS 2, 2017. Where data has not been available from both surveys, alternate sources were used.<sup>1</sup> In 2013, the micro-simulation used average earnings for the labour force and the labour participation rate as average losses. The vitamin A deficit rate was deemed to be 30% and child deaths between 6 and 11 months were excluded from the analytical framework due to data limitations. However, in 2020 the number of child deaths in the 6-11-month range was included in the analytical framework and the vitamin A deficit rate was 42% instead of 30%. The average earnings per person participating in the labour force was used instead of the average earnings per labour force. The 2013 data was

<sup>1</sup> Population and housing census, LSB; LECS6; World Bank; UNICEF; NIER & UNICEF; UN Inter-agency Group for Child Mortality Estimation, Lao Nutrition Surveys.

therefore re-analysed using the new model. As a result of the change, some of the results of 2013 appear different than initially presented. The two analyses were carried out in 2013 and 2020 respectively, the tables will mention the years 2013 and 2020, but all of the data used on analyses are based on LSIS 1, 2011 and LSIS 2, 2017.

The analysis makes use of seven indicators as a basis for calculations to estimate the economic losses due to undernutrition. It uses a micro-economic-modelling scenario which describes the negative outcomes of malnutrition, defined as the current prevalence of each of the seven indicators of undernutrition. The scientific literature has developed substantial evidence that defines heightened mortality or morbidity risks as well as the impact on cognitive development and physical performance deficits associated with each of these seven indicators – expressed as relative risk (RR) or proportional deficit (%).

The Damage Assessment Report (DAR) estimate describes the magnitude of losses from malnutrition in order to stimulate policy discussion and ultimately secure investment in programmes on a scale appropriate to the extent of the burden of malnutrition. The baseline losses projected by the DAR indicate the potential for significant economic as well as human and social benefits that might be secured by investment in interventions to lower prevalence of these indicators of malnutrition.

DAR is an estimate of the magnitude of the national burden emerging from selected indicators. For this DAR seven nutrition indicators have been selected. It also identifies simple, feasible and cost-effective interventions to lower the burden. The seven indicators used are listed in table 1.

The economic loss that will be incurred in the future is discounted into Net Present Value (NPV) by using the following formula:

$$NPV = \frac{R \left\{ \frac{(1+i)^{n_1} - 1}{i(1+i)^{n_1}} \right\}}{(1+i)^{n_2}}$$

NPV = Net Present Value of economic damage

- R* - Annual damage flow/loss, equal to the annual income that would have been incurred in the future of the child died.
- n<sub>1</sub>* - The future income generation of the deceased child (39 years long/ "healthy working life of WHO)
- n<sub>2</sub>* - The age at which the individual would have started earning money. In order to simplify, this report uses *n<sub>2</sub>* equal to 15 years for perinatal and neonatal death and equal to 13 years for 6-59-month-old cohorts.
- i* - Discounting rate (3%); this report employs a discounting rate of 3%; this is the interest rate of soft loans for social development, as suggested by the World Bank.

The Population Attributable Risk (PAR) is a function of the prevalence of the nutrition indicator along with the severity of the mortality risk as expressed by the Relative Risk (RR). It is calculated with the following formula:

$$PAR = \frac{Prevalence \times (RR - 1)}{1 + \{Prevalence \times (RR - 1)\}}$$

Mortality in risk group affected, number of deaths per year based on national data.

**Table 1: List of indicators and comparison between 2013 and 2020**

NUTRITION	RISK	NATIONAL PREVALENCE 2013 (LSIS 1) ESTIMATED	RISK OR DEFICIT	NATIONAL PREVALENCE 2020 (LSIS 2) ESTIMATED	SOURCE
Underweight	Children 1-5 months		Mortality		
	Moderate (<-2SD)	12.70%		11.40%	LSIS 1 and LSIS 2
	Severe (<-3SD)	5.40%		3.60%	LSIS 1 and LSIS 2
	Children 6-11 months				
	Moderate (<-2SD)	18.10%		15.20%	LSIS 1 and LSIS 2
	Severe (<-3SD)	3.90%		4.00%	LSIS 1 and LSIS 2
	Children 12-59 months				
	Moderate (<-2SD)	29.50%		23.00%	LSIS 1 and LSIS 2
	Severe (<-3SD)	7.90%		5.20%	LSIS 1 and LSIS 2
Stunting	Children 6-23 months		Retarded Development		
	Moderate (<-2SD)	36.70%		28.80%	LSIS 1 and LSIS 2
	Severe (<-3SD)	14.70%		11.80%	LSIS 1 and LSIS 2
Low birth weight	Infants < 1 month	14.83%	Mortality and increasing health care cost	6.60%	LSIS 1 and LSIS 2
	2000-2499g	13.10%		5.83%	LSIS 1 and LSIS 2
	1500-1999g	1.73%		0.77%	LSIS 1 and LSIS 2
Anaemia	Children 6-23 months	52.80%	Mental Development	63.10%	LSIS 2
	Working Age Women	36.20%	Work Performance,	44.50%	LSIS 2
	Working Age Men	9.10%	Work Performance	10.10%	WHO estimate*
	Anaemia in Pregnancy	36.20%	Mortality	44.50%	LSIS 2
Vitamin A deficiency	Children 6-59 months	42.00%	Mortality	30.00%	Estimated*
Sub-optimal breastfeeding	Children <1 month				
	Predominant BF	44.00%		39.00%	LSIS 1 and LSIS 2
	No breastfeeding	5.00%		4.40%	LSIS 1 and LSIS 2
	Children 1-5 months				
	Predominant BF	53.70%		47.50%	LSIS 1 and LSIS 2
	No breastfeeding	8.50%		7.55%	LSIS 1 and LSIS 2
	Children 6-23 months				
No breastfeeding	64.60%	47.00%	LSIS 2		
Birth defects (NTD)	All Births	0.15%	Mortality and Disability	0.15%	Estimated*

Source: LSIS 1, 2011 and LSIS 2, 2017

\*Estimates calculated by NIER, 2020

The analysis concludes four pathways to economic loss using the seven indicators of malnutrition listed in the table above. The four pathways are as follows:

- Lost workforce due to mortality of children
- Losses of future productivity and potential earnings of malnourished children 6-24 months
- Loss of current value of reduced productivity in working adults
- Value of excess and preventable healthcare costs.

The analysis used the consequence model by applying the coefficients of losses established in the global scientific literature to the Lao context. It used health, demographic and economic data to develop a national DAR via an algorithm shown in table 2 below.

**Table 2: DAR algorithm to project economic losses from individual indicators**

Number w/ Indicator		Average earnings of labour participating labour force		Labour Force Participation		Average Work-Life		Coefficient Risk-Deficit		Discount for NPV		Annual Loss
	x		x		x		x		x		=	
Prevalence (%) x population of Risk Group		\$2344/y		All: 81.8% Male: 82.7% Female: 80.7%		All: 39 y Male: 38 y Female: 39 y		RR or % from Literature		@ 3%		Net Present Value (NPV) of Loss \$/yr

Source: World Bank, *Development Report 1993: Investing in Health*. Oxford University Press World Bank 1993. Discount rate of 3 percent per year.

## 4. Limitations

Converting indicators of malnutrition to economic variables and attaching a monetary value to them is challenging. Firstly, monetizing the consequences of malnutrition is dependent on relatively few evidence complex methodologies and use of national health, demographics and economic statistics of uneven quality. Secondly, many factors beyond an individual physical and intellectual potential determine earnings or work performance. Workplace incentives, available technology and other opportunities determine how increased human potential translates into improved productivity. Finally, benefits of improved nutrition extend beyond the workplace to educational improvement, entrepreneurial pursuits in adulthood, household earnings and community participation. Improvement in nutrition has several determinants and not all were factored in the Damage Assessment Report, which focuses on monetary earnings only. For all these reasons and more, the margin of error is large. These are projections to focus and facilitate policy discussion and present a solid and conservative case for policy discussion.

It should be noted that this assessment report focuses only on the economic costs of undernutrition. Humanitarian, moral and good governance rationales for investing in nutrition are not reflected here as they are beyond the scope of this report.

## 2 Background

Freedom from hunger is an essential component of the Sustainable Development Goal (SDG 2). It targets to end hunger by 2030 and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.<sup>2</sup>

Improved nutrition goes beyond SDG 2 and is linked to the rest of the SDGs and will depend on the progress of many of the SDGs such as clean water and sanitation, education and poverty reduction in order to achieve sustainable development. Progress on sustainable development is necessary to reduce malnutrition.<sup>3</sup>

Malnutrition is defined as not having enough energy or nutrients to live a physically active life that allows for optimal health. It encompasses both overnutrition and undernutrition and has direct negative consequences in terms of disease and disability, brain development, educational attainment and income potential for individuals and communities. The World Health Organisation (WHO) considers that poor nutrition is the single most important threat to the world's health.<sup>4</sup>

Widespread malnutrition is a consequence as well as a cause of poverty. Poverty and undernutrition are locked in a vicious cycle of increased mortality, poor health, and retarded cognitive and physical growth, diminished learning capacity and ultimately lower work performance, productivity and earnings as illustrated in figure 1 below. As this vicious cycle threatens health and survival, it simultaneously erodes the foundation of economic growth - people's strength and energy, creative and analytical capacity, initiative and entrepreneurial drive. Extensive evidence demonstrates that undernutrition in young children has consequences not only for health and survival but also for physical and intellectual growth, school performance and adult productivity. Poor nutrition from birth through school and adolescence can delay school-attendance and reduces attainment, can reduce cognitive development, and resulting in lost employment opportunities throughout life.<sup>5</sup>



