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European Union



## Nutrition Policy Brief

# Economic Consequences of Chronic Malnutrition on Education in Lao PDR

June, 2024

**Children who experience stunted growth at any point are at a higher risk of repeating grades in school and more likely to drop out. Early dropouts not only hinder the development of important skills and educational milestones, they also limit earning potential as adults. Compounding this challenge, repetition of grades impose costs on the education system.**

This policy brief highlights key findings from "Economic Loss from School Dropout and Grade Repetition due to Malnutrition in Lao PDR". The analysis was conducted by the Socio-Economic and Policy Research Institute (SPRI), Lao Academy of Social and Economic Sciences (LASES), supported by the European Union (EU) and the United Nations Children's Fund (UNICEF).

### What's at Stake?

A child's growth and development require optimal nutrition, especially during the first 1,000 days of life, from conception to the second birthday. This period, often referred to as the "Window of Opportunity", is critical because nutritional deficiencies during this timeframe can cause irreversible setbacks in physical growth and cognitive development.<sup>1</sup> Insufficient nourishment at this time can lead to stunted growth, inadequate cognitive development, increased susceptibility to illnesses, and higher child mortality rates.<sup>2</sup>

Numerous studies conducted in developing countries have explored the effect of early childhood development on future academic achievement. These studies have shown that stunting in the first five years of life results in cognitive impairment in children, leading to poor school performance, fewer years of schooling, and low productivity in adulthood.<sup>3</sup> Children who experience stunting are, therefore, more likely to delay school enrolment, perform poorly in

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<sup>1</sup> Dean SV et al., 2014.

<sup>2</sup> De Onis & Branca, 2016.

<sup>3</sup> Gansaonré et al., 2022.

school, repeat a grade, and drop out of school compared to those who did not experience stunting.<sup>4</sup>

In 2022, approximately 1.3 million Lao children were enrolled in primary and secondary education. Among them, 1.62 per cent were repeating a grade from the previous academic year, and 7.4 per cent had dropped out by the end of the academic year.<sup>5</sup> These dropout students were not anticipated to return to school in the near future. Children who drop out not only lose the immediate opportunity to learn, their productivity and potential lifetime income are correspondingly lowered. Children repeating grades implies costs as well, including expenses of providing an additional year of education for a student, and the cost to society in delaying a student's entry into the labour market by at least one year.

These consequences have long-term impacts at individual and national levels. As such, the urgency to address the economic loss for Lao PDR from school dropouts and grade repetition due to malnutrition cannot be overstated. It requires comprehensive, multi-sectoral efforts to not only mitigate the immediate impacts, but also address the root causes and build a foundation for inclusive growth and sustainable development. Neglecting to tackle these issues perpetuates social exclusion and marginalization, further widening the gap between the privileged and marginalized. Ultimately, failure to address the economic loss from school dropouts and grade repetition due to malnutrition not only undermines individual potential, but also threatens the overall stability and prosperity of Lao PDR.

## Research Approach

The policy brief estimates the additional cases of school repetitions and dropouts that can be directly associated to a child's stunting, an indicator of chronic malnutrition, before the age of five years, along with the associated cost to the Lao economy. Estimates of malnutrition's impacts on education are based on the concept of the relative (or differential) risk experienced by individuals who suffer from stunting before the age of five as compared to a healthy child.



**6-18 Years**

Stunted children are at a heightened risk of repeating grades in school and dropping out. This is because stunting can lead to impaired cognitive functions, reduced attention spans, and lower academic performance. Additionally, stunted children may experience health issues such as frequent illness and fatigue, which can disrupt their ability to attend school regularly and concentrate in class. If a child drops out of school early, they are less likely to develop important skills and achieve educational milestones that limits their earnings potential. Additional instances of grade repetitions impose costs on the education system. This paper modelled the effects of malnutrition on educational outcomes among children in Grades 1 to 12.

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<sup>4</sup> Ibid.

<sup>5</sup> Data provided by the Ministry of Education and Sports, 2023.

Detailed methodologies on estimating the economic loss from school dropouts and grade repetition due to malnutrition in Lao PDR can be found in Appendix A.

## Key Findings

While there is no single cause for grade repetition and school dropouts in Lao PDR, substantive research suggests that students who experienced stunting before the age of five are more likely to underperform in school.<sup>6</sup> The number of repetition and dropout cases examined results from applying a differential risk factor associated with stunted children to the official government information on grade repetition and dropouts in 2022.

