# COST OF MALNUTRITION IN LAO PDR





World Food Programme

Mahidol University
Institute of Nutrition

June 2026

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# Preface

The Cost of Malnutrition in Lao People's Democratic Republic (Lao PDR) report is produced by the Centre of Nutrition, Department of Health and Hygiene Promotion, Ministry of Health, with technical support from the World Food Programme and Mahidol University. The study generates evidence on the economic cost of malnutrition faced by the country, using a well-established framework that has been applied in multiple countries across Africa and Latin America and the Caribbean.

Lao PDR has made notable progress in improving child health outcomes and reducing undernutrition. However, malnutrition continues to be a persistent challenge. The report clearly demonstrates that Lao PDR has incurred huge economic losses associated with undernutrition. This includes burden on the health and education sectors as well as substantial losses in productivity and income. The findings showcase the urgency of addressing malnutrition, given the irreversible impacts it has on health and human capital. The study also highlights the emerging problem of overweight and obesity, which need increased focus alongside efforts to reduce undernutrition.

Findings from the report should be used to increase attention to the consequences of malnutrition to the economy and to advocate for increased investment in nutrition by government and partners. The report is particularly timely as Lao PDR is set to finalise and publish its 10th National Socio-Economic Development Plan, the National Nutrition Strategy for 2026-2035 and the National Plan of Action on Nutrition for 2026-2030.

I would like to sincere thank and gratitude to the Technical Working Group for their support throughout this study. I call upon all sectors and partners to build on this evidence and work together to accelerate progress on nutrition. By doing so, we can ensure that every child has the opportunity to be healthy, to learn effectively, and contribute productively to the prosperity of our country.

**Vientiane Capital**

Minister of Health

Baykham KHATTIYA

# Executive Summary

Lao PDR has made notable progress in addressing malnutrition, yet it still has one of the highest prevalence of child undernutrition in Southeast Asia with 33% of children under 5 stunted and 10.7% wasted. At the same time, overweight and obesity among adults is rising, indicating an emerging double burden of malnutrition. Beyond its health impacts, malnutrition has significant economic costs that need to be quantified to strengthen the case for investment in nutrition and to expand its recognition in policy decisions and budget allocations.

The study uses an economic model that has been applied in more than 25 countries. It estimates the cost of malnutrition across three domains – health, education and productivity - capturing both the retrospective costs experienced today due to past undernutrition, and the prospective costs expected to arise in the future due to undernutrition in children today.

The cost of child undernutrition in 2023 is estimated to be LAK 13.8 trillion (USD 735 million), equivalent to 5.2% of Gross Domestic Product (GDP). This loss exceeds the GDP growth rate of 4.2% for that year.

Higher healthcare costs resulting from increased undernutrition-related morbidities are estimated to be LAK 92.7 billion (USD 5 million), or 3.5% of total health expenditure in 2023. Undernutrition also increases child mortality risk, which, in addition to its social impact, represents a loss to the economy in the form of a reduce workforce.

Stunting in childhood has adverse impacts on cognition and learning, reducing educational performance. Increased grade repetitions represent a cost of LAK 34.3 billion (USD 1.8 million), equal to 1.05% of total education expenditure. Lower education levels due to school dropouts reduce the productivity in non-manual jobs and stunting-related reductions in physical capabilities lower productivity of manual labour. Combined with workforce losses due to premature mortality, the total loss of productivity is estimated at LAK 13.6 trillion (USD 728 million).

Child undernutrition brings irreversible future costs. The prospective analysis shows that undernutrition in children under 5 today is projected to cost LAK 24.8 trillion (USD 1.3 billion) over their lifetimes, an annual equivalent cost of LAK 943 billion (USD 50.4 million).

The cost of malnutrition also includes the additional health and productivity costs associated with adult overweight and obesity. However, in Lao PDR, health expenditure data is not available at the disaggregation required to produce a meaningful estimate.

These costs are avoidable if timely and effective actions are taken to prevent undernutrition. Spending on nutrition should, therefore, not be viewed as a cost, but rather a means of reducing potential losses and an investment in human capital and economic progress.

# Section 1: Introduction

Despite progress in reducing malnutrition, Lao PDR continues to experience persistent and high rates of child undernutrition. At the same time, along with its neighbouring countries, there is a nutrition transition underway with increasing rates of overweight, obesity and associated non-communicable diseases. A double burden of malnutrition not only strains the health sector, but constrains human capital development with ultimate consequences on economic progress. All these generate their own costs and productivity losses.

The importance of reducing malnutrition is recognised in the second Sustainable Development Goal 2 on Zero Hunger which calls for ending all forms of malnutrition, that Lao PDR has committed to. Lao PDR has a well-established framework in place for nutrition - the National Nutrition Strategy 2026-2035 is under development along with the National Plan of Action on Nutrition (NPAN) 2026-2030. The strategy recognises the multisectoral nature of nutrition and takes on a systems approach covering the education, food, health and social protection systems.

However, the nutrition discourse continues to be framed as health problem only, with health consequences usually being well-documented and economic consequences less frequently recognised. At policy and planning levels, decision makers require evidence on economic returns to nutrition to justify resource allocation, and a cost of malnutrition analysis provides that.

This study uses an economic model developed by Economic Commission for Latin America and the Caribbean (ECLAC) and the World Food Programme (WFP) and applied in over 25 countries across Africa and Latin America and the Caribbean to quantify the social and economic cost of child undernutrition experienced by Lao PDR. The analysis focuses on costs and consequences across three domains: health, education and labour market productivity. It answers two questions: what is the economic cost that the economy bears today because of past undernutrition (retrospective costs) and second, what future costs will be generated because of undernutrition experienced by children today.

Findings from the analysis highlight the cost that malnutrition has on society and on the economy. They can be used to advocate for increasing attention to malnutrition in policy discussions and to showcase that nutrition is more than a health problem and requires coordinated efforts across sectors, including the Ministry of Finance. The report has been divided into 5 sections. In the next section, an overview of the socio-economic situation and the malnutrition problem in Lao PDR is described which frames the analysis. This is followed by an overview of the methodology and conceptual framework, findings on the cost of undernutrition and finally conclusions and recommendations.