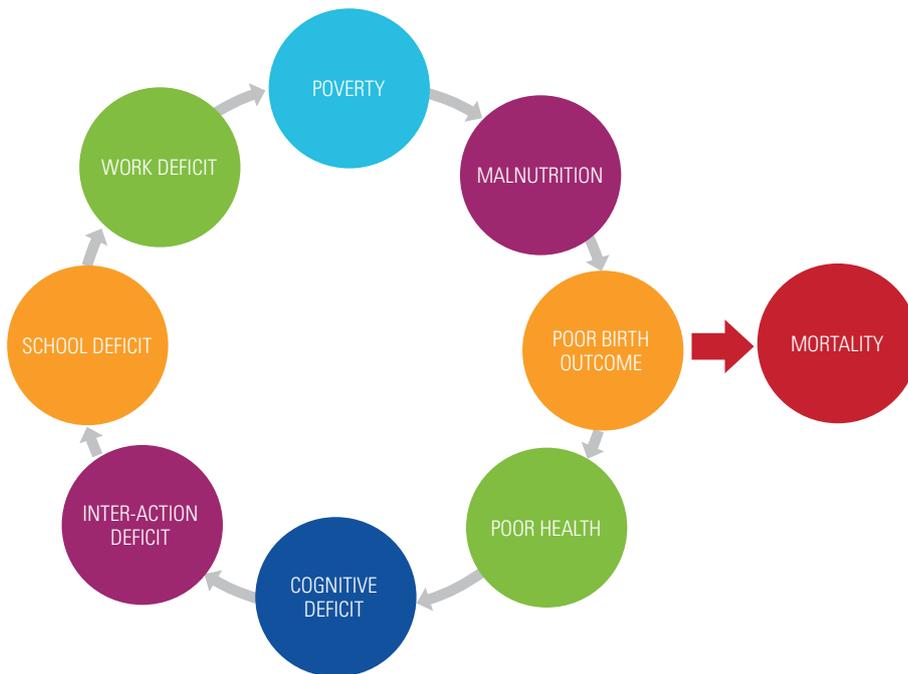
© ILO Bangkok/ Adri Berger

<sup>2</sup> <https://sustainabledevelopment.un.org>

<sup>3</sup> <https://www.powerofnutrition.org/nutrition-and-the-sustainable-development-goals/>

<sup>4</sup> [https://www.europarl.europa.eu/meetdocs/2009\\_2014/documents/acp/dv/background\\_/background\\_en.pdf](https://www.europarl.europa.eu/meetdocs/2009_2014/documents/acp/dv/background_/background_en.pdf)

<sup>5</sup> The Cost of Malnutrition: Why Policy Action is Urgent, Technical Brief, No. 3, July 2016

**Figure 1: Negative cycle of malnutrition & poverty**

Source: *Planning for Nutrition Investment in Uzbekistan*, Jack Bagriansky UNICEF Consultant, 2014

Therefore, achieving a reduction in the prevalence of malnutrition can substantially reduce this national burden as well as generate human and social capital to fuel economic development. At the microeconomic level, it is calculated that 1% loss in adult height as a result of childhood stunting is equal to a 1.4% loss in productivity of the individual. Other indirect losses for the country's economy are caused by poor cognitive function and reduced school attainment that originate in early childhood undernutrition. In fact, the education gap and consequent lower skill-level of workforce substantially delays the development of countries affected by malnutrition.<sup>6</sup> Calculations show that children in developing countries on average are losing six months of education attainment due to early child growth deficits, which equals a global economic loss of 176.8 billion USD.<sup>7</sup>

Malnutrition, in all its forms, brings huge costs to individuals, families and to entire nations. A recent assessment suggested that undernutrition, micronutrient deficiencies, and overweight among the population at today's levels cost the global economy up to 3.5 trillion USD or 500 USD per individual per year.<sup>8</sup> Child mortality represents a loss of human capital that affects families and whole communities. Malnutrition and micronutrient deficiencies have, in recent years, been increasingly associated with economic productivity losses.<sup>9,10</sup> The economic costs of undernutrition, in terms of lost national productivity and economic growth, are significant up to 11% of GDP in Asia each year. A study from the Philippines using the DAR methodology estimated that the total economic burden of undernutrition amounts to 4.5 billion USD per year or equivalent to 1.5% of Philippine GDP in 2015. Another example is from Malawi, where an assessment showed that child undernutrition cost almost 600 million USD in 2012, equivalent to more than 10% of that year's GDP.<sup>11,12</sup>

<sup>6</sup> Repositioning Nutrition as Central to Development: A Strategy for Large-Scale Action, The World Bank, 2006

<sup>7</sup> Schooling and wage income losses due to early-childhood growth faltering in developing countries: national, regional, and global estimates. Günther Fink et al., *Am J Clin Nutr* 2016;104:104–12. Printed in USA, 2016

<sup>8</sup> The Cost of Malnutrition: Why Policy Action is Urgent, Technical Brief No. 3, July 2016

<sup>9</sup> The Economic Burden of Malnutrition in Pregnant Women and Children under 5 Years of Age in Cambodia. *Nutrients*, 2016

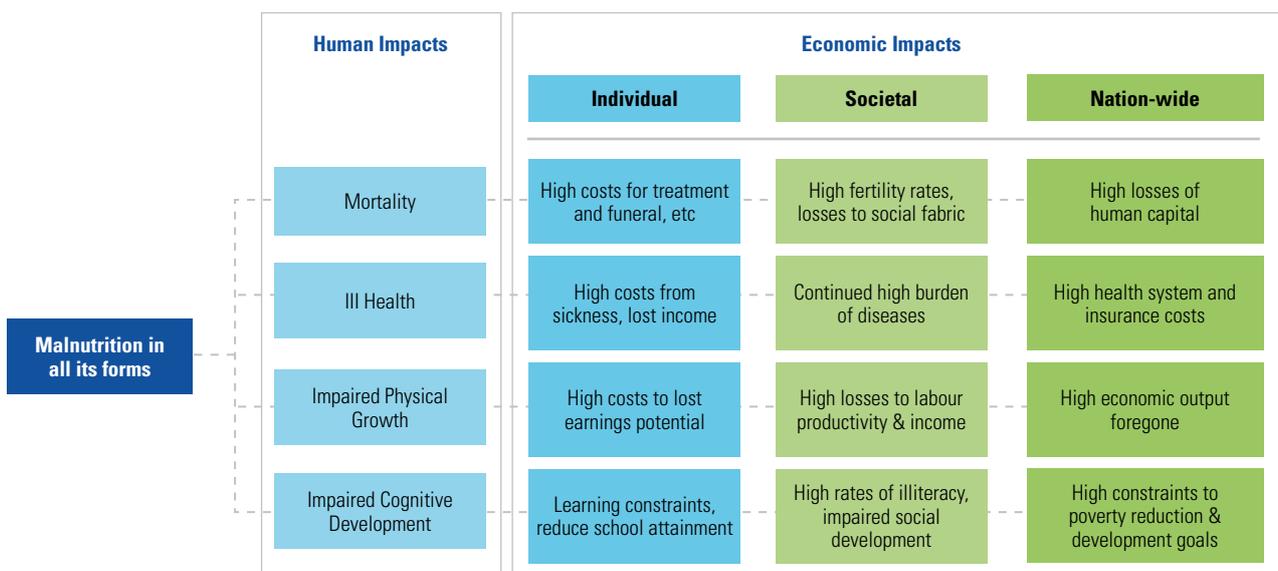
<sup>10</sup> The World Health Organization's global target for reducing childhood stunting by 2025: rationale and proposed actions, Mercedes de Onis et al, *Matern Child Nutr.* 2013 Sep; 9 (Suppl 2): 6–26

<sup>11</sup> The Cost of Malnutrition: Why Policy Action is Urgent, Technical Brief No. 3, July 2016

<sup>12</sup> Business Case for Nutrition Investment in the Philippines. UNICEF, 2016

Due to poor nutrition during pregnancy, there is an increased risk of stillbirths. In the past two decades there have been 48 million stillbirths worldwide, approximately 2 million stillbirths per year. Stillbirth rates ranged nationally from 1.4 to 32.2 per 1,000 live births in 2019. The highest numbers of stillbirths are to be found in Sub-Saharan Africa, followed by Southern Asia with Pakistan and India having the greatest burden. There is a risk that due to the covid-19 pandemic, the number of stillbirths may increase, as health care systems are over stretched with associated preventive measures, limited transportation options and fear of contracting covid-19. It is estimated that between 60,000 to 200,000 additional stillbirths could occur over a 12 month period.<sup>13</sup> These losses are largely preventable if adequate investment in proven interventions are made, particularly those that focus on ensuring optimal nutrition in the critical 1,000-day window between the start of a woman’s pregnancy and her child’s second birthday.<sup>14</sup>

**Figure 2: Conceptual framework for understanding the economic impacts of malnutrition in all its forms.**



Source: *The Cost of Malnutrition: Why Policy Action is Urgent*, technical brief, 2016

Malnutrition is the biggest threat to a child’s health and undernutrition is one of the main causes of death. Unlike starvation it can be difficult to see if a child is malnourished, when they are suffering from a milder form. The first 1,000 days after conception and until the child is two years old are very vital to the cognitive and linear growth of the child. In fact, it is during this period that the brain development occurs and any physiological deficiency during this period can lead to both short-term and long-term consequences. Interventions must focus on the 1,000 days window.<sup>15, 16</sup>

<sup>13</sup> A Neglected Tragedy. The global burden of stillbirths, 2020

<sup>14</sup> The World Bank and Nutrition, 2019

<sup>15</sup> Repositioning Nutrition as Central to Development A Strategy for Large-Scale Action, World Bank, 2006

<sup>16</sup> Prevalence and Socio-economic Impacts of Malnutrition Among Children in Uganda, Nutrition and Metabolic Insights Volume 12: 1–5, Adebisi et al, 2019

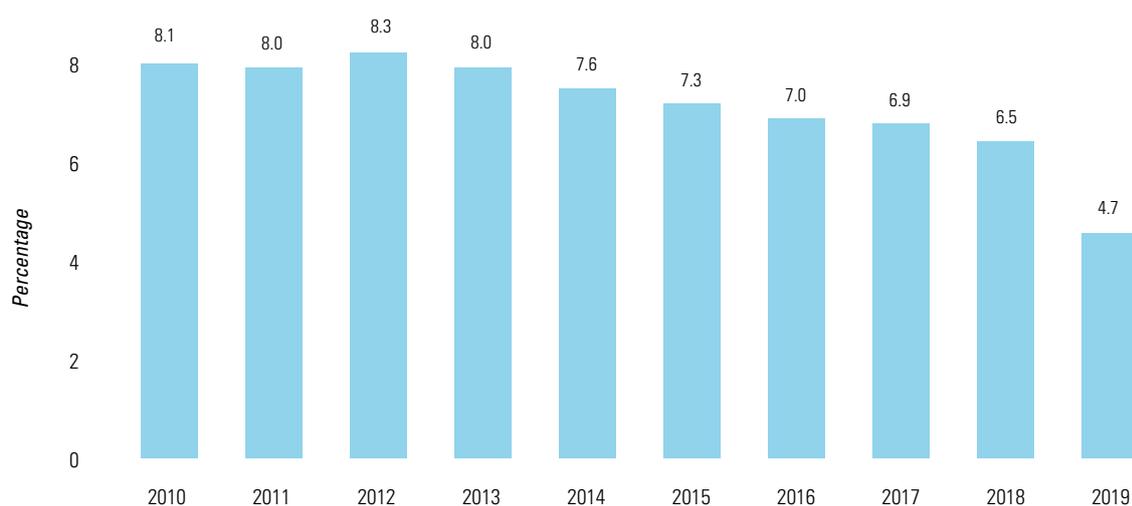
# Socio-Economic Development in Overview and Nutrition Situation in Lao PDR