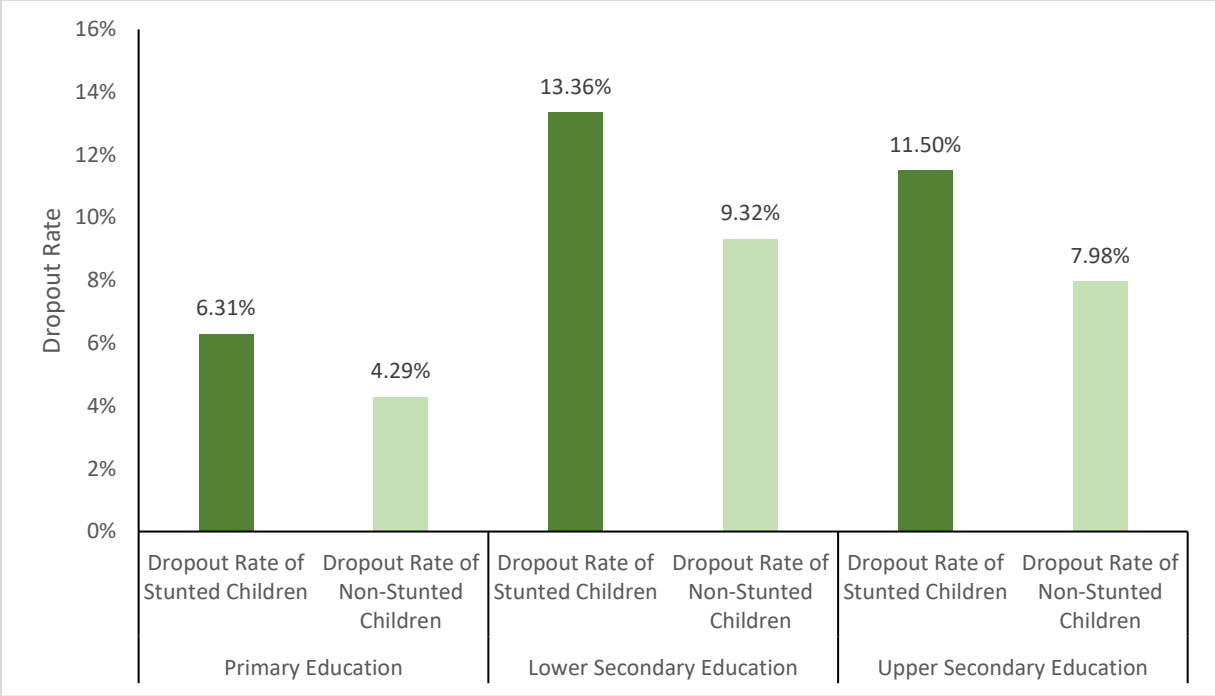
### Effects of malnutrition on school dropouts

Based on official information provided by the Ministry of Education and Sports, 36,620 children dropped out of primary education (Grades 1–5), 43,843 children exited lower secondary education (Grades 6–9), and 17,680 children walked away from upper secondary education (Grades 10–12) in 2022. Using data on the increased risk of dropouts among stunted students, the model estimates that the risk differentials were 2.01, 4.04, and 3.53 percentage points for stunted children in primary, lower secondary, and upper secondary education, respectively (Figure 1). Thus, given the proportion of stunted students, the model estimates that 14,381 students, or roughly 15 per cent of all dropouts in primary and secondary education in 2022, were associated with stunting.

*Figure 1. Dropout rates in primary and secondary education by nutritional status, 2022 (%)*

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<sup>6</sup> Daniels & Adair, 2004.

