Cost of Inaction Tool

Tool data sources and methodology

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Introduction

In 2024, Nutrition International launched the NI Cost of Inaction tool, developed by Sakshi Jain, Sameen Ahsan and Dr. Dylan Walters in partnership with Limestone Analytics, which is an analytical economic model that estimates the health, human capital and economic consequences of not investing in nutrition at the global, regional and national level (similar to the NI and Alive & Thrive Cost of Not Breastfeeding tool). The new tool was based on an earlier model created by Dr. Sue Horton (University of Waterloo) and Michelle Gaffey (SickKids Centre for Global Child Health) for internal reporting of the health and economic benefits of NI programs. The NI Cost of Inaction model calculates the cost of not investing in nutrition – to reduce the prevalence of stunting, anemia and low-birthweight - for children under five and women and girls of reproductive age, for more than 140 countries.

More details on the NI Cost of Inaction methodology can be found in the Jain et al. 2024 journal article in Health Policy and Planning journal.

The tool answers the following questions at country, regional and global level:

- What is the net present value of the cost of stunting, anaemia and low birthweight in children under five? i.e., if the mortality and morbidity (non-fatal cases) resulting from the above conditions were averted, what is the present value of the extra income that can be generated?

- What is the current cost of anaemia in adolescent girls and women aged 15-49 years old who participate in the labour force? If all the present cases of anaemia in are averted, what is the dollar value of the extra income that can be generated?

- This methodology calculates the projected income lost due to undernutrition, i.e., the income lost calculation takes into account age range of productivity, i.e., 15-end of healthy life expectancy and the labour force participation rate in the paid labour sector.

Data sources

CONDITION SPECIFIC INDICATORS

Indicator	Value (if applicable)	Source
Stunting		
Prevalence of stunting in children U5	Country level	UNICEF/WHO/World Bank Joint Child Malnutrition Estimates: Stunting, April 2023
Productivity deficit associated with stunting (male, female)	16-24%	McGovern et al 2017
Relative risk of mortality associated with stunting	2.12	Olofin et al 2013
Education years lost	1.74	Galasso & Wagstaff 2019
IQ points loss	10.86	Galasso & Wagstaff 2019
Anaemia		
Prevalence of anaemia among adolescents and women 15-49y	Country level	WHO, Global Health Observatory data repository, 2021
Prevalence of anaemia among pregnant women	Country level	WHO, Global Health Observatory data repository, 2021 (anaemia is defined as a haemoglobin concentration less than 120 g/L for non-pregnant women and lactating women, and less than 110 g/L for pregnant women, adjusted for altitude and smoking.)
Productivity deficit associated with anaemia in all labour sectors	4%	Horton & Ross 2003; an additional 1% for manual labour; an additional 12% for heavy manual labour
Additional productivity deficit associated with anaemia in manual labour sector	1%	
Additional lost productivity from anaemia in heavy manual labour sector	12%	

Prevalence of anaemia among children 6-59 mos	Country level	WHO, Global Health Observatory data repository, 2021 (anaemia is defined as haemoglobin concentration less than 110 g/L, adjusted for altitude)
Productivity deficit associated with child anaemia	2.5%	Horton & Ross 2003
Low Birthweight (LBW)		
LBW prevalence	Country level	UNICEF/WHO Low birthweight (LBW) estimates, 2023
Relative risk of neonatal mortality associated with LBW	2.80	Black et al 2008
IQ points lost due to LBW	10	Gu et al. 2017
Increase in earnings due to increase in 1 IQ pt	1.07%	Hanushek & Woessmann 2008
Percentage of lifetime earnings realized (child cognitive benefits)	90.0%	Hoddinott et al., 2013 (to be conservative, we take 90% of total earnings over lifetime)