## 1. Socio-Economic Development in Overview

Lao PDR is a land-locked country in South East Asia and categorized as a lower-middle income country by the World Bank. The population is about 7.2 million with a fertility rate of 2.7%. There has been a decline in the total fertility rate from 2.9 children (2015) to 2.7 children in 2019. Life expectancy has on average increased by 1.5 years in four years, reaching 68.9 in 2017.<sup>17</sup> The total workforce is 4.6 million with a legal working age from 15–64 years and the total labour force participation rate is 81.8% (2020). 50% of the workforce are women. The majority of the workforce (56%) is engaged in agriculture and 70% of the population lives in rural areas and about 8% in areas with no roads.<sup>18,19,20,21</sup>

Over the past decade Lao PDR has experienced rapid economic growth as illustrated in graph 1 below, however this has not resulted in the same proportional reduction in poverty. The growth is mainly a result such as megaprojects in the natural resource sector, which has created limited employment opportunities and has not been particularly inclusive for the population Lao PDR, as a whole.<sup>22</sup>

**Graph 1: Annual growth rate of real GDP, Lao PDR**



Source: Tradingeconomic.com, The Bank of Lao PDR

<sup>17</sup> Lao Social Indicator Survey (LSIS) 2, Government of Lao PDR, UNICEF, Vientiane, 2017

<sup>18</sup> Health and Nutrition Services Access Project, World Bank, Lao PDR, 2020

<sup>19</sup> The 4 population and housing census 2015. Lao Statistic Bureau. Lao PDR, 2015

<sup>20</sup> Highlight result of 6th Lao Consumption and Expenditure Survey (LECS VI), 2018/2019

<sup>21</sup> World Bank, <https://data.worldbank.org/indicator/SL.TLF.CACT.ZS?locations=LA>

<sup>22</sup> Health and Nutrition Services Access Project, World Bank, Lao PDR, 2020

Lao PDR has reduced its poverty rate from 24.6% in 2013 to 18.3% in 2019. The average GDP per capita is now 2,535 USD, which is an increase of 709 USD from 1,826 USD per capita in 2013, whereas Gini co-efficient was 38.8% (2020). The proportion of the population in Lao PDR that lives on less than USD 1.90 per day, declined from 15.6 in 2012/13 to 9% in 2020. The rate of poverty reduction has been rapid in rural areas, while urban poverty reduction has stagnated. Despite some improvement in poverty reduction, access to basic social services remains a challenge, especially in remote and rural upland areas. Savannakhet (20.6%), Oudomxay (8.7%), Khammouane (8.3%), Saravane (8.0%) and Luangprabang provinces (7.7%) account for more than half of the poor in Lao PDR. Poverty is concentrated among minority ethnic groups and people with low formal education level with the Hmong-lumien ethnic group having the highest level of poverty 38.4% compared to national level at 18.3%.<sup>23, 24, 25, 26</sup>

During the period 2000 to 2019, Lao PDR recorded a significant decline in infant and CU5 mortality rates. The infant mortality rate decreased from 83 in 2000 to 36.9 per 1,000 live births in 2019, while the CU5 mortality rate dropped from 118 to 41.4 per 1,000 live births, 87% of under 5 mortality happens in the first year of life. Similarly, the maternal mortality ratio significantly declined from 546 in 2000 to 132 per 100,000 live births in 2019, and the total fertility rate declined from 3.2 from 2011 to 2.7 in 2017. Neonatal mortality is 22.7/1,000 live births (2018), stillbirth rate was 24/1,000 total births (2015) and infants with low birthweight 17.3% (2018).<sup>27, 28, 29</sup>

Children entering the formal education system has improved with enrolment rates for children 5 years of age has increased from 70.9% in 2015-16 to 82.7% in 2019–20, which is above the target of 80% enrolment by 2020. This expansion has occurred across all provinces and gender equitably, with the Gender Parity Index (GPI) consistently falling between 0.99 and 1.01 and 142 of the 148 districts now enrolling over 60% of their age 5 population in ECE.<sup>30</sup>

Primary education completion rates have improved from 77.9% (female 79.1%) in 2015/16 to 79.9% with completion rates of girls at 82.7% in 2019-20, higher than that of boys in 2020, but still 20% of the enrolled children do not complete and drop out before they have completed their primary education. It is difficult to reach children from poor families living in remote areas. They often live a long distance from the nearest school, and many do not speak Lao language, which is the official language of instruction and they are therefore unable to understand the curriculum. 7.5% of youth aged between 15 -24 years are illiterate, 9.5% are women and 5.6% are male.<sup>31, 32, 33</sup>

## 2. Nutrition Situation in Lao PDR

Since 2000 there has been extensive focus on malnutrition in Lao PDR by GoL and development partners with prioritized programmes and awareness raising on malnutrition and the impacts of malnutrition, this has resulted in a reduction in stunting from 48.2% to 33% in 2017 and underweight from 36.4% to 21.1% in the same period, as graph 2 below illustrates. In spite of this significant progress and economic growth, there is still a big difference in levels of malnutrition across the country, with poor and rural areas most affected. According to LSIS 2 the percentage of wasting was 9%.<sup>34, 35</sup> On average, stunting in Lao PDR has declined by approximately 1.5% per annum, and underweight by approximately 1% per annum, over the last six years.<sup>36</sup>

<sup>23</sup> Highlight result of 6th Lao Consumption and Expenditure Survey (LECS VI), 2018/2019

<sup>24</sup> Health and Nutrition Services Access Project, World Bank, Lao PDR, 2020

<sup>25</sup> Lao Social Indicator Survey (LSIS) 2, Government of Lao PDR, UNICEF, Lao PDR, 2017

<sup>26</sup> World Bank: <https://data.worldbank.org/indicator/SI.POV.GINI?locations=LA>

<sup>27</sup> Lao Social Indicator Survey (LSIS) 2, Government of Lao PDR, UNICEF, Vientiane, 2017

<sup>28</sup> Ninth Five-Year Health Development Plan (2021-2025), MOH, 2019

<sup>29</sup> Healthy Newborn Network, 2020

<sup>30</sup> MOES, Education and Sports Sector Development Plan 2021-2025, October 2020

<sup>31</sup> Ibid.

<sup>32</sup> UNICEF Lao PDR website

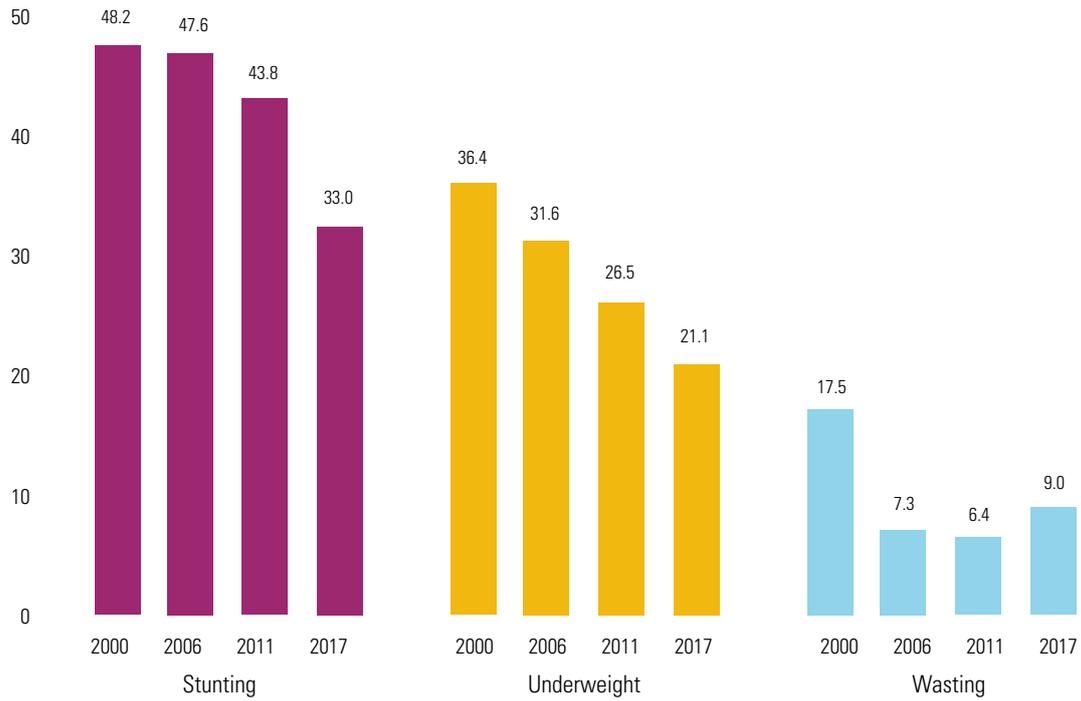
<sup>33</sup> UNESCO 2020

<sup>34</sup> FAO Nutrition Profile Laos, 2003

<sup>35</sup> Lao Social Indicator Survey (LSIS) 2, Government of Lao PDR, UNICEF, Lao PDR 2017

<sup>36</sup> Nutrition Policy Landscape Analysis in Lao People's Democratic Republic, NIPN Lao PDR, 2019

**Graph 2: Undernutrition rates among children under five years in Lao PDR.**



Source: MOH (2000), MICS (2006), LSIS 1 (2011) LSIS 2(2017)