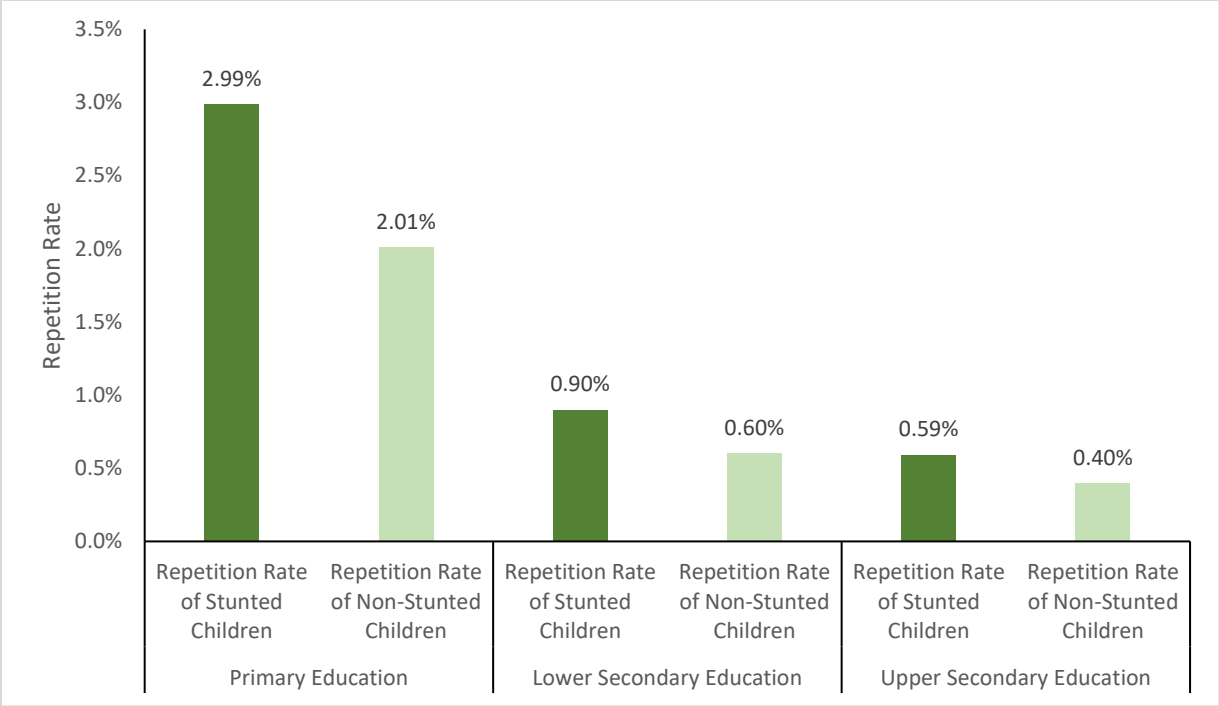


Source: Estimations based on data provided by the Ministry of Education and Sports and relative risks factors.

Effects of malnutrition on grade repetition

In 2022, approximately 17,232 children repeated Grades 1–5, 2,890 children resat Grades 6–9, and 894 children repeated from Grades 10–12. Using data on the increased risk of repetition among students who ever experienced stunted growth, the model estimates that the risk differentials were 0.98, 0.30, and 0.20 percentage points for stunted children in primary, lower secondary, and upper secondary education, respectively (Figure 2). Thus, given the proportion of stunted students, the model estimates that 3,025 students, or 14 per cent of all repetitions in primary and secondary education in 2022, were associated with stunting.

Figure 2. Repetition rates in primary and secondary education by nutritional status, 2022 (%)



Source: Estimations based on data provided by the Ministry of Education and Sports and relative risks factors.

Economic costs of chronic malnutrition on education

This study estimates the economic cost of malnutrition-induced school dropouts derived from the loss of human capital formation. This is achieved by assigning a monetary value to the reduction in lifetime earnings resulting from children dropping out of school due to chronic malnutrition. Differences in lifetime earnings are calculated based on observed differences in wages among individuals with different levels of academic attainment, adjusted using a discounted rate. This difference is then applied to the estimated number of primary, lower secondary, and upper secondary aged children presumed to have dropped out of school due to stunted growth. As a result, the estimated total economic loss due to malnutrition for 2022 amounts to approximately US\$21.85 million (Table 1).

Table 1. Present value of wage differential and economic impact of students dropping out due to malnutrition for 2022

Level at which students drop out	Number of stunted students who dropped out	Lifetime wage differential	Economic impact estimated in US\$
Primary	4,903	\$2,596	\$7,638,469
Lower Secondary	6,597	\$2,596	\$10,276,720
Upper Secondary	2,881	\$2,279	\$3,939,127
<b>Total</b>	14,381	-	\$21,854,316

Source: Model estimations based on author’s calculations.