# Section 2: Context analysis

## SOCIO-ECONOMIC CONTEXT

In 2023, Lao PDR had an estimated population of 7.66 million of which 10% were children under five years of age. There has been a reduction in under 5 child mortality from 106.7 per 1,000 live births in 2000 to 38.9 in 2023. Overall life expectancy at birth was 69 years in 2023 which has improved from 58 years in 2000 (UNDESA, 2024). The country also experienced rapid economic growth in 2010s which slowed down following the COVID-19 pandemic – average growth rate in 2015-2019 was 6.6% compared to 3.7% in 2020-2022. Growth recovered in 2023 to 4.2% (Bank of the Lao PDR, 2021, 2025). Poverty rates while still high at 15% have declined in recent years, but with a reduced pace in part due to the slowdown in growth rates (Lao Statistics Bureau, 2025).

The total general government health expenditure in 2023 was Lao Kip (LAK) 2,636 billion (United States Dollars (USD) 140.8 million) or LAK 532,136 per capita (USD 28.4 per capita) which was equal to 6.9% of total government expenditure and 1% of Gross Development Product (GDP) (Ministry of Health, 2025). The total expenditure on education was LAK 3,275 billion (USD 175 million) equal to 8.5% of total government expenditure and 1.2% of GDP (UNESCO Institute of Statistics 2023)

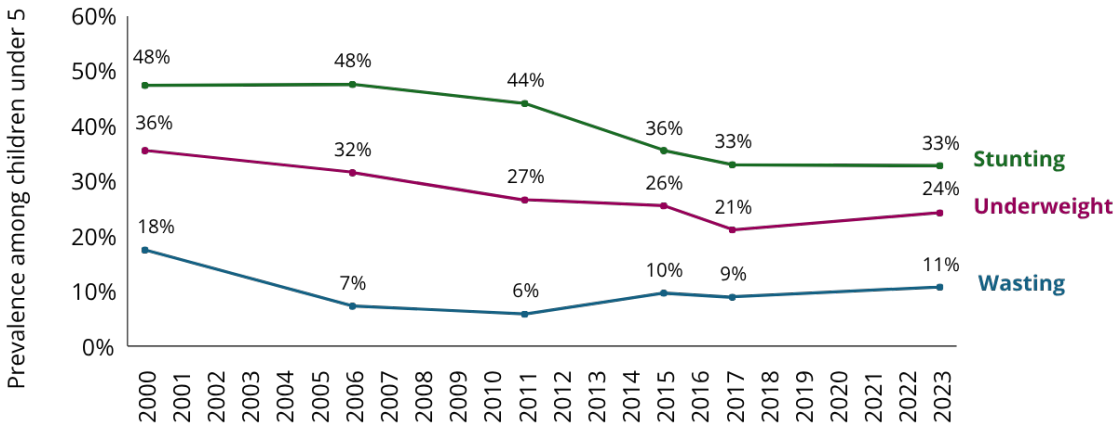
## UNDERNUTRITION

Child undernutrition takes on three forms: stunting (low height-for-age, which is often referred to as chronic undernutrition), underweight (low weight-for-age) and wasting (low weight-for-height, an indicator of acute undernutrition). Despite progress, Lao PDR has one of the highest rates of child undernutrition in Southeast Asia. A third of children under 5 years are stunted, compared to the regional average of 23% (Lao Statistics Bureau and UNICEF, 2025). At over 30% prevalence, according to the World Health Organisation's (WHO) thresholds stunting in Lao PDR is considered 'very high'. At the same time, 10.7% of children are wasted, compared to a regional average of 7%, which as per WHO thresholds is considered 'high', and 24% are underweight.

**FIGURE 1: STUNTING AND WASTING IN CHILDREN UNDER 5 IN LAO PDR, COMPARED TO NEIGHBOURING COUNTRIES IN SOUTH EAST ASIA (MOST RECENT YEAR)**



**FIGURE 2: TRENDS IN CHILDREN UNDERNUTRITION IN LAO PDR, 2000 – 2023**



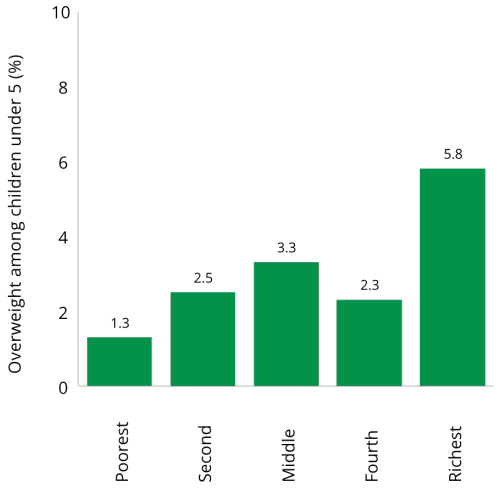

Source: UNICEF/WHO/World Bank 2025

Lao PDR has achieved a remarkable decline in stunting among children under 5 years - in the last 2 decades stunting declined from 47.5% in 2000 to 32.8% in 2023 (Figure 2). However, progress has since then stagnated and there has been minimal change in levels of stunting between 2017 and 2023. Similarly, underweight and wasting rates have also declined compared to 2000, but in the last few years there has been reversal of progress.

## OVERWEIGHT AND OBESITY

Lao PDR is undergoing an epidemiological transition with an increase double burden of malnutrition. Approximately 2.8% of children under 5 are overweight, which is below the regional average of 4.3%. Prevalence of overweight has, however, increased 2% in 2012 to 3.5% in 2017 but fell to 2.8% in 2023 (Lao Statistics Bureau and UNICEF, 2025). As households get wealthier, there is a noticeable increase in child overweight prevalence. In 2023, 5.8% of children in the richest households were overweight, compared to 1.3% of children in the poorest quintile. This indicates that economic growth leading to higher incomes could lead to increasing rates of overweight among children.

**FIGURE 3: OVERWEIGHT IN CHILD UNDER 5, BY WEALTH QUINTILE 2023**




Source: LSISIII

The most recent publicly available national survey data on adult overweight and obesity in Lao PDR is from 2013, which found overweight and obesity to be 21.4% among males and 28% among females (Pengpid et al., 2019). More recent estimates are available from the NCD Risk Factor Collaboration (NCD-RiSC) group which uses statistical modelling to estimate overweight and obesity prevalence (Phelps et al. 2024). Prevalence of overweight and obesity in 2022 was estimated to be 28.5% among adult males and 35.8% in adult females. Of these, 6% of men and 10.5% of women were obese. These results show a growing trend of overweight and obesity among adults.