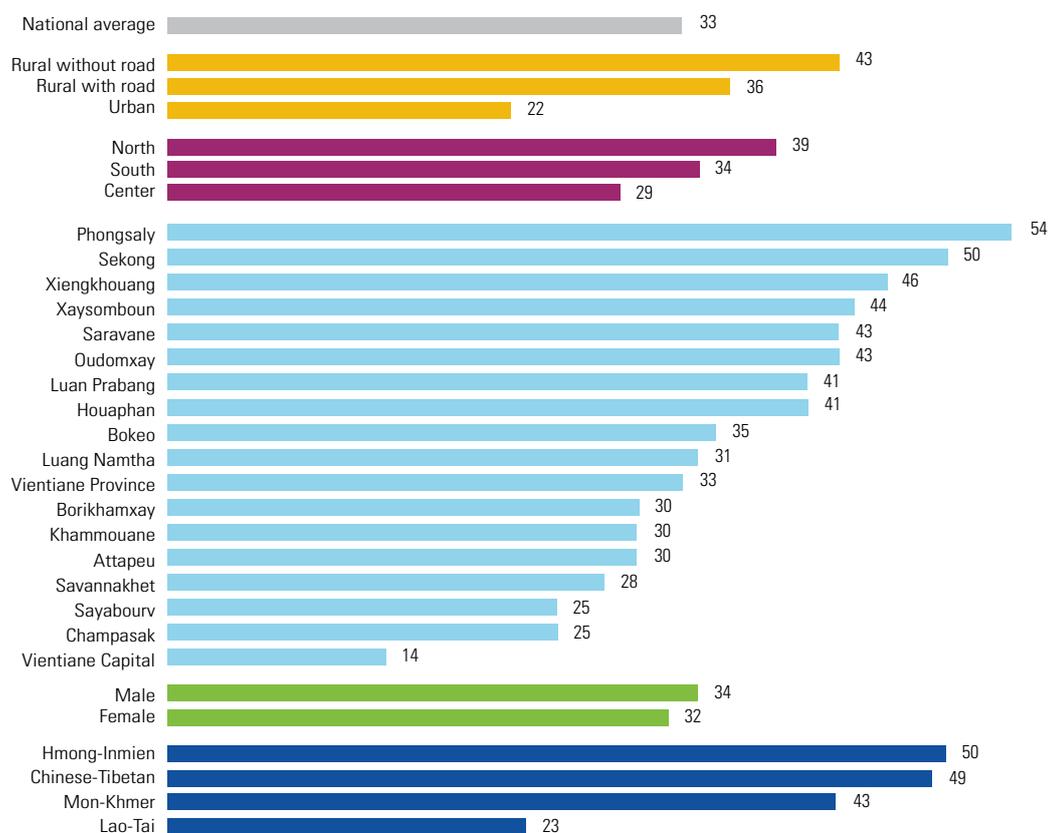
As illustrated in graph 3 below every third child in Lao PDR under five years of age is stunted with a wide difference between the 18 provinces in the country. In 2017, Vientiane capital had the lowest prevalence of stunting (13.8%) and Phongsaly Province had the highest (54%). As the following graph shows 11 out of 18 provinces have stunting rates above 30%, which is classified as seriously high or critical according to WHO/UNICEF anthropometric classification.<sup>37</sup>



© UNICEF/Laos

<sup>37</sup> UNICEF nutrition profile, Lao PDR, 2019

**Graph 3: Prevalence of stunting in Lao PDR**



Source: Multiple Overlapping Deprivation Analysis on Stunting, UNICEF, Lao PDR, 2019

Undernutrition varies by geographic location and ethnic groups. Children in remote, rural areas without access to roads have a much higher probability of being nutritionally deprived and stunted than children living in urban areas. Stunting is also highest among children living with a household head of Chinese-Tibetan and Hmong-lumien ethnicity. Stunting levels in provinces such as Sekong (50%), Phongsaly (54%), and Xiengkhouang (46%) are particularly high. Also, children of mothers with no education were three times more likely to be stunted (45%) than children of mothers with higher education (17%).<sup>38, 39</sup>

The high prevalence of malnutrition in Lao PDR is caused by a variety of reasons. Some of the main causes are related to limited nutrition knowledge, quality of food and food safety, vitamin deficiencies, access to food, cultures and traditions among others and the fact that the Lao diet is generally dominated by a large share of rice and other staples as main consumption.

Micronutrient deficiency among the population remains a challenge. 44.1% CU5 years are anaemic and 30% of pre-school children are suffering from vitamin A deficiency (VAD). 40% of women in reproductive age are anaemic and 48% of women develop anaemia during pregnancy. Women living in rural areas without roads are more likely to be anaemic than women living in rural areas with roads (42% versus 37%). The prevalence of anaemia varies considerably by province; women in Khammouane Province are more than 4 times more likely than women in Xayaboury Province to be anaemic (62% versus 18%). 26% of children in Lao PDR have mild anaemia, 18% have moderate anaemia, and <1% have severe anaemia. CU5 in Khammouane Province are more than two times more likely to be anaemic than children in Houaphan Province (59% versus 24%). Insufficient foetal growth and nutrition intake during pregnancy increases the risk of infant mortality and can have lifelong effects on the immune function and cognitive outcomes.<sup>40</sup>

<sup>38</sup> Multiple Overlapping Deprivation Analysis on Stunting, UNICEF, Lao PDR, 2019

<sup>39</sup> Lao Social Indicator Survey (LSIS) 2, Government of Lao PDR, UNICEF, Lao PDR 2017

<sup>40</sup> Ibid

Approximately 25% of households do not consume adequately iodized salt. Thiamine deficiency is reportedly high among pregnant and lactating women because of the high consumption of rice, and diets low in vitamin B1. Thiamine deficiency in Laos has been associated with intra uterine growth retardation and infant mortality.<sup>41,42</sup>

Micronutrient supplementation programmes are being carried out in Lao PDR, but the coverage is constrained by limited supplies at the health centres across the country.

## 3. Food Security and Food Consumption

Lao PDR has achieved national self-sufficiency, especially in rice. Nationally, calorie deficiency is less of a challenge. In 2012/13, the average calorie intake per capita per day was 2,751 kcal, which is well beyond 2,400 kcal, which is the nationally defined minimum daily dietary energy supply per capita to meet the daily needs of an average Lao person. Despite this impressive national outlook, about 25% of households are food insecure, and many households, especially in remote areas, experience periods during the year with seasonal food insecurity and no rice to eat.<sup>43</sup>

Food insecurity is widely assumed to be a major determinant of malnutrition in Lao PDR, however analyses show that lack of dietary diversity and a balanced diet are the main sources of inadequate nutrient intake in children and not access to food.<sup>44</sup>

There is limited information available about the dietary intake of Lao women. National data show that only one third (32%) of women meet a minimum dietary diversity of five or more food groups. A study conducted in four provinces in Lao PDR found that only 44% of pregnant women reached a minimum dietary diversity while 10% ate less than three meals a day.<sup>45</sup>

Nearly all children are breastfed, but practices are suboptimal: early initiation is 40%, 40% of children under 6 months are exclusively breastfed, and duration falls short of the recommended 24 months (median is 20 months). 38% of babies born in Lao PDR are introduced to complementary foods too early (before 6 months) while 55% of children aged 6 months to 2 years do not have a diet that is sufficiently diverse and 31% are not fed frequently enough. These children have poor quality diets that are lacking in essential nutrients. Around 40% do not consume vitamin A rich foods whilst 46% do not consume iron-rich foods on daily basis. 55% of children under 5 years consume less than three food groups despite the availability diverse foods in the household. The poorest children have the least adequate complementary feeding practices.<sup>46,47,48</sup>

The percentage of children 6-23 months receiving the minimum meal frequency has increased from 43% in 2011 to 69% in 2017, however only half of the children 6-23 months received the minimum diet diversity or the variety of foods required for optimal growth and development. Additional studies show that even though food groups are available and consumed in the household, a significant proportion of children under 2 years old (CU2) are not fed these important food groups, which is partly attributable to limited nutrition knowledge in the household.<sup>49,50</sup>

<sup>41</sup> Ibid.

<sup>42</sup> National Nutrition Strategy and Plan of Action, 2016-2020, Ministry of Health, Lao PDR, 2016

<sup>43</sup> Increasing Agricultural Commercialisation and Enhancing Food Security and Nutrition in Lao PDR: A Framework for Balanced Policy Analysis, Planning and Programming, Ministry of Agriculture and Forestry, Lao PDR, 2020

<sup>44</sup> Increasing Agricultural Commercialisation and Enhancing Food Security and Nutrition in Lao PDR: A Framework for Balanced Policy Analysis, Planning and Programming, Ministry of Agriculture and Forestry, Lao PDR, 2020

<sup>45</sup> Maternal Nutrition Brief UNICEF, Lao PDR, 2019

<sup>46</sup> Fill the Nutrition Gap, WFP 2017

<sup>47</sup> Lao PDR Complementary feeding, UNICEF 2019

<sup>48</sup> Strategic Review of Food and Nutrition Security in Lao People's Democratic Republic, WFP, Lao PDR, 2016

<sup>49</sup> Lao Social Indicator Survey (LSIS) 2, Government of Lao PDR, UNICEF, Vientiane, 2017

<sup>50</sup> Nutrition in Lao PDR, World Bank, 2016

# Economic Impact/Consequences of Malnutrition in Lao PDR

The analysis of consequences of malnutrition for Lao PDR is based on the use of seven indicators of malnutrition formulated into four pathways to economic loss. The four pathways are:

- Lost workforce due to mortality of children
- Losses of future productivity and potential earnings of malnourished children 6-24 months
- Loss of current value of reduced productivity in working adults
- Value of excess and preventable healthcare costs.

**Table 3: Nutrition indicators used for the assessment\***

INDICATOR	RISK GROUP	RELATIVE RISK (RR)*	SOURCE OF EVIDENCE
Maternal anaemia	Perinatal	0.84/1dl Hb	WHO (2004)
Low birth weight (LBW)	Neonatal	2.8-8.1	Lancet (2008)
Underweight	6-59 months	2.5-9.7	Lancet (2008)
Breastfeeding	< 6 months	1.13-14.4	Lancet (2008)
Vitamin A deficiency (VAD)	6-59 months	1.75	WHO (2007)

Sources: *The Economic Consequences of Malnutrition, Lao PDR, 2013*, *The Economic Consequences of Malnutrition in Albania, 2010*.

\* RR for birth defect and stunting were not available and has not been included in this part of the analysis, and the 2013 report is used for this purpose.