Repeating grades in school has direct cost implications for the education system, as they require twice the resources for the same academic year. In 2022, students who repeated a grade, and

whose repetitions are considered associated with undernutrition incurred a total cost of US\$549,650. The majority of repetitions occurred during primary education (Grades 1–5). Table 2 provides a summary of public education costs associated with stunting.

*Table 2. Costs of grade repetition associated with stunting for 2022*

	Primary	Lower Secondary	Upper Secondary	Total
<b>Number of repetitions associated with stunting</b>	2,378	487	160	3,025
<b>Public costs per student</b>	\$178	\$178	\$248	\$182
<b>Total Public Costs in US\$</b>	\$423,284	\$86,686	\$39,680	\$549,650

Source: Model estimations based on author’s calculations.

Overall, the study indicates that approximately 15 and 14 per cent of all dropouts and grade repetitions in school were associated with a higher incidence of dropout and grade repetition experienced by stunted children, respectively. Most of these dropouts occurred in lower secondary and most grade repetitions in primary school, suggesting that a reduction in the prevalence of stunting could also support improved school progression and retention. It could also reduce burdens on the education system as well as increase the number of people who are more productive, competitive, and earn better wages. Overall, a reduction in prevalence of stunted children could have an important impact on school progression and grade retention. Increasing the educational level and maximizing the productive capacity of the population are key elements to boost national competitiveness and development.

Total losses associated with school dropouts and grade repetition due to malnutrition are estimated at US\$22.40 million for 2022 (Table 3).

*Table 3. Summary of costs associated with school dropouts and grade repetition due to malnutrition for 2022*

	Number of students affected	Estimated costs in US\$
<b>Dropout</b>	<b>14,381</b>	<b>\$21,854,316</b>
<i>Primary</i>	4,903	\$7,638,469
<i>Lower Secondary</i>	6,597	\$10,276,720
<i>Upper Secondary</i>	2,881	\$3,939,127
<b>Repetition</b>	<b>3,025</b>	<b>\$549,687</b>
<i>Primary</i>	2,378	\$423,240
<i>Lower Secondary</i>	487	\$86,660
<i>Upper Secondary</i>	160	\$39,787
<b>Total</b>	<b>17,406</b>	<b>\$22,404,003</b>

Source: Model estimations based on author’s calculations.

## Policy Recommendations

Based on findings of the analysis, the following recommendations are proposed:

- 1) Ensure access to safe and nutritious food for all.** The 2030 Sustainable Development Agenda makes an explicit pledge to "leave no one behind". Reforms are necessary to ensure that every element of the food system – production, processing, distribution, marketing, and consumption – is aligned to improve access to safe and nutritious foods, especially for children and mothers during the first 1,000 days to support children’s optimal growth and cognitive development. This should be coupled with behaviour change interventions promoting the consumption of nutritious and locally-available foods to increase their production and consumption. Nutrition-sensitive social protection programmes should be targeted to reach the most vulnerable populations.
- 2) Strengthen health and nutrition services for pregnant women and children under two years of age.** Stunting prevention also requires access to and uptake of quality health and nutrition services. To reach the most vulnerable, the Lao Government and partners must expand the coverage of maternal, infant and child nutrition services, including counselling, in these communities.
- 3) Implement nutrition interventions to improve the learning potential of undernourished children in school.** These interventions could include deworming, iron supplementation, nutrition education, and school feeding programmes that offer nutritious meals and safe drinking water. This should be coupled with additional measures to restrict the marketing and sale of unhealthy foods and snacks in and around schools.
- 4) Harness data and evidence to inform policy and programme decisions and strengthen accountability for women's and children’s nutrition.** It is critical for the Lao Government and partners to invest in surveys, research, and evaluations to identify strategies for improving diets, nutrition services, nutrition and care practices for women and children, while also monitoring progress. Reviewing and disseminating empirical data on effective approaches – as well as those not successful – can inform policymakers and promote implementation of tailored actions.