**TABLE 1: OVERWEIGHT AND OBESITY AMONG ADULT MALES AND FEMALES, 2022**

| Condition | Adult Males (20 years +) | Adult Females (20 years+) |
|---|---|---|
| Overweight (BMI:25-29.9 kg/m2) | 22.4% | 25.3% |
| Obese (BMI >=30 kg/m2) | 6.1% | 10.5% |

Source: NCD-RiSC; BMI = Body Mass Index

Overweight and obesity result in increasing rates of morbidity and mortality due to non-communicable diseases (NCDs). The Global Burden of Disease estimates show that cardiovascular diseases are the leading contributors to burden of disease in Lao PDR, increasing from 13.7% of disease burden in 2013 to 17.5% in 2023. Other obesity-associated diseases such as neoplasms, diabetes and kidney diseases are also among the top 10 contributors to morbidity and mortality and have experienced an increase in share of burden (Institute of Health Metrics and Evaluation, 2025). This highlights that overweight and obesity are also public health and economic concerns which should be paid increasing attention to.



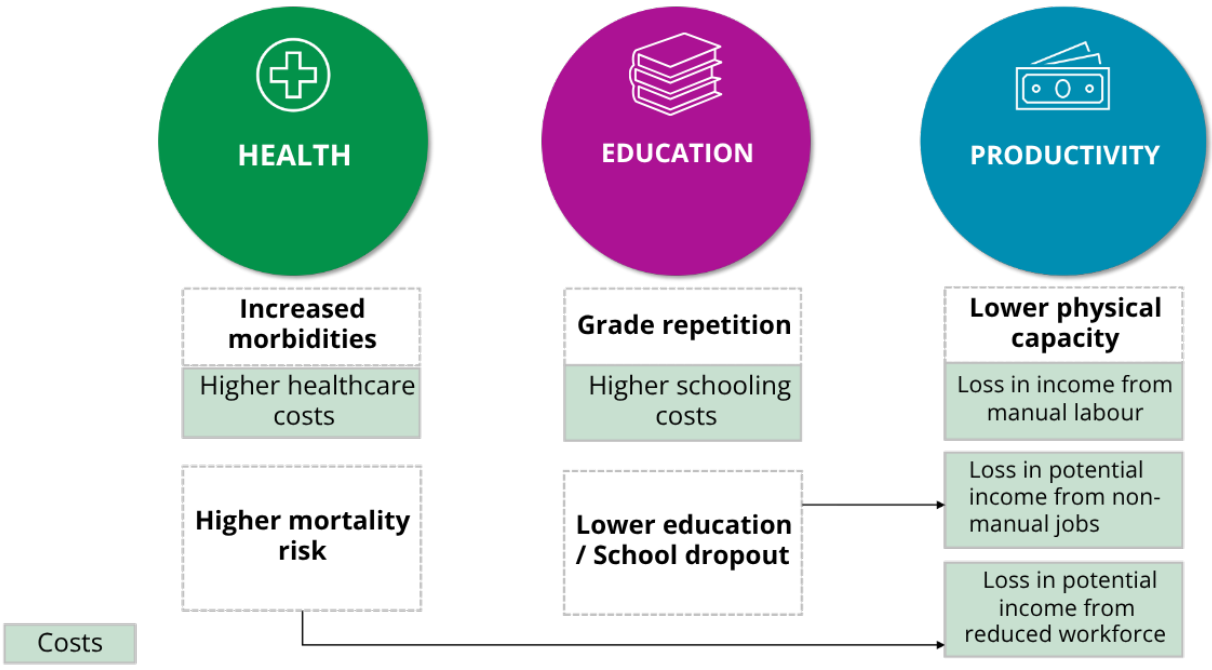
# Section 3: Analytical framework and methodology

This section describes the analytical framework, methodological aspects and an overview of data sources. A list of parameters and data sources can be found in Annex I and a detailed methodology in Annex II.

## ANALYTICAL FRAMEWORK:

The analysis uses the analytical framework developed by ECLAC and WFP that has been applied in the Cost of Huger in Africa and the Cost of Double Burden of Malnutrition in Latin American and Caribbean studies (Africa Union, 2021; Martinez et al., 2024) and is illustrated in Figure 4.

**FIGURE 4: ANALYTICAL FRAMEWORK FOR COST OF UNDERNUTRITION**




Undernutrition has negative impacts of various dimensions – health, education, productivity and the economy. For individuals, this leads to constrained physical and mental development with consequences for their well-being throughout their life cycle. For the economy this leads to lower human capital development and lower productivity and higher costs to address the consequences of malnutrition. This increases vulnerabilities and perpetuates a vicious cycle of continued underdevelopment and poverty.

The most serious effect of undernutrition in children under 5 years is the increased risk of death, beginning with intrauterine growth restriction and increased susceptibility to infections and disease (Black et al., 2008). As children who experience undernutrition face a higher risk of disease compared to healthy children, the burden on preventable costs to the healthcare system increases.

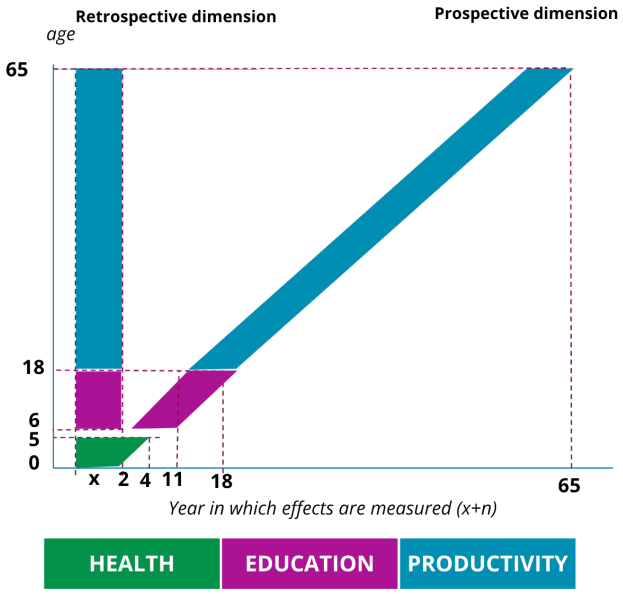
Stunting impairs neural development with direct structural effects on the brain that constrain cognitive development (Victoria et al., 2008). This resulting limitation in learning ability impacts performance in school. Studies show that it leads to greater likelihoods of grade repetition, school dropouts and overall lower educational attainment (Victoria et al., 2008). Grade repetitions add a burden on the education system and on families as they bear the cost of extra years of schooling.

Undernutrition also has implications for a population's productive capacity. First, premature mortality in childhood reduces the size of the working-age population. Second, lower educational attainment of stunted children leads to lower earnings and productivity in skilled, non-manual jobs (Hoddinott et al., 2013). Third, studies show that stunting in early childhood has impacts on physical capacities in adulthood, with repercussions on productivity of those engaged in manual labour (Haddad and Bouis, 1991).