## 1. Pathway #1 Evidence of Mortality Risk by Nutrition Indicator

This pathway applies coefficients of risk for mortality for specific maternal and child nutrition indicators, these include: underweight, low birth weight (under 1 month), perinatal mortality attributed to anaemia in pregnancy, sub-optimal breastfeeding, vitamin A deficiency and birth defects.

The scale of child mortality caused by malnutrition is hidden in a negative synergy of malnutrition, infection, disease, and premature death of children. Malnutrition is rarely listed as cause of death. Estimating the national impact of malnutrition on child mortality is based on current rates of child death as could be seen from the table below. In total, the number of child deaths was 12,339 in 2013 and in 2020 6,373 children, before their 5th birthday. See table below for further details.

**Table 4: Mortality rates Lao PDR**

AGE SEGMENT	2013		2020		SOURCE
	RATE/1000	NUMBER ESTIMATED	RATE/1000	NUMBER ESTIMATED	
Under 5 mortality	79	12,339	46	6,373	LSIS 1 @ 156,195 births/year LSIS 2 @ 138,550 births/year.
Infant mortality	68	10,621	40	5,542	LSIS 1 @ 156,195 births/year LSIS 2 @ 138,550 births/year.
Neonatal < 1 month	32	4,998	18	2,494	LSIS 1 @ 156,195 births/year LSIS 2 @ 138,550 births/year.
Post-neonatal 1-12 months	36	5,623	22	3,048	Infant minus Neonatal
Infant: 1-5 months		2,812		1,247	50% Post Neonatal – 562 deaths/month
Infant: 6-11 months		2,812		1,247	50% Post Neonatal -468 deaths /month
Child: 1 -5 years		1,718		831	Under Five minus Infant Mortality
Early neonatal @ 74% of neonatal	24	3,699	13.32	1,845	Calculated from WHO 2005[1]
Stillbirths	32	4,998	23.7	3,284	Calculated from WHO 2005[2]
Perinatal death		8,697		5,129	Early Neonatal plus Stillbirths

Source: LSIS 1, 2011 and LSIS 2, 2017

The sections that follow apply coefficients for higher risk of mortality found in the scientific literature to six individual indicators of malnutrition to paint a general picture of child mortality that can be attributed to current prevalence of malnutrition in Lao PDR.

For pathway 1, to estimate the number of deaths attributable to maternal and child malnutrition, the following algorithm was used:

**Number of Deaths attributed = Population attributable risk x Mortality in risk group affected**

As mentioned earlier the Population Attributable Risk (PAR) is a function of the prevalence of the nutrition indicator along with the severity of the mortality risk as expressed by the Relative Risk (RR).

The association between maternal nutrition and low birth weight is strong. Indicators of maternal nutritional status including body mass index, mid upper arm circumference and iron status strongly predict low birth weight among new-borns. An analysis pooling 11 studies concluded that, compared to normal weight babies, infants weighing 1500–1999 g were 8.1 times more likely to die and those weighing 2000–2499 g were 2.8 times more likely to die during the first month of life.<sup>51</sup>

When compared to 2013, there has been a reduction of 39% in the estimated numbers of dead children related to the six indicators in 2020.

<sup>51</sup> The Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, NIER & UNICEF, Lao PDR, 2013

**Table 5: Attributed death individuals related to nutrition indicators and comparison of 2013 and 2020.**

NUTRITION INDICATOR	RR	ESTIMATED 2013			ESTIMATED 2020		
		PAR	ATTRIBUTED DEATH INDIVIDUAL	ADJUST	PAR	ATTRIBUTED DEATH INDIVIDUAL	ADJUST
<b>I. Underweight</b>			<b>3,888</b>	<b>3,131</b>		<b>1,505</b>	<b>1,212</b>
1.1. Children 1-5 months			1,349	1,087		479	386
Moderate (<-2SD)	2.5	16.0%	450	363	14.6%	182	147
Severe (<-3SD)	9.7	32.0%	899	724	23.9%	297	240
1.2. Children 6-11 months			1,313	1,056		553	445
Moderate (<-2SD)	2.5	21.4%	600	483	18.6%	232	186
Severe (<-3SD)	9.7	25.3%	712	573	25.8%	322	259
1.3. Children 12-59 months			1,227	989		472	381
Moderate (<-2SD)	2.5	30.7%	527	425	25.7%	213	172
Severe (<-3SD)	9.7	40.7%	700	564	31.1%	259	209
<b>II. Low birth weight &lt;1 month</b>			<b>471</b>	<b>433</b>		<b>366</b>	<b>337</b>
2,000-2,499 g	2.8	19.1%	286	263	9.5%	237	218
1,500-1,999 g	8.1	10.9%	185	170	5.2%	129	119
<b>III. Perinatal mortality attributed to anemia in pregnancy</b>			<b>611</b>	<b>611</b>		<b>393</b>	<b>393</b>
Deficit 0.41 g/dl Hb	0.84	7.0%	611	611	7.7%	393	393
<b>IV. Sub-optimal breastfeeding</b>			<b>2,320</b>	<b>2,221</b>		<b>995</b>	<b>951</b>
Children <1 month			1,284	1,185		577	532
Predominant	1.13	5.4%	270	250	4.8%	120	111
No breastfeeding	6.09	20.3%	1,014	936	18.3%	456	421
Children 1-5 months			1,035	1,035		419	419
Predominant	1.13	6.5%	183	183	5.8%	73	73
No breastfeeding	6.09	30.3%	852	852	27.8%	346	346
<b>V. Vitamin A deficit</b>			<b>1,085</b>	<b>800</b>		<b>382</b>	<b>281</b>
Children 6-11 months	1.75	24.0%	674	496	18.4%	229	169
Children 12-59 months	1.75	24.0%	412	303	18.4%	153	112
<b>VI. Birth defects</b>			<b>234</b>	<b>216</b>		<b>208</b>	<b>192</b>
<b>Total</b>			<b>8,609</b>	<b>7,412</b>		<b>3,849</b>	<b>3,367</b>

Estimates are based on calculations carried out by NIER, 2020.

Source: LSIS 1, 2011 and LSIS 2, 2017

In table 5 numbers of child deaths attributed to malnutrition are estimated. According to the table, around 7,412 children in 2013, and 3,367 children in 2020, deaths were attributed to malnutrition in Lao PDR. The annual economic loss can be estimated in two ways. Firstly, by multiplying the number of attributive deaths with average earnings per person participating in the labour force and with labour participation rate or secondly, by multiplying the number of attributive deaths with average earnings of the labour force. Both methods bring the same result. This report employs the second method, meaning:

**Annual loss = Number of attributive deaths × average earnings per labour force**

The average earning per labour force is estimated by the average labour share of GDP multiplied by number of people in the labour force (15-65 years old) or by multiplying the GDP per capita with labour share in GDP. Both ways of estimation bring the same result. In the case of Lao PDR, the average earning per labour force member was estimated to be around USD 1,244 in 2013 and USD 2,344 in 2020. Hence, the annual loss was estimated to be USD 9.2 million in 2013 and around USD 7.9 million in 2020.

However, the loss is not immediate, but will start occurring when these children would have been 15 years old and entering the labour market. From this time and onward, the loss will occur annually until retirement at age 65 years. The total earning period of each labour force accounts about 45 years. According to WHO, the “healthy working and earning life” accounts 38 years for men and 39 years for female. In order to keep conservative assessment, this report uses the “healthy working or earning life” of WHO as period of loss.

Because this will impact in the future, the annual loss needs to be discounted to net present value (NPV) by using formula below:

$$NPV = \frac{R \left\{ \frac{(1+i)^{n_1} - 1}{i(1+i)^{n_1}} \right\}}{(1+i)^{n_2}}$$

NPV = Net Present Value of economic damage/loss

*R* - Annual damage flow/loss, equal to the annual income that will be incurred in the future of the child died.

*n<sub>1</sub>* - The future income generation of the deceased child (39 years long/ “healthy working life” of WHO)

*n<sub>2</sub>* - It is time for the child to enter the profession and start earning money. In order to simplify, this report uses *n<sub>2</sub>* equal to 15 years for perinatal and neonatal death and equal to 13 years for 6-59 months old cohorts.

*i* - Discounting rate (3%); this report employs discounting rate of 3%; it is interest rate of soft loan for social development, suggested by World Bank.

Table 6 below estimates the NPV of attributed economic loss by nutrition indicator.

**Table 6: Estimates of attributed economic loss**

NUTRITION INDICATOR ATTRIBUTED DEATH INDIVIDUAL	2013		2020	
	ATTRIBUTED DEATH INDIVIDUAL	ESTIMATED LOSS IN USD-MILLION	ATTRIBUTED DEATH INDIVIDUAL	ESTIMATED LOSS IN USD-MILLION
I. Underweight	3,131	85.7	1,212	42.4
1.1. Children 1-5 months	1,087	27.3	386	13.3
Moderate (<-2SD)	363	9.1	147	5.0
Severe (<-3SD)	724	18.2	240	8.2
1.2. Children 6-11 months	1,056	32.1	445	15.3
Moderate (<-2SD)	483	17.7	186	6.4
Severe (<-3SD)	573	14.4	259	8.9
1.3. Children 12-59 months	989	26.3	381	13.9
Moderate (<-2SD)	425	11.3	172	6.3
Severe (<-3SD)	564	15.0	209	7.6
II. Low birth weight <1 month	433	11.3	337	11.6
2,000-2,499 g	263	7.0	218	7.5
1,500-1,999 g	170	4.3	119	4.1
III. Perinatal mortality attributed to anaemia in pregnancy	611	15.3	393	13.5
Deficit 0.41 g/dl Hb	611	15.3	393	13.5
IV. Sub-optimal breastfeeding	2,221	55.8	951	32.6
Children <1 month	1,185	29.8	532	18.3
Predominant	250	6.3	111	3.8
No breastfeeding	936	23.5	421	14.5
Children 1-5 months	1,035	26.0	419	14.4
Predominant	183	4.6	73	2.5
No breastfeeding	852	21.4	346	11.9
V. Vitamin A deficit	800	20.5	281	9.9
Children 6-11 months	496	12.5	169	5.8
Children 12-59 months	303	8.1	112	4.1
VI. Birth defects	216	5.4	192	6.6
<b>Total</b>	<b>7,412</b>	<b>194.1</b>	<b>3,367</b>	<b>116.6</b>

*Estimates are calculated by NIER, 2020 based on numbers from LSIS 1, 2011 and LSIS 2, 2017*

The estimated value of workforce lost to child mortality has been estimated. This value is simply derived as a lost workforce - by taking a discounted net present value (NPV) of future lost earnings. NPV includes a delayed earnings stream that presumes entry into the workforce at an average of 15 years of age - a delay ranging from 15 years for perinatal and neonatal deaths to an average of 13 years for the 6–59 months old cohort.

