Cost of Not Breastfeeding (CONBF)

Tool Data Sources and Methodology

November 10, 2022
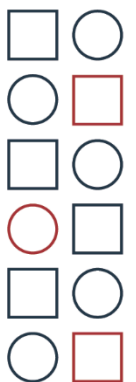
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ACRONYMS

APA	American Psychological Association
ARI	Acute Respiratory Infection
CBF	Continued Breastfeeding
CONBF	Cost of Not Breastfeeding
DHS	Demographic and Health Survey
EBF	Exclusive Breastfeeding
GBD	Global Burden of Disease
GNI	Gross National Income
HALE	Healthy Life Expectancy
IDF	International Diabetes Federation
ILO	International Labour Organization
IQ	Intelligence Quotient
LCU	Local Currency Unit
LMIC	Low and Middle Income Country
NPV	Net Present Value
PAR	Population Attributable Risk
RR	Relative Risk
UNICEF	United Nations Children's Fund
USD	United States Dollar
WBG	World Bank Group
WHO	World Health Organization
WPP	World Population Prospects
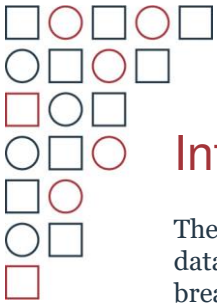
Introduction

The Cost of Not Breastfeeding Tool is an evidence-based modelling tool that uses open-access data to estimate the health and economic costs of not protecting, promoting and supporting breastfeeding. First launched in 2019 by Dr. Dylan Walters and Alive & Thrive, with funding from the Bill & Melinda Gates Foundation, the tool was the first of its kind. It has been used by organizations around the world to inform advocacy, policy development and investments in breastfeeding promotion. The methodology for the tool is based on the Walters et al. (2019) paper.

In 2022, Nutrition International updated and developed the second version of the tool in partnership with Alive & Thrive and Limestone Analytics, with funding from the Government of Canada. This new and updated version of the tool, which is available on both the Nutrition International and Alive & Thrive websites, contains updated datasets, new indicators, a new function to calculate results for different scenarios or targets, and online access to the results for more than 180 countries.

The purpose of this document is to share the data sources and provide an example of the analytical approach used to estimate the indicators reported in the tool. The data points and sources used in the online tool may differ from the ones noted here as the datasets are updated periodically. If you are aware of a better data source, for more information on using the tool, or to share your experience using the tool, please contact us at: healthecon@nutritionintl.org.

When citing our work on the tool, please use the following (APA referencing style):

The Cost of Not Breastfeeding Tool. (2022, July 28). Nutrition International. Retrieved [add date here: Month, Day, Year] from https://www.nutritionintl.org/learning-resource/the-cost-of-not-breastfeeding-tool/

Data Sources

ID	Dataset Name	Dataset Name
1	Infant and young child feeding – Exclusive breastfeeding (< 6 months)	UNICEF
2	Infant and young child feeding – Continued breastfeeding (12-23)	UNICEF
3	Infant and young child feeding – EBF and CBF for select countries	Appendix A
4	Demographic Health Surveys	DHS
5	Diarrhoea – Child Health Coverage	UNICEF
6	Pneumonia – Child Health Coverage	UNICEF
7	Joint Malnutrition Estimate	WHO
8	Global Burden of Disease (GBD) – Results tool	Global Burden of Disease
9	Number of deaths in children under five	Global Burden of Disease
10	International Diabetes Federation (IDF) – People with undiagnosed diabetes in 1,000s	IDF
11	IDF – People with diabetes, in 1,000s	IDFF
12	IDF – Diabetes-related health expenditure per person, USD	IDF
13	Total Population – Both Sexes	WPP
14	ILOSTAT Explorer	ILO
15	World Bank Group (WBG) Development Indicators	World Bank
16	Breastmilk substitutes	Appendix B
17	WHO Choice Data	WHO
18	Regions (WBG, WHO, etc.)	Country Code Package
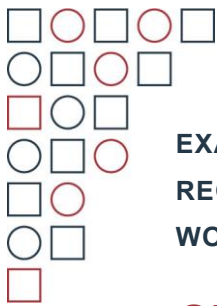
EXAMPLE COUNTRY: BANGLADESH

REGION: SOUTH ASIA

WORLD BANK INCOME GROUP: LOWER-MIDDLE INCOME

Child Morbidity and Mortality

A — NUMBER OF CASES OF CHILD (0-23M) DIARRHOEA AND ACUTE RESPIRATORY INFECTION (ARI) ATTRIBUTABLE TO SUBOPTIMAL BREASTFEEDING