DEMOGRAPHIC AND ECONOMIC INDICATORS

Indicator	Value (if applicable)	Source
Total population - all	Country level	World Population Prospects 2022
Crude birth rate (births/1000 population)	Country level	World Population Prospects 2022
Children under-5 (0-4 y)	Country level	World Population Prospects 2022
Adolescents and women aged 15-49y	Country level	World Population Prospects 2022
Percentage of women aged 15-49y who are pregnant	Country level	DHS data, STATcompiler
Percentage of adolescents and women (15-49y) currently pregnant	Country level/regional	DHS, where country level indicators are not available, we have taken a regional weighted average
Percentage of adolescents and women (15-19y) currently pregnant	Country level	World Development Indicators, 2021
Neonatal mortality (deaths/1000 live births)	Country level	UN Inter-agency Group for Child Mortality Estimation (UNICEF, WHO, World Bank, UN DESA Population Division)
Infant mortality (deaths/1000 live births)	Country level	
Under-5 mortality (deaths/1000 live births)	Country level	
Adults aged 15-65y	Country level	World Population Prospects 2022
Adults aged 15-65y, male	Country level	World Population Prospects 2022
Adults aged 15-65y, female	Country level	World Population Prospects 2022
Labour force participation rate	Country level	ILO modelled estimates, November 2020 (%)
Labour force participation rate, male	Country level	ILO modelled estimates, November 2020 (%)
Labour force participation rate, female	Country level	ILO modelled estimates, November 2020 (%)
Healthy life expectancy	Country level	World Health Organization, Global Health Observatory

		Data Repository, 2019 estimates
Healthy life expectancy, male	Country level	World Health Organization, Global Health Observatory Data Repository, 2019 estimates
Healthy life expectancy, female	Country level	World Health Organization, Global Health Observatory Data Repository, 2019 estimates
Age at entry into work force	15	Assumption
GNI (current US$)	Country level	World Development Indicators, 2021 estimates
Labor share of GNI	Country level	ILOSTAT, ILO modelled estimates, 2017 estimates
Labor share of income per economically active adult	Country level	GNI*Labor share of GNI/ (Adults aged 15-65y*Labor force participation rate)
(Social) Discount rate - (Recommended default: 3%. Alternative 0% or 5%)	3%	Assumption
Average annual per capita real GDP growth rate - Recommended default: 3%. Alternative: 5% for long-term LMIC historical mean or country/region specific historical mean or projection	3%	World Development Indicators, 2021 estimates
Share of labour force in agriculture	Country level	World Development Indicators, 2021 estimates
Share of labour force in construction	15% of labour force in agriculture	Assumption
Share of labour force in manual labour	60%	Assumption
Share of labour force in heavy manual labour	50%	Assumption, 50% of labour force in agriculture and construction

Calculating the cost of inaction

EXAMPLE COUNTRY: BANGLADESH | REGION: SOUTH ASIA

WORLD BANK INCOME GROUP: LOWER-MIDDLE INCOME

NET PRESENT VALUE OF LOSS OF FUTURE INCOME DUE TO STUNTING

Indicator	Calculation	Notes
Prevalence of under-5 stunting among target population	26.4%	
Number of under-5 stunting cases in target population	3,871,964	U5 stunting prevalence *Population (0-4 y)
Annual number of under-5 stunting cases in target population	774,393	Number of under-5 stunting cases in target population/5
Relative risk of mortality associated with stunting	2.12	
Population attributable fraction of mortality due to stunting	0.228	(Stunting prevalence * (RR - 1))/((Stunting prevalence* (RR-1))+1)
Estimated number of under-5 deaths due to stunting in target population	18,988	No. of under-5 (0-59m) deaths * Population attributable fraction of mortality due to stunting
Net percent value (NPV) of loss of future income from mortality due to stunting	$1,337,529,224	NPV of (Estimated number of under-5 deaths due to stunting * Labour share of income per economically active adult) from age 15 to their healthy life expectancy
Annual stunting morbidity cases (non-fatal)	755,405	Total annual cases of stunting – number of under-5 deaths due to stunting in target population
Productivity deficit associated with stunting	16-24%%	Men: 16%, women: 24%
NPV of loss of future income from annual stunted cases (morbidity/non-fatal)	$9,793,038,260	NPV of (Number of U5 stunting cases * Productivity deficit associated with stunting * Labour force participation rate * Labour share of income per economically active adult) from age 15 to their healthy life expectancy