## RETROSPECTIVE AND PROSPECTIVE DIMENSIONS

The model distinguishes between two temporal dimensions leading two types of analyses and estimates of the cost of malnutrition: the first aimed at estimating the present impacts generated by past and current malnutrition, and the second projects the impacts that are foreseeable in the future given the malnutrition experienced today.

**FIGURE 5: RETROSPECTIVE AND PROSPECTIVE DIMENSIONS**




The social and economic impacts observed in a given year are the result of the nutritional profile in previous years. The retrospective incidental dimension makes it possible to estimate this cost in the year of analysis. The study also includes projections of the future impact (prospective dimension), which reflect what is estimated to happen to the current cohort of children under 5 who experience undernutrition, in the coming years as they enter school and then the labour force.

In both retrospective and prospective models, morbidity and mortality impacts are estimated for children under 5 years, education effects are estimated for school-going children (6 to18 years) and loss of potential productivity is analysed for working-age population (15 to 64 years) (Figure 5).

## DATA SOURCES

Data compilation was led by Mahidol University and two national coordinators in consultation with the Technical Working Group established for this study (see Annex III). The study utilizes existing data sources collected and reported by the government of Lao PDR (such as LSIS, Lao Labour Force Survey, Lao Expenditure and Consumption Survey (LECS), National Health Accounts, Lao Education System Management Information System (LESMIS)). Data was obtained from reports, dashboard and raw survey data. Additionally, data reported and published by international organisations such as the World Health Organisation (WHO), UNESCO, United National Department of Social Affairs (UNDESA) Population Division has also been used. These data sources are supplemented by information obtained from global and national grey and published literature. All data sources were validated by the Technical Working Group. All full list of model parameters and data sources is provided in Annex I.

Scope and year of analysis: The model requires a single year for the retrospective incidental analysis. For this study, the year of analysis is 2023, which has been selected based on data availability. Where data from other years is used, adjustments have been made for inflation using Consumer Price Index. Future costs are reported at 2023 prices, using a discount rate of 3%, commonly used in health economic analysis. Costs are presented in Lao Kip and US Dollars using the official exchange rate for 2023 published by the Bank of Lao PDR.


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# Section 4: Findings on Cost of Undernutrition

This section presents findings on the effects and costs associated with child undernutrition, first for the year of analysis (retrospective dimension) in Sections 4.1 to 4.5 and then for future years (prospective dimension) in Section 4.6. Findings are provided by the different components of the analytical framework described in Section 3.

## Section 4.1: Child morbidity and health costs

### INCREASED MORBIDITIES

The effects of child undernutrition on the increased morbidities requiring treatment comprises of two components: (1) Treatment of undernutrition, specifically, low birthweight due to intrauterine growth restriction and severe acute malnutrition; (2) Treatment of diseases associated with undernutrition, specifically acute respiratory illness (ARI), diarrhoea and fever.

The most recent estimate for low birthweight is from 2023, which finds that 8.3% of children weighed less than 2500g at birth. Severe wasting or severe acute malnutrition prevalence is around 2.7% (Table 2). Prevalence of ARI is low at 0.3%, diarrhoea prevalence is 6.5% while fever was experienced by approximately 15% of children.

**TABLE 2: PREVALENCE OF CHILD MORBIDITIES AND PROPORTION RECEIVING HEALTHCARE**

| Condition | Prevalence 2023 | Received treatment from health facility |
|---|---|---|
| Low Birthweight | 8.3% | 67.4%* |
| Severe Acute Malnutrition / Severe Wasting | 2.7% | 20%** |
| Diarrhoea | 6.5% | 64.5% |
| Acute Respiratory Illness | 0.3% | 66% |
| Fever | 14.8% | 59.5% |

Source: LSIS 2023 (*obtained from Prinja 2020, **assumed coverage based on stakeholder consultation)

To estimate the additional burden of these undernutrition-associated diseases, relative risks, or the difference in probability of disease in a malnourished child compared to a healthy child were calculated using data from LSIS III. Relative risks were not generated for ARI due to its low prevalence.

The total number of additional cases of morbidity in 2023 due to undernutrition is estimated to be 31,722 (Table 3). The largest contributor is treatment of severe acute malnutrition.

### HEALTH COSTS

The treatment of undernutrition and related illnesses is a critical recurrent cost in the health sector. The increased healthcare costs associated with the morbidity burden outlined above is estimated to be LAK 92.7 billion (USD 4.95 million). This is equivalent to 3.51% of total national health expenditure for 2023.

**TABLE 3: INCREASE IN NUMBER AND COST OF CHILD MORBIDITIES**

| Condition | Number of cases | Cost (LAK billion) | Cost (USD million) |
|---|---|---|---|
| Low birthweight | 6,088 | 9.4 | 0.5 |
| Severe acute malnutrition | 18,709 | 73.2 | 3.94 |
| Increased morbidities (diarrhoea, ARI, fever) | 6,925 | 10.1 | 0.54 |
| **Total** | 31,722 | 92.7 | 4.95 |

Source: Modelled estimates

The largest single component of health costs is the treatment of severe acute malnutrition which accounts for 79% of the total health cost. This reflects the relatively higher cost of treatment, as well as the prevalence of severe wasting which affects 2.7% of children under 5 years. This cost of treatment can however be avoided by interventions that prevent a child from becoming severely wasted.

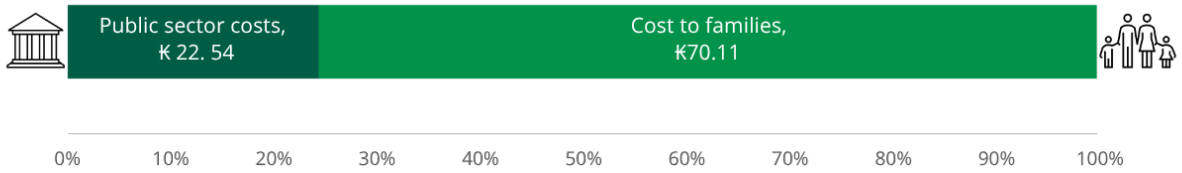


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Health costs can be divided into public and private costs. Public costs include treatment of those children that were taken to a health facility. Private costs cover transport, loss of wages of caregivers due to increased care time, and the economic cost of those children that were not taken for treatment to a healthy facility, which is assumed to be equal to the treatment cost. In line with the conservative approach taken by this analysis, we assume that the total cost of treatment is covered by the health facility and that families do not have to pay for treatment or contribute to medicines.