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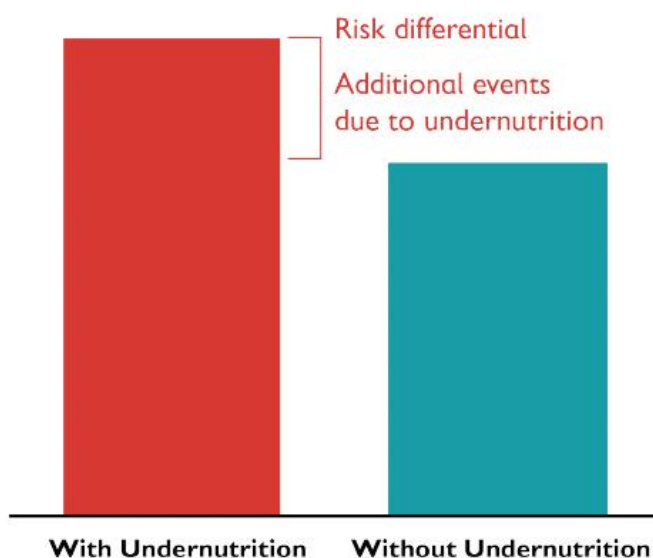
Save the Children. Cost of Hunger: Philippines; 2016. [Internet]. Available from: <https://resourcecentre.savethechildren.net/pdf/save-the-children-cost-of-hunger-philippines-2016.pdf>

## APPENDIX A: Detailed methodology for estimating the economic loss from school dropouts and grade repetition due to malnutrition in Lao PDR

Estimating the number of students who dropped out and repeated grades due to malnutrition

The number of children who dropped out of school or repeated grades due to malnutrition in Lao PDR was estimated using an adaptation of the analytical model developed and used by Save the Children for analyzing the impact of malnutrition in terms of losses in educational attainment.<sup>7</sup>

*Figure A3. Graphical representation of the probability of an event between children with and without stunting to compare the risk differentia*



Source: Save the Children, 2016.

The model estimates the number of children who dropped out or repeated a grade due to malnutrition based on relative risks, specifically the differential risks or the difference in the probability of an event (e.g., children who dropped out or repeated a grade) between individuals who suffered from stunting and individuals who did not suffer from stunting before the age of five years old. The difference represents the incremental or additional events associated with child malnutrition (Figure A1).

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<sup>7</sup> Save the Children, 2016.

Risk differential may be directly computed from the local data sets. In the absence of local data, the odds ratio (OR) will be used to estimate the probability of an event in children with and without stunting. The step-by-step procedures for calculations of incremental costs in education are explained in detail below.

According to the 2011–2012 Lao Social Indicator Survey (LSIS I), the prevalence rate of stunting among children under five was 44 per cent.<sup>8</sup> It is assumed that children under five, while the LSIS I was undertaken, would be in Grades 7–12 in the 2022 academic year. The more recent 2017 Lao Social Indicator Survey (LSIS II) suggests that the prevalence rate of stunting in 2017 among children under five was 33 per cent.<sup>9</sup> It is assumed that children under five, while the LSIS II was undertaken, would be in Grades 1–6 in the 2022 academic year.

Based on this information, the adapted analytic model we applied used a retrospective analysis to estimate the economic losses due to school dropout and grade repetition among 6- and 17-year-old learners, students in Grades 1–12, as a result of stunting before the age of five years old using data on primary, lower secondary, and upper secondary education.

### Risk Differential Estimation

Risk Differential Estimation is calculated from a tetrachoric (2x2) data table using the following formula:

		STUNTED		
		YES	NO	
DROPPED OUT/ REPEATED GRADE	YES	a	b	$P_i = a + b$
	NO	c	d	$c + d$
		$P_u = a + c$	$b + d$	$1 = a + b + c + d$

Where:

Cell a: Number of those suffering from stunting who dropped out/repeated grade (i)

Cell b: Number of those not suffering from stunting who dropped out/repeated grade (i)

Cell c: Number of those suffering from stunting who did not drop out/repeated grade (i)

Cell d: Number of those not suffering from stunting who did not drop out/repeated grade (i)

$$\Delta P = \left( \frac{a}{a + c} \right) - \left( \frac{b}{b + d} \right)$$

In the absence of local data, the odds ratio (OR) will be used to estimate the probability of school dropout or grade repetition for children who are and who are not stunted. There are little studies assessing the association between stunting and school dropout or grade repetition. In a

<sup>8</sup> LSB, 2012.