NPV of loss of future income from stunting cases (morbidity and mortality)	$11,130,567,484	NPV of loss of future income from stunted cases (non-deaths) + NPV of loss of future income from stunting mortality adjusted over the course of productive years (15-healthy life expectancy)

LOSS OF CURRENT INCOME DUE TO ANAEMIA IN ADOLESCENT GIRLS AND WOMEN

Indicator	Calculation	Notes
Prevalence of anaemia among adolescent girls and women 15-49y	36.70%	
Number of adolescent girls and women aged 15-49y with anaemia	17,718,285	Population of women aged 15-49y * Prevalence of anaemia among women 15-49y
Prevalence of anaemia among adolescent girls 15-19y	42.3%	
Number of adolescent girls aged 15-19y with anaemia	3,477,027	Population of women aged 15-19y * Prevalence of anaemia among adolescent girls 15-19y
Prevalence of anaemia among pregnant women	42.2%	
Percentage of women aged 15-49y who are pregnant	2.3%	
Number of pregnant women with anaemia	468,593	Population of women aged 15-49y * Percentage of women 15-49y who are pregnant *Prevalence of anaemia among pregnant women 15-49y
Estimated number of anaemia cases among economically active women aged 15-49y	6,526,640	Estimated number of anaemia cases among women aged 15-49y * Female Labour force participation rate
Productivity deficit associated with anaemia in all labour sectors	4%	

Lost productivity from anaemia in all sectors	$ 625,671,525	Labor share of GNI per economically active adult aged 15-65y * Estimated number of anaemia cases among economically active women aged 15-49y * Productivity deficit associated with anaemia in all labour sectors
Additional productivity deficit associated with anaemia in manual labour sector	1%	
Additional lost productivity from anaemia in manual labour sector	$ 93,850,729	Estimated number of anaemia cases among economically active women aged 15-49y * Share of labour force in manual labour * Labor share of GNI per economically active adult aged 15-65y * Additional productivity deficit associated with anaemia in manual labour sector
Additional productivity deficit associated with anaemia in heavy manual labour sector	12%	
Additional lost productivity from anaemia in heavy manual labour sector	$ 400,306,314	Estimated number of anaemia cases among economically active women aged 15-49y * Share of labour force in heavy manual labour * Labor share of GNI per economically active adult aged 15-65y * Additional productivity deficit associated with anaemia in heavy manual labour sector
Total loss of current income from anaemia cases in women aged 15-49y	**$ 1,119,828,568**	Lost productivity from anaemia in all sectors + additional lost productivity from anaemia in manual labour sector + additional lost productivity from anaemia in heavy manual labour sector

NET PRESENT VALUE OF LOSS OF FUTURE INCOME DUE TO ANAEMIA IN CHILDREN 6-59 MOS

Indicator	Calculation	Notes
Prevalence of anaemia among target population (6-59mos)	43.10%	
Number of children under-5y with anaemia	5,684,093	Population 6-59m * Prevalence of anaemia among target population (6-59m)
Estimated annual number of cases of child anaemia	1,136,819	Number of children under-5y with anaemia/5
Productivity deficit associated with child anaemia	2.5%	
NPV of loss of future income from annual child anaemia cases	**$2,002,009,045**	Estimated annual number of cases of child anaemia * Labour force participation rate * Productivity deficit associated with child anaemia adjusted over the course of productive years (15-healthy life expectancy)