The analysis finds that the higher burden falls on families (75.7%) compared to the public sector (24.3%), which is driven by the costs of children who are not provided with proper healthcare and not taken for treatment to a health facility.

**FIGURE 7: DISTRIBUTION OF PUBLIC AND PRIVATE HEALTH COSTS (COST IN BILLION KIP)**




Source: Modelled estimates



# Section 4.2 Premature child mortality

Child undernutrition increases the risk of mortality most often associated with incidence of disease (Black et al., 2008). The total figure is an estimate of the number of deaths of those children aged 0-4 years accumulated between 1959 and 2023 based on historical levels of underweight prevalence and relative risk of mortality due to underweight, adjusted for survival rates. During this period, a total of 366,631 cases are estimated to be associated with undernutrition.

**TABLE 4: MORTALITY BURDEN AMONG CHILDREN UNDER 5 YEARS, NUMBER OF CASES**

| Year | Estimated mortality cases |
|---|---|
| 1959-2008 | 331,391 |
| 2009-2018 | 25,895 |
| 2019-2023 | 9,345 |
| **Total** | **336,631** |

Source: Modelled estimates

# Section 4.3 Education attainment

Stunting in childhood affects education by creating learning gaps linked to cognitive limitations caused by nutritional deficiencies. These gaps increase the likelihood of lower education performance in the form of grade repetition and dropouts.

### BURDEN AND COSTS OF REPETITION

The total number of repetitions in school children in 2023 is based on the probability that they were exposed to stunting in their early childhoods. The estimated number of school-aged children affected is 10,163. In terms of costs, the total increase in schooling expected associated with stunting-related grade repetition, as outlined in Table 5 is estimated to be LAK 34.3 billion (USD 1.8 million). The increase in education expenditure is equivalent to 1.05% of total education expenditure in 2023.

The primary level accounts for most cases of repetition (79%) as well as education costs (83%). This reflects the larger enrolment numbers at that level as well as the concentration of grade-repetition due to stunting in early schooling years.

**TABLE 5: EDUCATION COSTS BY SCHOOL LEVEL**

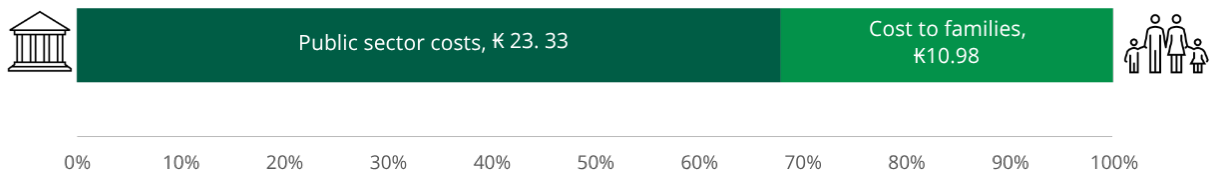
| Schooling level | Number of cases | Increased cost (LAK million) |
|---|---|---|
| Primary | 8,418 | 27 |
| Lower Secondary | 1,408 | 5.7 |
| Upper Secondary | 337 | 1.6 |
| **Total** | **10,163** | **34.3** |

Source: Modelled estimates

Similar to health, education costs are also divided into public and private costs. Public costs include cost to the schooling system of having an additional year of schooling for a child. Private costs cover out-of-pocket costs such as transport and educational materials like books and uniforms. In line with the conservative approach taken by this analysis, we assume that the total tuition fees is covered by the health facility and that families do not contribute towards it.

The analysis finds that the higher burden falls on the public sector (68%), however, families too experience additional schooling costs representing a burden on their incomes.

**FIGURE 7: DISTRIBUTION OF PUBLIC AND PRIVATE EDUCATION COSTS (COST IN BILLION KIP)**




Source: Modelled estimates

## BURDEN OF SCHOOL DROPOUTS

There is a higher relative risk of dropping out of school due among those children that have experienced stunting in their early childhoods. The estimate here captures the effect of historical undernutrition among those in the labour force, employed in non-manual jobs. On average, the model estimates there to be a loss of 2.18 years of schooling due to stunting in childhood.

# Section 4.4: Loss of productivity

For those individuals who were stunted as children but survive and enter the workforce their productivity is affected by impaired early childhood development. It reduces educational attainment and lowers physical capacity, which constrains labour market productivity. The estimate loss of  labour productivity is estimated by identifying differential incomes associated with lower schooling in non-manual activities. The lower productivity associated with people who were stunted in childhood in manual work, such as agriculture. It adjusts for those not employed in the labour force.

The study uses ISCO classification to identify manual and non-manual activities (see Annex I). In Lao PDR, the proportion of working-age population who are in labour force is 46.5%. Of those in the labour force, 31.6% are employed in non-manual activities, while 68.4% in manual activities.

An estimated 898,630 people in the labour force engaged in non-manual activities experienced childhood stunting along with 1,857,005 workers in manual activities resulting in a combined loss of income of LAK 7,038 billion (USD 376 million).

In addition, mortality caused by undernutrition (estimated in Section 4.2) removes potential productive individuals from the workforce. The opportunity cost of their productivity is the expected income that a healthy person would have been earning had they been part of the workforce in 2023.

The total estimated productive potential lost in the labour force and income attributable from the above is estimated to be LAK 13,633 billion (USD 728 million), or 5.1% of GDP. The largest contributor to this cost is the loss in number of workers lost due to premature mortality in their childhoods (48%) followed by loss in productivity in non-manual activities due to lower education attainment (34%).

**TABLE 6: LOSS IN PRODUCTIVITY AND INCOME DUE TO CHILD UNDERNUTRITION**

| Nutrition Pathway | Impact on Labour Market | Total Economic Cost (LAK billion) | Total Economic Cost (USD million) |
|---|---|---|---|
| Childhood stunting leads to higher school dropouts | Reduced productivity in non-manual activities | **4,686** | **250.4** |
| Childhood stunting leads to lower physical capacity | Reduced productivity in manual activities | **2,352** | **125.7** |
| Premature mortality due to undernutrition | Reduced workforce and loss of potential income | **6,594** | **352.3** |
| **Total loss in potential productivity and income** | | **13,633** | **728** |

Source: Modelled estimates

# Section 4.5: Total cost of undernutrition

Bringing the three domains together, the total cost of child undernutrition in 2023 was estimated at LAK 13,760 billion (USD 735.1 million). This is equivalent to 5.2% of 2023 GDP. Productivity losses accounted for the largest share, followed by health and education. This is in line with findings from other countries where a similar model has been applied.