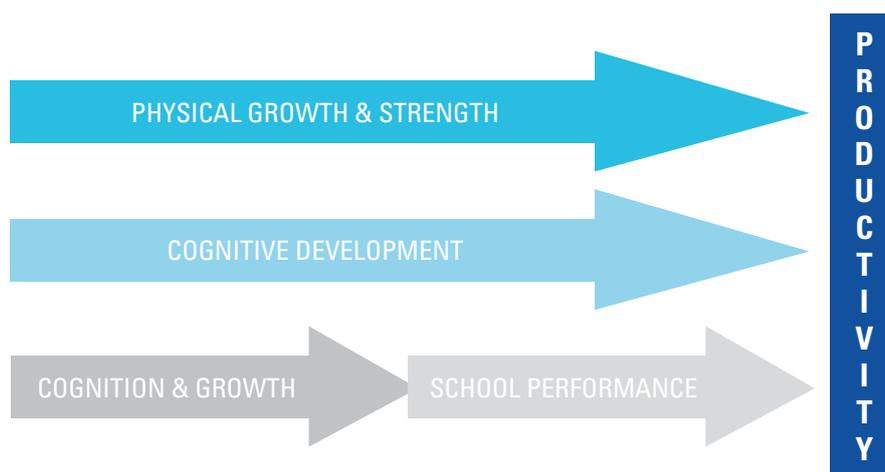
NPV of the economic loss due to underweight in 2020 is estimated to be 42.4 million USD, which is a reduction by 43.3 million USD since 2013.

NPV of the lost future workforce lost due to child mortality attributable to undernutrition is measured across six indicators of undernutrition: 1) underweight, 2) low birth weight, 3) perinatal mortality attributed to anaemia in pregnancy, 4) sub-optimal breastfeeding, 5) vitamin A deficit and 6) birth defects. The NPV of the economic loss is estimated at 116.6 million USD in 2020, which is a reduction by 77.5 million USD compared to 2013 and the number of deaths has decreased with 45.4% since 2013.

## 2. Pathway #2 Losses of Future Productivity and Potential Earnings of Malnourished Children 6-24 months

The second pathway looks into losses of future productivity and potential earnings of malnourished children 6-24 months. It focuses on child anaemia and stunting indicators, these indicators are associated with slow growth, reduced cognition, suboptimal school performance and reduced adult earnings.

**Figure 3: Stunting pathways to productivity**



As the figure above illustrates, stunting has an effect on physical growth, strength and the cognitive development of a child. Malnourished children will score low on cognitive tests, psychomotor development, and fine motor skills. These early childhood deficits will, to a large extent, determine educational outcomes and later employment opportunities, and can result in an adult productivity deficit and NPV of loss.

Together cognitive development and physical growth will improve school performance, which will result in a higher productivity, when the child becomes an adult and active member of workforce.

There are two approaches of assessing the impact of stunting on future productivity. The first approach is based on findings from a number of global studies that stunting has a significant impact on educational quality and school attainment. Most recently, an authoritative review in the *Lancet* concluded that after statistically correcting for poverty, stunted children suffer a combined grade attainment and school performance deficit of 2.91 years – with each year predicting decreased future wage of 8.3%. Thus, stunted children have an expected future income deficit of 19.9% annually.<sup>52</sup>

The second approach is based on findings from a number of international studies or observation that wage earning workers rose by 1.38% for every 1cm increase in height. This finding, together with figures found in standard growth reference charts, suggests that severe stunting (>-3SD) represents a reduction in height of 6.25% and moderate stunting (-2 to -3 SD) represents deficit of 4.38%.<sup>53</sup> Based on the findings, the future income deficit is estimated be 8.6% for severe stunted children and around 6% for moderate stunted children annually. It is significantly lower comparing to the first approach. To prevent a distortion of the figures due to biases, this assessment report used the second approach.

Substantial evidence shows stunted children start school later, progress through school less rapidly and have lower overall schooling attainment. Research shows that for every 10% increase in stunting, the proportion of children reaching the final grade of primary

<sup>52</sup> Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, NIER & UNICEF, Lao PDR 2013

<sup>53</sup> Burkhalter, Barton R., Victor M. Aguayo, Serigne M. Diene, Margaret B. Parlato, and Jay S. Ross Profiles: A Data-Based Approach to Nutrition Advocacy and Policy Development. BASICS/USAID.1998

school dropped by 7.9%. Stunted children suffer a combined grade attainment and school performance deficit of 2.4 years - with each year predicting decrease in future income of 8.3%.<sup>54</sup>

**Table 7: Losses of future productivity**

NUTRITION INDICATORS	2013				2020			
	National prevalence	Estimated affected population	Coefficient of deficit	Estimated NPV of loss	National prevalence	Estimated affected population	Coefficient of deficit	Estimated NPV of loss
Stunting (6-23 months)				122.2				135.0
Moderate (<-2SD)	38.0%	49,792	6.0%	77.8	28.8%	39,902	6.0%	85.2
Severe (<-3SD)	14.7%	19,944	8.6%	44.5	17.1%	16,349	8.6%	49.8
Anaemia in child (6-23 months)				46.3				77.3
Children 6-23 months	52.8%	71,636	2.5%	46.3	62.2%	87,425	2.5%	77.3
Total in USD				168.5				212.3

*Estimates are calculated by NIER, 2020 based on numbers from LSIS 1, 2011 and LSIS 2, 2017<sup>55</sup>*

The table above estimated NPV of depressed adult productivity due to stunting and anaemia/ iron deficits in children aged 6-23 months old in 2013 and 2020. According to the table, the NPV of this future productive potential lost to undernutrition in 2020 is 135 million USD per year. Compared to 2013 NPV has increased with 44.3 million USD from the first analysis was conducted in 2013 and up to 2020.

### 3. Pathway #3 Impact of Anaemia on Adult Productivity

The third pathway focuses on loss of productivity due to anaemia among adults in the current workforce.

Although the Lao SDGs, National Nutrition Strategy and this analysis focuses mainly on malnutrition in pregnant women and children, widespread anaemia among adults may result in current work performances deficits and losses to the national economy. In addition to the potential impact on national economic development, the inter-generational links of mother and child associated with child nutrition indicators – including birth outcome, underweight, stunting and others – suggest that undernutrition among adult women may be an intergeneration link and an important component of the national burden of malnutrition.

Since 2013 there has been an increase in the national prevalence of anaemia among the workforce. Especially the number of women of reproductive age with anaemia has increased, with 8%, or 277,496, more women being anaemic giving an overall total of one million women. This may also reflect that more women have joined the workforce.

<sup>54</sup> The Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, NIER & UNICEF, Lao PDR 2013

<sup>55</sup> The approach is based on direct observations of Haddad et al that wages earned workers rose 1.38% for every 1% increase in height. This finding together with figures found standard growth reference charts suggest that severe stunting (> -3 SD) represents a 6.25% reduction in height and moderate stunting (-2 to -3 SD) represents a 4.375% deficit. Multiplying these percentage height deficits by the assumed loss of 1.38% productivity suggests severely stunted children suffer a productivity loss of 8.6% while moderate stunting results in about a 6% future deficit. These coefficients are applied to the data for severe and moderate stunting reported by LSIS 1, 2011 and LSIS 2, 2017. Source: The Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, NIER & UNICEF, Lao PDR 2013

**Table 8: Anaemia in labour force**

NUTRITION INDICATORS	2013					2020				
	National prevalence	Estimated affected population	Coefficient of deficit	Additional coefficient of deficit for heavy worker	Estimated NPV of loss (USD-million)	National prevalence	Estimated affected population	Coefficient of deficit	Additional coefficient of deficit for heavy worker	Estimated NPV of loss (USD-million)
<b>Anaemia in labour force</b>										
Female	36.5%	753,733	5.0%	12.0%	65.8	44.5%	1,031,229	5.0%	12.0%	123
Male	9.0%	185,698	5.0%	12.0%	16.2	10.1%	233,860	5.0%	12.0%	28
<b>Total mill USD</b>					<b>82.0</b>					<b>151</b>

*Estimates are based on calculations carried out by NIER, 2020.*

*Source: LSIS 1, 2011, Lao PDR National Nutrition Survey UNICEF/NCDC, 2010, and LSIS 2, 2017, Lao Food and Nutrition Security Survey, Ministry of Health, 2015<sup>56, 57, 58</sup>*

Weakness and fatigue brought on by anaemia result in measurable productivity deficits in manual labour due to lower performance. With 55.6% or 1.27 million workers of the total workforce suffering from iron deficits, this has a big impact on the productivity. An estimate suggests a 5% in deficit among all manual labour. While there is no data distinguishing normal manual labour from heavy manual labour such as agriculture, manufacturing and construction, it is assumed that 15% of manual labour may be classified as heavy – and therefore subject to an additional 12% deficit. This is based on a global analysis done for the Copenhagen Consensus.<sup>59</sup>

This reduced level of productivity has an enormous impact on the Lao economy and the economic burden of lost productivity among anaemic adults working in agriculture, industry and other employment manual labour or loss adds up to an annual cost of 151 million USD. This is a significant increase of the burden compared to 2013, where the economic loss was 82 million USD per year and is due to increasing numbers of anaemic labour force and the economic loss per anaemic labour.

## 4. Pathway #4 Financial Burden on the Health Care System

The last pathway focuses on the financial burden on the health care system. This pathway assesses the increase of healthcare expenditure due to poor breastfeeding practices, low birth weight, diarrhoea and Acute Respiratory Infection (ARI). Child malnutrition contributes to reduced immunity and increased infections. As a result malnourished children often suffer more frequently from diseases or are more severely ill. This can generate a significant financial burden both on individual families and the health care system. While there are also significant opportunity costs to families involved in caring for sick children, only direct financial costs were estimated in the DAR. Reviews have shown that infants (children 0–6 months) that are predominantly breastfed have a relative risk of 1.26 for diarrhoea morbidity, whereas the risk triples for infants that are not being breastfed at all.<sup>60</sup>

Population Attributable Risks (PAR) have been calculated to derive the number of cases attributable to each infection (diarrhoea and ARI) and nutrition indicators. The sum of these three individual projections gives the total burden of cases to be treated at health facilities.