<sup>9</sup> LSB, 2018.

systematic review of 16 studies estimating the association between stunting and school enrolment, grade repetition, and low schooling levels in developing countries, meta-analysis showed that stunted children were more likely to repeat a grade than non-stunted [OR = 1.59 (95% CI, 1.18-2.14)].<sup>10</sup> However, pooled effects were not estimated for school dropout because no two studies used the same effect measures.<sup>11</sup>

Mendez and Adair reported that by age 11, children stunted at age two were more likely to drop out of school than non-stunted children [OR = 3.0 (95% CI, 1.5-5.8)].<sup>12</sup> To make the analysis conservative, the lower confidence bound [OR = 1.5] found in the Mendez and Adair study and odds ratios from the meta-analysis by Moore et al. are used as proxies for school dropout and grade repetition in Lao PDR, respectively.

We will use the following formula to calculate the risk differential estimation using OR:

1) Estimate “d” using the following formula:

$$\frac{-B - \sqrt{B^2 - 4AC}}{2A}$$

Where,

$$A = OR - 1$$

$$B = OR(P_u + P_i - 2) - P_i - P_u + 1$$

$$C = OR(1 - P_u - P_i + P_u P_i)$$

2) Complete the table and calculate  $\Delta P$

$$b = 1 - P_u - d$$

$$c = 1 - P_i - d$$

$$a = P_u - c = P_i - b$$

Data on the number of enrolments, grade repetitions, and dropouts have been obtained from the Ministry of Education and Sports. The impact of stunting on school dropouts and grade repetition of school-age children was estimated using the estimated number of students dropping out of school and repeating grades due to malnutrition given by the formula below:

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<sup>10</sup> Moore et al., 2022.

<sup>11</sup> Ibid.

<sup>12</sup> Mendez & Adair, 1999.

Number of students dropping out of school/repeating a grade due to malnutrition	=	Estimated initial student enrolment that has suffered from malnutrition	X	differential probability of school dropout/grade repetition due to malnutrition
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### Calculating the economic losses from grade repetition associated with stunting

The costs associated with the grade repetition of students because of malnutrition was computed for the educational system using the following formula:

Cost of repeated grades	=	Population that has suffered malnutrition and repeated grade	X	[Government expenditure per student]
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Add the cost of primary and secondary education to get the total cost.

### Calculating the economic losses from school dropout associated with stunting

(1) This study estimated wage differentials between workers with different educational backgrounds to gauge the economic loss from school dropout due to malnutrition. First, using data from the 2017 Lao Labour Force Survey, the average annual wages were calculated from the starting age of work to the age of retirement. The streams of annual wages are then adjusted for the time value of money to obtain their present value (PV) equivalents in 2022. The PV differences in lifetime earnings will be calculated between: (1) graduates from upper secondary education and graduates from lower secondary education, (2) graduates from lower secondary education and graduates from primary education, and (3) graduates from primary education and those who have not completed primary education. These represent forgone wages from dropping out of upper secondary, lower secondary, and primary education, respectively.

Annual wage differentials are converted to the present value, as their future monetary value will differ from today's value due to inflation and uncertainty. The present value of lifetime earnings is calculated as follows:

Present value of lifetime earnings =  $\sum_{i=age\ of\ starting\ work}^{i=retirement\ age} (PV\ of\ annual\ earnings)_i$ ,

Where  $PV = \frac{C_i}{(1+r)^n}$ , in which  $C_i$  is cash flow in period  $i$ ,  $r$  is discount rate and  $n$  is the years from the age of starting work.<sup>13</sup>

Once the PVs of lifetime earnings are calculated, they were multiplied by the number of students dropping out of school due to malnutrition and the estimated labour force participation rate in Lao PDR to estimate the total economic loss of human capital in the country from school dropouts due to malnutrition. The wage differentials between workers were multiplied by the number of students dropping out of school due to malnutrition in 2022.

## Data

This paper uses labour market data provided by Ministry of Planning and Investment (MPI) and the Lao Statistics Bureau (LSB) based on the 2017 Lao PDR Labour Force Survey. The study uses tables computed by the MPI and LSB, including average monthly wage by level of education. This paper uses labour force participation rates and government expenditure per student provided by the World Bank. Data on the number of enrolments and dropouts were obtained from the Ministry of Education and Sports for the 2022 academic year. The number of children who dropped out of school was estimated using the risk differential computed from the lower confidence bound odds ratio of 1.50 by Mendez and Adair. Similarly, the number of children who repeated a grade was estimated using the risk differential computed from the odds ratio of 1.50 in the meta-analysis by Moore et al. The 2017 Lao Social Indicator Survey (LSIS II) was used to estimate the prevalence of stunting among school-age children.