**TABLE 7: COST OF CHILD UNDERNUTRITION, BY DIMENSION**

| Dimension | Total Cost (LAK billion) | Total Cost (USD billion) |
|---|---|---|
| Higher healthcare costs | 92.7 | 5 |
| Higher schooling costs | 43.3 | 1.8 |
| Loss in productivity and income | 13.633 | 728.3 |
| **Total** | **13.760** | **735.1** |

Source: Modelled estimates

To put this result in perspective, at 5.2% of GDP the cost of undernutrition exceeds Lao PDR's GDP growth rate of 4.2% in 2023. Malnutrition is therefore a structural concern for economic performance.

# Section 4.6: Future effects and costs of undernutrition

In addition to the retrospective analysis, the study estimates the future economic costs that will be generated by the cohort of children under 5 who experience undernutrition in the year of analysis, 2023. The developmental trajectory of these children has already been affected by undernutrition, and economic consequences of this will manifest over the course of their lifetime. These will be in the form of increased risk of morbidity and mortality, reduced education performance and outcomes, and lower productivity in the workforce. For the economy, this represents an irrecoverable loss.

The cost is estimated for their total productive lifetime (i.e. up to 65 years) and its Net Present Value for 2023 is calculated using a discounted rate of 3%. The cost is also reported as an annualised cost.

The total lifetime cost of malnutrition among today's children is estimated at LAK 24,798 billion (USD 1.3 billion), while the annualized cost (i.e. cost per year from 2023 onwards) is estimated

to be LAK 943 billion (USD 50.4 million) or 0.4% of 2023 GDP.

A failure to address child undernutrition would indicate that the current trends would continue beyond the reference year, 2023. Given projected population growth, the numbers of children who experience undernutrition will rise. This means that the estimated costs will also continue to rise and will aggregate across cohorts. Alternatively, programmes and policies that address child undernutrition could combat these rising costs and therefore, the future equivalent annual costs could represent potential savings for the economy.

**TABLE 8: PROSPECTIVE COST OF CHILD UNDERNUTRITION AMONG CHILDREN 0-5 YEARS IN 2023, BY DIMENSION**

| Dimension | Total Cost (LAK billion) | Equivalent annual cost (LAK billion) | Total Cost (USD million) | Equivalent annual cost (USD million) |
|---|---|---|---|---|
| Higher healthcare costs | 253.7 | 55.4 | 13.6 | 3 |
| Higher schooling costs | 21.7 | 1.7 | 1.2 | 0.1 |
| Loss in productivity and income | 24,522.8 | 886 | 1,310.1 | 47.3 |
| **Total** | **24, 798** | **943** | **1,325** | **50.4** |

Source: Modelled estimates

# Section 4.7: Cost of overweight and obesity

The original intention of this study was to estimate the cost of the double burden of malnutrition, which includes not only the cost of child undernutrition but also the cost of overweight and obesity among adults. Like the Cost of Undernutrition component, the objective was to undertake a bottom-up analysis using national data from the Lao PDR.

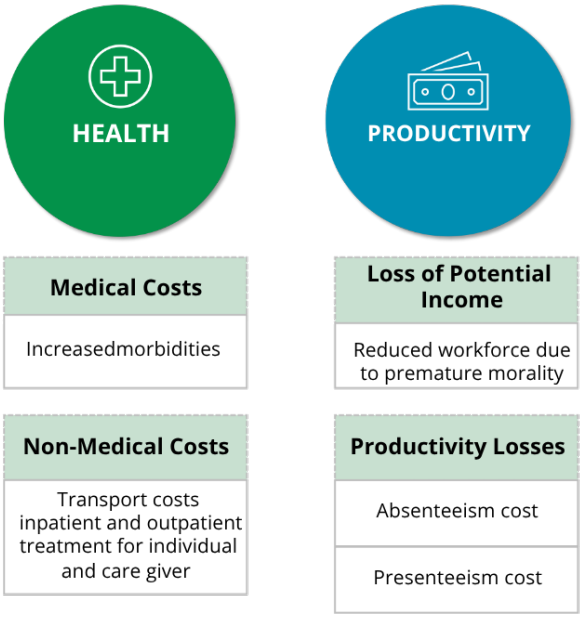
Figure 8 shows the analytical framework for the Cost of Overweight and Obesity based on the Cost of Double Burden methodology and the Okunogbe et al. (2022) Cost of Overweight and Obesity methodology. The cost of overweight and obesity among adults leads to higher costs of health care but also a loss of production which combined represent a loss to the economy.

Overweight and obesity have also been associated with increased risk of mortality from obesity-attributable diseases. This leads to an increase opportunity cost of a reduced workforce in the form of loss of their potential income. For those who continue to be part of the workforce, studies show that they experience higher absenteeism from their jobs as well as lower productivity in their jobs (presenteeism).

There is a lack of disaggregated national data on health expenditure on non-communicable diseases in Lao PDR. The most recent National Health Accounts from 2023 shows that 86.7% of health expenditure could not be classified by disease. (Ministry of Health, 2025). The study team explored alternative options such as utilising data from neighbouring countries such as Thailand where these detailed disaggregation of national health accounts is available and was accessed by the study team. However, there are

vast differences in the maturity of the health system and total health expenditure between Thailand and Lao PDR and the two counties vary in economic development and epidemiological landscape. This implies that despite geographical proximity, data from Thailand cannot be considered a valid proxy for this study.

**FIGURE 8: ANALYTICAL FRAMEWORK FOR COST OF OVERWEIGHT AND OBESITY**




Therefore, due to data limitations in agreement with the Technical Working Group this component of the study has not been completed as a reliable estimate can be calculated.

A global study published in 2022 (Okungobe et al. 2022) estimated the cost of overweight and obesity for over 161 countries. The study relies on parameters from high income countries and Brazil to estimate the losses in productivity and uses a top-down approach to proxy the proportion of health expenditure assumed to be spent on treatment of obesity-related NCDs. For Lao PDR, the study estimated the Cost of Overweight and Obesity in 2019 at USD 244 million, equivalent to 1.3% of GDP.

# Section 5: Conclusions and recommendations

The economic impact of child undernutrition in Lao PDR is significant with far-reaching effects on health, education attainment and productivity. The estimated loss was equivalent to 5.2% of GDP in 2023, which exceeds the rate of growth in GDP in that year. The findings from this study echo the results of similar studies in other countries which find the cost of child undernutrition to range from 1 – 16% of GDP.