<sup>56</sup> The Lao PDR National Nutrition Survey established national prevalence of anaemia at 36.2% for reproductive age women – more than half a million women of working age. While there is no available data on anaemia or iron deficiency in Lao men, it stands to reason that this condition exists – but at a much lower level than in women. For the DAR analysis 2013 and 2020, anaemia in men is estimated to be a one-quarter of the female rate – or 9%.

<sup>57</sup> Based on an extensive review of the literature, Ross & Horton estimate a 5% deficit among all manual manufacturing work. Based on a global analysis done for the Copenhagen Consensus, the Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, NIER & UNICEF, Lao PDR 2013 assumed 15% of manual labour may be classified as heavy, and the same numbers have been used in this analysis.

<sup>58</sup> After corrections for general labour participation and estimates for proportion employed in manual labour, a 5% productivity deficit has been applied.

<sup>59</sup> Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, NIER & UNICEF, Lao PDR 2013

<sup>60</sup> The Economic Burden of Malnutrition in Pregnant Women and Children under 5 Years of Age in Cambodia. Nutrients, 2016

#### 4. ECONOMIC IMPACT / CONSEQUENCES OF MALNUTRITION IN LAO PDR

Evidence suggests an association between suboptimal breastfeeding and increased morbidity from ARI and diarrhoea. A Lancet review suggests that the RRs for various suboptimal breastfeeding behaviours range from 1.17 to 2.6.<sup>61</sup> In the two tables below the attributed cases related to diarrhoea and ARI are estimated. For diarrhoea the number of attributed cases has decreased by 98,636 cases in total, whereas attributed ARI cases have decreased by 43,147 cases between 2013 to 2020.

**Table 9: Relative risk (RR) of diarrhoea by breastfeeding status 2013 and 2020**

BREASTFEEDING	DIARRHOEA		ESTIMATED DIARRHOEA CASES 2013			ESTIMATED DIARRHOEA CASES 2020		
	RR	PAR	National prevalence	Estimated cases	Attributed cases	National prevalence	Estimated cases	Attributed cases
Infants <6 months					71,079			24,753
Predominant breastfeeding	1.26	12.25%	54%	231,481	28,360	47.50%	161,694	19,810
No breastfeeding	3.65	18.45%	9%		42,719	7.55%		4,943
Children 6-23 months					104,816			52,505
No breastfeeding	1.2	11.44%	65%	916,086	104,816	47.00%	458,894	52,505
<b>Total</b>					<b>175,895</b>			<b>77,259</b>

Estimates are based on calculations carried out by NIER, 2020. Source: LSIS 1, 2011, LSIS 2, 2017

**Table 10: Relative risk (RR) of ARI by breastfeeding status 2013 and 2020**

BREASTFEEDING	ARI		ESTIMATED ARI CASES 2013			ESTIMATED ARI CASES 2020		
	RR	PAR	National prevalence	Estimated cases	Attributed cases	National prevalence	Estimated cases	Attributed cases
Infants <6 months					48,964			22,273
Predominant breastfeeding	1.79	29.79%	54%	58,885	17,540	47.50%	26,786	7,979
No breastfeeding	14.4	53.37%	9%		31,425	7.55%		14,295
Children 6-23 months					23,966			7,510
No breastfeeding	1.17	9.90%	65%	242,193	23,966	47.00%	75,894	7,510
<b>Total</b>					<b>72,930</b>			<b>29,783</b>

Estimates are based on calculations carried out by NIER, 2020. Source: LSIS 1, 2011, LSIS 2, 2017

The cost related to treatment of diarrhoea and ARI has decreased since 2013, as the two tables below show. Not all cases result in health care seeking and only the proportion of cases actually seeking care or receiving medical services is counted as a cost. For ARI, utilization of health care services is based on the percentage of cases seen in public or private health care facilities along with the proportion receiving medication. For diarrhoea, LSIS data defines the proportion of cases receiving specific treatments.

Table 11 below shows the cost associated with low birth weight in 2013 and in 2020. Since 2013 there has been a massive reduction in home delivery declining from 10,261 babies to 3,237 babies equal to 31.5%. In particular, the number of low birth weight babies born at health facilities has decreased by 60%, whereas the number of infants born below 2000 g born at home has decreased from 1,231 babies in 2013 to 378 babies home delivered in 2020. Overall, the reduction in the number of children also reflects the reduced fertility

<sup>61</sup> The Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, NIER & UNICEF, Lao PDR 2013

rate and the efforts put into family planning initiatives. The number of children born with a low birthweight has also reduced the cost associated with low birth weight by 461,364 million USD or 42.5% between 2013 and 2020.

**Table 11: Cost associated with low-birth-weight deliveries**

LOW BIRTH WEIGHT	2013			2020		
	Number of cases	Additional unit cost (USD)	Total cost (USD)	Number of cases	Additional unit cost (USD)	Total cost (USD)
Delivered at health facility	9,859		991,422	5,907		593,277.1
2,000-2,499 g	8,676	96	832,889	5,218	96	500,936.8
<2,000 g	1,183	134	158,533	689	134	92,340.3
Home delivery	10,261		92,353	3,237		29,133.6
2,000-2,499 g	9,030	9	81,270	2,859	9	25,735.0
<2,000 g	1,231	9	11,082	378	9	3,398.6
<b>Total</b>	<b>20,120</b>		<b>1,083,775</b>	<b>9,144</b>		<b>622,410.7</b>

*Estimates are based on calculations carried out by NIER, 2020. Source: LSIS 1, 2011 and LSIS 2, 2017*

Table 12 below illustrates the cost associated with health care related to sub-optimal breastfeeding and low birth weight and the difference between 2013 and 2020.

**Table 12: Nutrition indicators excess health care cost**

NUTRITION INDICATORS	2013	2020
	COST (USD-MILLION)	COST (USD-MILLION)
Sub-optimal breastfeeding	1.7	1.27
Diarrhoea	0.4	0.71
Acute respiratory infection	1.4	0.56
Low birth weight	1.1	0.62
Facility delivery	1.0	0.59
Home delivery	0.1	0.03
<b>Total</b>	<b>2.8</b>	<b>1.89</b>

*Estimates are based on calculations carried out by NIER, 2020. Source: LSIS 1, 2011 and LSIS 2, 2017*

The current value of excess and preventable healthcare utilization due to suboptimal breastfeeding, low birthweight is around 1.89 million USD per year. This is a reduction since 2013 with almost one million USD, as the table above illustrates. The highest cost is related to sub-optimal breastfeeding.

# Conclusion and Recommendations

## 1. Conclusion

For this analysis a proven methodology was used on how to calculate the economic burden of malnutrition in regard to seven key nutrition indicators for Lao PDR. The analysis has shown that Lao PDR is annually losing approximately 481.66 million USD due malnutrition, in particularly stunting and anaemia. 1.8 million people in 2020 are suffering from various forms of malnutrition in Lao PDR.

In the table below the four pathways are summarised for 2013 and 2020 respectively. Despite an increased value in total cost from 446.5 million USD in 2013 to 481.66 million USD in 2020, there has been a decrease in the total loss of GDP by 1.12 percentage point from 3.78% in 2013 to 2.66% in 2020. The biggest burden of economic loss in Lao PDR 2020 was due to anaemia among children and women of reproductive age, as well as among the labour force which accounts for over half of the total economic loss or 241.7 million USD.

**Table 13: Summary of four pathways 2013**

ESTIMATED 2013	LOSS OF FUTURE PRODUCTIVITY	REDUCING FUTURE PRODUCTIVITY	REDUCING CURRENT PRODUCTIVITY	EXCESS HEALTH CARE COST	TOTAL	PERCENT (%)
Underweight	85.7				85.7	19.2%
Stunting		122.2			122.2	27.4%
Low birth weight	11.3			0.6	11.9	2.7%
Anaemia	15.3	46.3	82.0		143.6	32.2%
Vitamin A deficiency	20.5				20.5	4.6%
Sub-optimal breastfeeding	55.8			1.3	57.0	12.8%
Birth defects (NTD)	5.4				5.4	1.2%
Total	194.1	168.5	82.0	2.8	446.5	100.0%
<b>Percentage of GDP</b>	<b>1.64%</b>	<b>1.43%</b>	<b>0.69%</b>	<b>0.02%</b>	<b>3.78%</b>	

Source: LSIS 1, 2011

**Table 14: Summary of four pathways 2020**

ESTIMATED 2020	LOSS OF FUTURE PRODUCTIVITY	REDUCING FUTURE PRODUCTIVITY	REDUCING CURRENT PRODUCTIVITY	EXCESS HEALTH CARE COST	TOTAL	PERCENT (%)
Underweight	42.39				42.39	8.8%
Stunting		135.00			135.00	28.0%
Low birth weight	11.57			0.62	12.19	2.5%
Anaemia	13.49	77.26	150.95		241.70	50.2%
Vitamin A deficiency	9.89				9.89	2.05%
Sub-optimal breastfeeding	32.63			1.27	33.90	7.0%
Birth defects (NTD)	6.59				6.59	1.4%
Total	116.56	212.26	150.95	1.89	481.66	100%
<b>Percentage to GDP</b>	<b>0.64%</b>	<b>1.17%</b>	<b>0.83%</b>	<b>0.01%</b>	<b>2.66%</b>	

Source: LSIS 2, 2017

Losses are concentrated among the youngest children. These account for 330.71 million USD or 68.7% of children under 5 years (pathway 1, 2 and 4). 90% of childhood loss comes from the prenatal and below 24 months periods.

Currently, 28% of the annual economic loss due to malnutrition in Lao PDR is linked to stunting. If the target of 25% or less prevalence of stunting as contained in the National Nutrition Strategy (2016-2025) is to be met, Lao PDR must increase investments in stunting prevention strategies and reduce the costs associated with it. Currently Lao PDR is experiencing a yearly loss of approximately 135 million USD. This is actually an increase from 2013, despite the stunting rate having been reduced, the economic loss has increased by 13 million USD since 2013. The figure below summarises the differences between the analysis conducted in 2013 and the analysis conducted in 2020.