NET PRESENT VALUE OF LOSS OF FUTURE INCOME DUE TO LOW BIRTHWEIGHT IN NEWBORNS

Indicator	Calculation	Notes
Estimated prevalence of LBW among target population	23%	
Number of LBW cases	701,664	Incidence of LBW * Annual live births
Relative risk of neonatal mortality associated with LBW	2.80	
Population attributable fraction of neonatal mortality due to LBW	0.293	(LBW prev. * (RR - 1))/((LBW prev * (RR-1)) + 1)
Estimated number of annual neonatal deaths due to LBW	14,295	No. of neonatal deaths * Population attributable fraction of neonatal mortality due to LBW
NPV of loss of future income due to LBW mortality	$100,6974,053	Estimated number of neonatal deaths due to LBW * Labour force participation rate adjusted over the course of productive years (15-healthy life expectancy)
Children born with low birth weight (morbidity/ non-fatal)	687,369	Number of LBW cases – mortality due to LBW
Percentage of lifetime earning realized (child cognitive benefits)	90.0%	Hoddinott et al., 2013
Decrease in IQ due to lbw	10	Gu et al. 2017
Increase in earnings due to increase in 1 IQ pt	1.07%	Hanushek & Woessmann 2008
NPV of loss of income due to lbw (morbidity for all years of productivity)	$ 4,662,845,487	Estimated number of cases of lbw morbidity * Labour force participation rate * IQ points lost per case of LBW *IQ associated increase in earnings * Percentage of lifetime earning realized Adjusted over the course of productive years (15-healthy life expectancy)
NPV of loss of future income due to LBW (morbidity + mortality)	$5,669,819,540	Sum of loss of future income from mortality and morbidity

TOTAL ECONOMIC COSTS

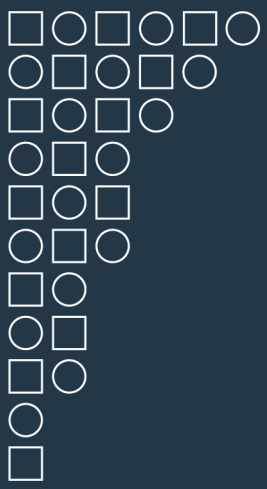
The economic costs from stunting and low birthweight can not be summed up, as there are significant overlaps in the populations they affect, and stunting and low birth weight incidences have significant overlaps. To estimate a total cost, the authors suggest a conservative approach of adding the maximum estimate among the costs of stunting and low birthweight to the cost of anaemia in adolescent girls and women, and the cost of anaemia in children aged 6-59 months who are anaemic but not stunted (Tran et al. 2019, Christian et al. 2023)

Indicator	Calculation	Notes
NPV of loss of future income from stunting cases (morbidity and mortality)	$11,130,567,484	
NPV of loss of future income due to LBW (morbidity + mortality)	$5,669,819,540	
Total loss of current income from anaemia cases in women aged 15-49y	$ 1,119,828,568	
Percentage of children with anaemia who are also stunted	44.5%	
Estimated number of anaemic children under five who are not stunted	3,152,991	Estimated Number of cases of child anaemia * (1- Percentage of children with anaemia who are also stunted)
Estimated annual number of anaemic children under five who are not stunted	630,598	Estimated Number of anaemic children under five who are not stunted/5 this calculation is used to find total economic cost related to undernutrition)
Annual NPV of loss of future income from anaemic children under five who are not stunted	$1,110,523,186	Estimated annual number of anaemic children who are not stunted * Labour force participation rate * Productivity deficit associated with child anaemia Adjusted over the course of productive years (15-healthy life expectancy)
Total economic cost	**$13,360,919,239**	Max (cost of stunting, cost of LBW) + cost of anaemia in women and girls + annual NPV of loss of future income from anaemic children under five who are not stunted

HUMAN CAPITAL LOSSES BY CONDITION

Indicator	Calculation	Notes
Stunting		
Years of education lost per case of stunting	1.74	
IQ points lost due to stunting	10.86	
Estimated annual lost years of schooling due to stunting morbidity	1,314,405	Annual cases of stunting * years of education lost per case
Annual number of IQ points lost due to stunting	8,203,701	Annual cases of stunting * IQ points lost per case
Low Birthweight		
IQ points lost due to low birthweight	10	
Annual number of IQ points lost due to low birthweight	6,873,689	Annual cases of low birthweight * IQ points lost per case

Nutrition International's Health Economics unit produces advanced modelling tools and robust data to bolster the organization's impact in addressing malnutrition. Developed in 2023 in partnership with Limestone Analytics, with funding from the Government of Canada, the Cost of Inaction Tool equips stakeholders with essential evidence for informed decision-making. For further support, including additional analyses, tool demonstrations and technical assistance in developing and operationalizing costed nutrition plans and governance frameworks, please contact us at healthecon@nutritionintl.org.



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