Lao PDR is about to embark on its next 10-year strategy for nutrition and along with a 5-year NPAN. The strategy emphasises the need for action across different systems – health, education, food systems and social protection – and for multi-sectoral coordination. The NPAN includes a list of prioritised interventions across multiple ministries and departments to address malnutrition. The cost of malnutrition study reaffirms that undernutrition imposes an avoidable cost on the economy and that there is an urgent need for action. Expenditure on nutrition programmes and policies, particularly those targeted to the first 1,000 days, therefore, should not be seen as a 'cost' for the country but rather a means of reducing potential losses and an 'investment' inhuman capital development and future economic growth.

The study additionally shows that the cost of malnutrition is not just immediate but continues in the future as a child enters school and faces risk of poor learning and then the labour force. Relevant stakeholders should use these findings to highlight the long-term benefits of investing in and addressing malnutrition.

There are efforts underway to track budgets and expenditures on nutrition across different sectors, as well as to cost the forthcoming NPAN. These data along with the cost of malnutrition estimates should be utilised to develop an investment case for nutrition. This could include a prioritisation of activities for where budgetary allocations need to be increased to achieve nutrition targets and development results in an effective and coordinated manner.,

This study also highlights that there is a nutrition transition underway in Lao PDR with emerging overweight and obesity issues, and all forms of malnutrition should be given consideration. It is essential to design programmes and interventions that address the double burden of malnutrition effectively, for example, through the promotion of healthy and diverse diets.

From a data availability perspective, this study brings forth the limitations in information systems that prevent detailed analysis to be carried out. There is an opportunity to improve data collection and disaggregated reporting of health expenditure to undertake analyses such as these as well as other costing and investment studies in health and nutrition, which can support future evidence-based decision making.

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# Annex I: Parameters and Data Sources

| | Parameter | Data Source |
|---|---|---|
| Economic and Demographic | Gross Domestic Product | Annual Reports Bank of Lao PDR |
| | USD-LAK exchange rate | Annual Report Bank of Lao PDR |
| | Total health Expenditure | National Health Accounts 2023 |
| | Annual consumer price index | Annual Reports Bank of Lao PDR |
| | Population, mortality rate and survival rate by age and year | Life tables from UN DESA World Population Prospects 2024 |
| Labour and income | Minimum wage<br>Average income per education level<br>Average working hours per week<br>Working age population by education<br>Employment rate<br>Distribution of workers by manual and non-manual labour by age group and income | Own calculations using data from the Lao Labor Force Survey 2022; minimum wage from ILOSTAT. Classification of manual and non-manual jobs based on ISCO classification codes.<br>Note: prior to calculating average income by age cohort and education level, a cell-level winsorisation was applied to limit the influence of extreme values |
| Health and nutrition | Prevalence of stunting, wasting, underweight (year of analysis and historical) and low birth weight | LSIS III, LSIS II, Lao Child Anthropometry Assessment, 2015 LSIS I, MICS 2006, MICS 2000 |
| | Number of annual disease events | For diarrhoea assumed to be 1 as per average incidence in low-middle income countries reported in Fekadu et al (2025); for others, assumed 1 due to missing data |
| | Average number of primary care visits | Assumptions based on Prinja (2020) |
| | Proportion of events of pathology requiring hospitalization | Vorlasane et al (2023) for diarrhoea, Lim et al (2022) for ARI, for fever conservative assumption of half of ARI as no data available, for low birth weight assumptions based on Prinja (2020); for SAM treatment no data were available for in-patient care |
| | Average number of days of hospital treatment | Assumed to be 5 days based on Vorlasane et al (2023) |
| | Average waiting time spent at primary care attention | Aryal et al (2024) is a national survey find wait-time to see provider exceeded 45 mins for only 14%, and 63% reported that consultation time was less than 15 mins. Based on these, a conservative assumption of 1 hour is taken |

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| | Average unit cost for treatment including medical inputs in primary care and in hospital | MoH (2022): Costing of Public Health Facilities in Lao PDR. For hospitalisation analysis, reported values are unit cost per case rather than per day<br><br>For Severe Acute Malnutrition treatment: UNICEF (2023) |
| | Average transport costs to health facility | Calculated using LECS VII ; |
| Education | Enrolment, pass rates and dropouts | Laos Education MIS (LESMIS) |
| | Population repeating grades by years of education | Estimated using Lao Labour Force Survey 2022 |
| | Public cost per student | Estimated using education expenditure from UNESCO Institute of Statistics and total number of students by school level obtained from LESMIS |
| | Private cost per student | Calculated using LECS VII |
| Relative risks and differential probabilities | Differential probability for ARI, diarrhoea, fever in underweight children | Calculated using LSIS III |
| | Relative risk of mortality due to underweight | 2.63; Estimated from Olofin, et al (2012) |
| | Relative risk of stunting on grade repetition and school dropouts | 2.44 and 2.86. Estimated from Daniels, M. C., & Adair, L. S. (2004) |
| | Productivity differentials in manual labour between stunted and non-stunted | 6.3; Estimated from two studies, Haddad and Bouis (1991) and Ndiaye et al (2012) as per Cost of Hunger in Africa model |

Note that LECS VII raw data provided by Lao Bureau of Statistics covers60% of the total data which has been adjusted or using an appropriate survey weight, included in the dataset

# Annex II: Methodology

The model uses an inductive approach to estimate the burden of morbidity and mortality based on the probability of its occurrence from malnutrition. The effects are estimated using differential probabilities or relative risks of occurrence of an effect between those who were and were not exposed to malnutrition obtained from meta-analyses of global studies.

The social and labour impacts of undernutrition generate economic costs and losses that affect not only people with malnutrition, but also their families and the whole of society. The economic cost ($TC^U$) is defined as the total of public and private healthcare costs in the healthcare system ($HC^U$), in education ($EC^U$), and loss in productivity ($PC^U$),

$TC = f(HC^U, EC^U, PC^U)$

## HEALTH EFFECTS

The total cost healthcare is a function of the cost of treating illnesses ($HSC^U$) and the costs paid by families because of lost time and quality of time ($IHC^U$).

$HC^U = f(HSC^U, IHC^U)$

The burden of disease in children under 5 years occurring in a specific year (year of analysis x) as consequence of undernutrition (underweight) is estimated using the differential probability of occurrence of the pathological condition due to malnutrition.

Health costs have two components, costs to the public health system and private costs. For public costs, unit costs for outpatient and inpatient treatments are used. Due to missing information on intensive care treatment, it is not applied although a proportion of cases may require more expensive intensive care treatment. Private costs include the cost of time (based on minimum wage) spent by caregiver to seek treatment for child along with cost of transportation to health facility. It is assumed that the public healthcare costs cover all treatment costs, including medicines.