**Figure 4: Comparison and overview of the four pathways in 2013 and 2020**

	Nutrition indicators	Health issues	Losses	Value of Losses		
PATHWAY 1	Underweight Low birth weight Anemia in pregnancy Sub-optimal breastfeeding Vitamin A deficiency Birth defects	CHILD MORTALITY RISK 	Lost future workforce	2013	2020	
				Estimated (US\$ M/Y)	194.10	116.56
				% to GDP	1.64%	0.64%
PATHWAY 2	Childhood stunting Anemia in children	CHILD COGNITIVE & GROWTH DEFECTS 	Lost future productivity	2013	2020	
				Estimated (US\$ M/Y)	168.50	212.26
				% to GDP	1.43%	1.17%
PATHWAY 3	Adult anemia	ADULT WORK DEFICIT 	Lost current productivity	2013	2020	
				Estimated (US\$ M/Y)	82.00	150.95
				% to GDP	0.69%	0.83%
PATHWAY 4	Sub-optimal breastfeeding Low birth weight	CHILD MORBIDITY 	Excess preventable healthcare cost	2013	2020	
				Estimated (US\$ M/Y)	2.80	1.89
				% to GDP	0.02%	0.01%
				2013	2020	
<b>Total % to GDP</b>				<b>3.78%</b>	<b>2.66%</b>	

*In summary;*

*Pathway 1: The net present value (NPV) of the future workforce lost due to child mortality attributable to undernutrition is measured across six indicators of undernutrition: 1) underweight, 2) low birth weight, 3) perinatal mortality attributed to anaemia in pregnancy, 4) sub-optimal breastfeeding, 5) vitamin A deficit and 6) birth defects. The NPV of the economic loss is estimated at 116.6 million USD in 2020.*

*Pathway 2: The NPV of depressed adult productivity due to deficits in child growth and cognition is measured using childhood stunting and anaemia as indicators. The NPV of this future productive potential lost to undernutrition in 2020 is 135 million USD.*

*Pathway 3: A reduced level of productivity has an enormous impact on the Lao economy and the economic burden of lost productivity among anaemic adults working in agriculture, industry and other employment manual labour or loss adds up to 151 million USD in 2020.*

*Pathway 4: The current value of excess and preventable healthcare utilization due to suboptimal breastfeeding and low birthweight is around 1.89 million USD million in 2020.*

## 2. Recommendations

In order to reduce the stunting rate in the country, several actions must be taken to improve the nutritional situation, these include: reduction of wasting, reduction of low birth weight, increase appropriate feeding practices during pregnancy and in children under 5 years of age. Furthermore, increased access to adequate sanitation and addressing water, sanitation and hygiene (WASH) intervention implemented, otherwise this could have a negative impact on efforts implemented to reduce stunting.

The main causes of malnutrition are related to quality and not quantity of food intake. The consumption of rice is not sufficient to address anaemia, vitamin A deficiency, birth defects, stunting or underweight. More than half of the deaths are not related to children receiving insufficient food. Maternal nutrition knowledge, understanding and behaviour are important factors in addressing child malnutrition. All the losses identified include some components of maternal care and behaviour. 91 million USD/year are solely linked to the mother's status and behaviours, and not to children or food.

Good nutrition is the foundation of a child's survival, health and development. There is ample global evidence that stunting prevention is relatively simple and inexpensive, as proven cost-effective solutions are available: micronutrients such as vitamin A, zinc, iron supplements and iodized salt, as well as community nutrition programmes, like breast-feeding and good child feeding practices. What is needed is the necessary investment to implement these solutions. Compared with other areas of investment, such as child survival and child education, investing in childhood nutrition has the disadvantage of generating results in the distant future and may therefore appear as a less rewarding investment from government, as the result will show 10-20 years later.

The assessment has shown that Lao PDR is losing approximately 481.66 million USD per year due to malnutrition. To reduce the economic loss, it is key to link with other sectors such as education, agriculture, sanitation to address malnutrition through further nutrition specific and nutrition sensitive interventions, and to ensure that these are implemented in a synergetic and cost-effective way. Through joint interventions and effort Lao PDR can develop healthy citizens and a labour force that will further increase economic development.

Affecting a significant portion of population in Lao PDR, especially women and children, the economic burden emerging from undernutrition has a negative impact on the Lao economy. Undernutrition erodes the human capital that lays the foundation of economic growth: people's strength and energy, creative and analytical capacity, and initiative and entrepreneurial drive.

The current generation of children in Lao PDR is the backbone of the future economic growth and social development. Therefore, timely and strategic investments in children will maximise the cognitive and human capital of Lao PDR's generation 2030, who will drive the development of Lao PDR and achieve the SDGs. Reducing malnutrition among children in the country will contribute enormously towards the economic growth and overall productivity level of the country for a better and more prosperous Lao PDR.

The assessment does not suggest easy ways for addressing those two nutrition problems, but it suggests and urges the government of Lao PDR to undertake a thorough review of its current policies and directives to assess if they address malnutrition in the most optimal way. The government should rapidly expand a range of low-cost effective nutrition interventions to break the current cycle of increased mortality, poor health and ultimately lower work performance, productivity and earnings.

# References

- A Neglected Tragedy. The global burden of stillbirths. Report of the UN Inter-agency Group for Child Mortality Estimation, 2020
- Burkhalter, Barton R., Victor M. Aguayo, Serigne M. Diene, Margaret B. Parlato, and Jay S. Ross Profiles: A Data-Based Approach to Nutrition Advocacy and Policy Development. BASICS/USAID, 1998
- Business Case for Nutrition Investment in the Philippines. UNICEF, 2016
- FAO Nutrition Profile Laos, 2003
- Health and Nutrition Services Access Project, World Bank, Vientiane, Lao PDR, 2020
- Healthy Newborn Network, <https://www.healthynewbornnetwork.org/resource/database-global-and-national-newborn-health-data-and-indicators/>
- Highlight result of 6th Lao Consumption and Expenditure Survey (LECS VI), 2018/2019
- [https://www.europarl.europa.eu/meetdocs/2009\\_2014/documents/acp/dv/background\\_/background\\_en.pdf](https://www.europarl.europa.eu/meetdocs/2009_2014/documents/acp/dv/background_/background_en.pdf)
- <https://www.powerofnutrition.org/nutrition-and-the-sustainable-development-goals/>
- <https://sustainabledevelopment.un.org>
- Increasing Agricultural Commercialisation and Enhancing Food Security and Nutrition in Lao PDR: A Framework for Balanced Policy Analysis, Planning and Programming, Ministry of Agriculture and Forestry, Vientiane, Lao PDR, 2020
- Lao Food and Nutrition Security Survey, Ministry of Health, 2015
- Lao PDR Complementary Feeding, UNICEF, Lao PDR, 2019
- Lao PDR National Nutrition Survey UNICEF, NCDC, Lao PDR, 2010
- Lao Social Indicator Survey (LSIS) 1, LSB, Government of Lao PDR, Lao Statistic Bureau, UNICEF, Vientiane, Lao PDR, 2013
- Lao Social Indicator Survey (LSIS) 2, Government of Lao PDR, Lao Statistic Bureau, UNICEF, Vientiane, Lao PDR, 2017
- Maternal Nutrition Brief UNICEF, Lao PDR, 2019
- Ninth Five-Year Health Development Plan (2021-2025), 26 August 2020. MOH, 2019
- Multiple Overlapping Deprivation Analysis on Stunting, UNICEF, Lao PDR, 2019
- National Nutrition Strategy and Plan of Action, 2016-2020, Ministry of Health, Vientiane, Lao PDR, 2016
- Nutrition Policy Landscape Analysis in Lao People's Democratic Republic, NIPN, Lao PDR, 2019
- Nutrition profile, UNICEF, Lao PDR, 2019
- Planning for Nutrition Investment in Uzbekistan, PowerPoint presentation, Jack Bagriansky UNICEF Consultant, 2014
- Prevalence and Socio-economic Impacts of Malnutrition Among Children in Uganda, Nutrition and Metabolic Insights, Volume 12: 1–5, 2019, Adebisi et al
- Repositioning Nutrition as Central to Development: A Strategy for Large-Scale Action, The World Bank, 2006
- Schooling and wage income losses due to early-childhood growth faltering in developing countries: national, regional, and global estimates. Günther Fink et al., *Am J Clin Nutr* 2016;104:104–12. Printed in USA, 2016
- Strategic Review of Food and Nutrition Security in Lao People's Democratic Republic, WFP, Vientiane, Lao PDR, 2016
- UNESCO 2020, <http://uis.unesco.org/en/country/LA>
- The Cost of Malnutrition: Why Policy Action is Urgent, Technical Brief, No. 3, July 2016
- The Economic Burden of Malnutrition in Pregnant Women and Children under 5 Years of Age in Cambodia. *Nutrients*, 2016
- The Economic Consequences of Malnutrition in Albania, UNICEF, 2010
- The Economic Consequences of Malnutrition in Lao PDR: A Damage Assessment Report, National Economic Research Institute, Ministry of Planning and Investment, UNICEF, 2013, Vientiane, Lao PDR
- The 4 population and housing census 2015. Lao Statistic Bureau, Lao PDR, 2015
- The World Bank and Nutrition, <https://www.worldbank.org/en/topic/nutrition/overview>, October 2019
- The World Bank Development Report 1993: Investing in Health. Oxford University Press World Bank, 1993
- The World Health Organization's global target for reducing childhood stunting by 2025: rationale and proposed actions, Mercedes de Onis et al, *Matern Child Nutr.* 2013 Sep; 9 (Suppl 2): 6–26
- The World Bank, <https://data.worldbank.org/indicator/SL.TLF.CACT.ZS?locations=LA>
- [www.Tradingeconomic.com](http://www.Tradingeconomic.com), The Bank of Lao PDR, 2020





## Disclaimer

This publication has been produced with the assistance of the European Union. The contents of this publication are the sole responsibility of the Centre for Socio-Economic Science and Policy Research (CSPR) of the National Institute of Economic Research (NIER), Lao People's Democratic Republic (PDR) and UNICEF and can in no way be taken to reflect the views of the European Union.

For more information, please visit: <https://nipn.lsb.gov.la/>