## Assumptions

- **Government expenditure per student**

The latest data (2014) estimates that 9 and 12.5 per cent of GDP per capita (US\$1,984.50) were allocated per primary and secondary students, respectively, in Lao PDR for education.<sup>14</sup> This equates to approximately US\$248 per secondary student and US\$178 per primary student.<sup>15</sup>

- **Annual wage differential**

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<sup>13</sup> The discount rate is necessary to evaluate the future money value in terms of today's value. For example, today's US\$100 will be worth US\$103 next year with an inflation rate of 3 per cent. Thus, a discount rate of 3 per cent can be used to discount US\$103 of next year to express it in terms of its value today.

<sup>14</sup> UNESCO Institute for Statistics.

<sup>15</sup> To ensure a conservative analysis, the cost of repeating a grade for students in primary and lower secondary education is estimated at US\$178 per student and the cost of repeating a grade for students in upper secondary education is estimated at US\$248 per student.

The 2017 Lao PDR Labour Force Survey provided average monthly wages by level of education. The average monthly wage in 2017 for a Lao worker who graduated from lower secondary education was LAK2,711,000, a worker who completed primary school was LAK2,265,000, and LAK1,972,000 for those who have less than primary-level education.<sup>16</sup> The difference between lower secondary education and primary education was LAK446,000 per month. The difference between primary and less than primary was LAK293,000 per month. These differences represent forgone wages from dropping out of school.

Assuming Lao workers are working 12 months out of the calendar year, the annual wage differential for each education level is estimated to be approximately LAK3.5 million per year.<sup>17</sup>

- Working age

The age of starting work:

- Workers with lower secondary or less: 15 years old
- Workers with upper secondary education or less: 18 years old

Age of retirement:

Article 72 of the Law on Labour (No. 06/NA, 27 December 2006) sets the standard age of retirement at 60 years for male workers and 55 for female workers, subject to conditions and exception. To make the analysis conservative, we estimate that the age of retirement for Lao workers is 55 years old.

- Labour force participation rate

Based on the World Bank's estimates, it is assumed that the labour force participation rate for Lao PDR is 60 per cent.<sup>18</sup>

- Discount rate

The discount rate is assumed to be 3 per cent.<sup>19</sup>

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<sup>16</sup> LSB, 2017.

<sup>17</sup> To ensure a conservative analysis, we do not differentiate between lifetime earnings between graduates from upper secondary education and lower secondary education and between graduates from lower secondary education and primary education.

<sup>18</sup> ILOSTAT.

<sup>19</sup> Based on NIPN (2021), "The Economic Consequences of Malnutrition in Lao PDR".

- Number of students who enrolled in 2022
  - i. Enrolled in primary education: 738,643 students.
  - ii. Enrolled in lower secondary education: 399,504 students.
  - iii. Enrolled in upper secondary education: 185,547 students
  
- Estimated number of stunted students who enrolled in 2022
  - iv. Stunted in primary education: 243,752 students.
  - v. Stunted in lower secondary education: 163,340 students.
  - vi. Stunted in upper secondary education: 81,641 students
  
- Number of students who dropped out in 2022
  - i. Dropped out from primary education: 36,620 students.
  - ii. Dropped out from lower secondary education: 43,843 students.
  - iii. Dropped out from upper secondary education: 17,680 students
  
- Number of students who repeated a grade in 2022
  - i. Repeated primary education: 17,232 students.
  - ii. Repeated lower secondary education: 2,890 students.
  - iii. Repeated upper secondary education: 894 students.
  
- PVs are evaluated at 2022 value.
  
- The exchange rate is the current approximate exchange rate: US\$1 = LAK20,000.

### Limitations

The study's findings should be interpreted in light of the following limitations. Firstly, monetizing the consequences of malnutrition is dependent on a relatively limited evidence base, complex methodologies, and national health, education, demographic and economic statistics of varying quality. Secondly, improvements in nutrition, health, and subsequent educational attainment mainly emerge from individual choices and behaviours, which are not fully captured in the modelling. However, the significance of these voluntary activities cannot be overstated. These projections should be considered as an order of magnitude and present a conservative basis for policy discussions. The conclusions drawn may be considered as conservative low-end estimates.



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NIPN aims to build institutional capacities at national and sub-national levels to manage and analyse information and data from all sectors that influence nutrition, track progress, and better inform their policies and strategies.

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