## EDUCATION EFFECTS

The total cost in education is a function of increased costs to the education system ($ESC^U$) due to reduced learning capacity of those who suffered from child undernutrition and private costs incurred by families from the larger quantity of inputs, and time required to mitigate lower education performance ($EPC^U$)

$EC^U = f(ESC^U, EPC^U)$

The study uses grade repetition rate and school dropouts as a marker of lower education performance. The additional years of schooling for the education system is estimated using repetition rate according to malnutrition status for each education level using relative risks from the literature, historical modal rates of stunting to determine undernutrition within each cohort, and size of the population by education level. Aggregating these across all grades yields the total number of additional pupil-years that the education system must provide due to grade repetition.

The gap in education levels for stunted and non-stunted is reflected in differences in the distribution of schooling attained. These differences are observed by comparing the proportion of individuals reaching each level of education across the two groups and calculating the difference in mean years of schooling. Due to earlier dropouts among stunted children, these gaps typically appear negative at the lower grades and positive at the higher ones.

The model estimates dropout by grade using average years of schooling reported in surveys. Differential dropout risk at each grade is based on relative risks obtained from global literature. A calibration is then applied to distribute dropout across grades consistent with the overall dropout levels. The weighted average level of education for each group (stunted, not stunted) is calculated using population data, undernutrition prevalence and distribution of education attainment across levels.

Education costs have two components: costs for the public education system and private costs. The costs to the education system in the year of analysis is the cost of the extra pupil-years of operation due to malnutrition estimated earlier. Operating cost of an academic year per student is estimated using total education expenditure and number of students taught in a year. Private costs include the additional costs borne by families which include cost of books, stationery, uniforms and transport.

## PRODUCTIVITY EFFECTS

The productivity costs are equivalent to the loss of human capital owing to the related premature mortality that results in a reduction in an economically active population ($MMC^U$), the gaps in the level of education that affect those who have suffered from undernutrition ($LEC^U$) and the lower productivity in manual labour of those who experience stunting ($MLC^U$).

$PC^U = f(LEC^U, MLC^U, MMC^U)$.

Mortality burden or the number of deaths associated with undernutrition is estimated using the relative risk of mortality, which corresponds to the accumulation of deaths occurring because of past undernutrition since x-64 (where x is year of analysis). The differential relative risks for all causes of death are used, derived from Olofin et al. (2013).

The loss of their potential lifetime earnings is estimated. For the year of analysis, the model counts the deaths attributable to undernutrition across each working-age group and values each of these lost lives at the average earnings that a comparable, undernourished person of the same age and education level would have earned. It also accounts for the survival rate of non-undernourished population recognising not everyone would have lived through their full working life as well as the educational distribution.

The second component includes the reduction in potential earnings of those who did not die due to malnutrition capturing the income gap in the year of analysis between people who experienced stunting before the age of five and those who did not. The gap is estimated for two types of labour activities – non-manual (skilled) and manual – as lower education levels are more likely to affect skilled jobs versus manual jobs. The latter are influenced by lower physical capacity.

For non-manual jobs, the gap in productivity exists due to lowered educational attainment and the model estimates how much less people earn because undernutrition pushed them into a lower education level and aggregates these shortfalls across those of working age. This estimate is calculated using three things: the schooling difference attributable to stunted (described earlier), average income associated with each level of schooling, and size of affected population.

For manual jobs, the gap in productivity exists due to lower physical capacity and the model estimates how much less people earn because of this and aggregates these shortfalls across those of working age working in manual jobs. This estimate is calculated using the differential is productivity attributable to stunting, the average income, and the size of the affected population.

# Annex III: Technical Working Group

| Name | Designation | Role |
|---|---|---|
| 1. Dr. Bounyod Mounkhalak, | Deputy Director of the Centre of Nutrition (CN), Department of Health and Hygiene Promotion (DHHP), Ministry of Health (MoH) | Chair |
| 2. Dr. Souphaxay Khamphanthong | Deputy Head of Administrative and Planning Unit, CN, MoH | Vice-Chair |
| 3. Dr. Manithong Vonglorkham | Deputy director general of Lao Tropical Public Health Institute (LTPHI), MoH | Member |
| 4. Dr. Chansavang Vongkhamsao | Deputy Director of the Centre for Maternal Child Health, MoH | Member |
| 5. Mr. Vongsone Phoumanivong | Deputy Director of the Center for Inclusive Education Promotion, Department of General Education, Ministry of Education and Sports (MoES) | Member |
| 6. Dr. Ningnong Xayavong | Head of Public Healthcare Management Division, Department of Healthcare and Rehabiliation, MoH | Member |
| 7. Mrs. Naly Xayachack | Deputy Head of Health Promotion and Management Division, DHHP, MoH | Member |
| 8. Ms. Thipmalay Vannajit | Deputy Head of Division, Department of Planning, Ministry of Finance (MoF) | Member |
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| 18. Ms. Kingkham Inthaxay | Technical Officer, Department of Economic and Finance Policy, MoF | Member |
| 19. Mr. Bounthavy Southavong | Technical officer, Department of General Education, MoES | Member |

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|---|---|
| 20. Technical officer of administrative division, Mahosot hospital | Member |
| 21. Technical officer of administrative division, Setthathirat hospital | Member |
| 22. Technical officer of administrative division, Mittaphab hospital | Member |
| 23. Technical officer of administrative division, Children hospital | Member |
| 24. Technical officer of administrative division, Mother and Newborn hospital | Member |

# Acronyms

| | |
|---|---|
| **ARI** | Acute Respiratory Illness |
| **BMI** | Body Mass Index |
| **ECLAC** | Economic Commission for Latin America and the Caribbean |
| **GDP** | Gross Domestic Product |
| **ISCO** | International Standard Classification of Occupation |
| **LAK** | Lao Kip |
| **Lao PDR** | Lao People's Democratic Republic |
| **LSIS** | Lao Social Indicator Survey |
| **LECS** | Lao Expenditure and Consumption Survey |
| **LESMIS** | Laos Education Management Information System |
| **NCD** | Non-Communicable Disease |
| **NCD-RisC** | NCD Risk Factor Collaboration |
| **NPAN** | National Plan of Action for Nutrition |
| **UNDESA** | United Nations Department of Economic and Social Affairs |
| **UNESCO** | United Nations Educations, Scientific and Cultural Organisation |
| **UNICEF** | United Nations Children's Fund |
| **USD** | United States Dollar |
| **WFP** | World Food Programme |
| **WHO** | World Health Organisation |

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