Table A.1.1 List of inputs

| Variable	Value	Formula/Assumption	Source
Exclusive breastfeeding <6m	62.6%		UNICEF
Non-exclusive breastfeeding (non-EBF) <6m	36.8%	100% – Exclusive breastfeeding (EBF)	
No breastfeeding <6m	0.6%	If no data, then 10% of non-EBF	DHS
Partial breastfeeding <6m	9.2%	25% of non-EBF minus no breastfeeding is assumed to be partial breastfeeding; (Non-EBF - No BF)*0.25	
Predominant breastfeeding <6m	27.6%	75% of non-EBF minus no breastfeeding is assumed to be predominant breastfeeding; (Non-EBF - No BF)*0.75	
Continued BF at 20-23m	84.2%		UNICEF
No breastfeeding 20-23 m	15.8%	100% – Continued BF at 20-23m	
Incidence of diarrhoea (0-5 months)	1,769,109		Global Burden of Disease
Incidence of diarrhoea (6-23 months)	272,942		Global Burden of Disease
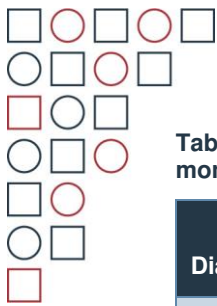
Table A.2.1 Projected morbidity from suboptimal breastfeeding behaviours for infants aged 0-5 months

Diarrhoea	None	Partial	Predom	Source/Calculation
RR of morbidity by infection pathway & breastfeeding behaviour	2.65	1.68	1.26	Lamberti (2011)
% Suboptimal breastfeeding behaviour	0.60%	9.2%	27.6%	Table A.1.1
PAR morbidity from infection - hybrid	13.05%	13.05%	13.05%	1 - (1 - PAR Morbidity ~None) * (1 - PAR Morbidity ~ Partial) * (1 - PAR Mortality~Predom)
Incidence of diarrhoea (0-5 months)	1,769,109	1,769,109	1,769,109	Table A.1.1
Morbidity attributed to suboptimal breastfeeding	230,865	230,865	230,865	PAR Morbidity ~Hybrid * Infection Share 0-5m morbidity

ARI	None	Partial	Predom	Source/Calculation
RR of morbidity by infection pathway & breastfeeding behaviour	2.07	2.48	1.79	Lamberti (2013)
% Suboptimal breastfeeding behaviour	0.60%	9.2%	27.6%	Table A.1.1
PAR morbidity from infection - individual	0.64%	11.98%	17.90%	(% Suboptimal BF behaviour * (RR-1)) / ((1 + % Suboptimal BF behaviour * (RR-1)))
PAR morbidity from infection - Hybrid	28.20%	28.20%	28.20%	1 - (1 - PAR Morbidity ~None) * (1 - PAR Morbidity ~ Partial) * (1 -
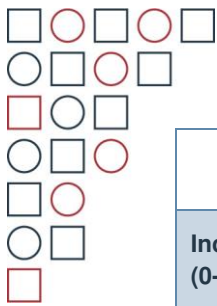
				PAR Morbidity ~Predom)
Incidence of ARI (0-5 months)	76,805	76,805	76,805	Table A.1.1
Morbidity attributed to suboptimal breastfeeding	21,660	21,660	21,660	PAR Morbidity ~Hybrid * Infection Share 0-5m morbidity

Table A.2.2 projected morbidity from suboptimal breastfeeding behaviours for children 6-23 months

Diarrhoea	Value	Formula/Assumption
Relative Risk (RR) of morbidity by infection pathway & breastfeeding behaviour	2.07	Lamberti (2011)
% Suboptimal breastfeeding (not breastfeeding at 2 years)	15.80%	Table A.1.1
PAR morbidity from infection	14.46%	(% Suboptimal BF behaviour * (RR-1)) / ((1 + % Suboptimal BF behaviour * (RR-1)))
Incidence of diarrhoea (6-23 months)	4,225,541	Table A.1.1
Morbidity attributed to suboptimal breastfeeding	611,064	PAR Morbidity * Diarrhoea Share >6-23m mortality
ARI	**Value**	**Formula/Assumption**
RR of morbidity by infection pathway & breastfeeding behaviour	1.17	Lamberti (2013)
% Suboptimal breastfeeding (not breastfeeding at 2 years)	15.80%	Table A.1.1
PAR morbidity from infection	2.62%	(% Suboptimal BF behaviour * (RR-1)) / ((1 + % Suboptimal BF behaviour * (RR-1)))
Incidence of ARI (6-23 months)	272,942	Table A.1.1
Morbidity attributed to suboptimal breastfeeding	7,139	PAR Morbidity * ARI Share >6-23m mortality

Table A.3.1 Number of cases of child morbidity attributed to not breastfeeding according to recommendation

| ARI	Value	Formula/Assumption
Number of cases of child diarrhoea (0-23 months) attributed to not breastfeeding according to recommendation	841,929	Morbidity from Suboptimal BF (0-5m) due to diarrhoea + Morbidity from Suboptimal BF (6-23m) due to diarrhoea
Number of cases of child ARI/Pneumonia (0-23 months) attributed to not breastfeeding according to recommendation	28,799	Morbidity from Suboptimal BF (0-5m) due to ARI + Morbidity from Suboptimal BF (6-23m) due to ARI

B — NUMBER OF CASES OF CHILDHOOD OBESITY PREVENTABLE WITH FULL BREASTFEEDING

Table B.1.1 List of inputs

Variable	Value	Formula/Assumption	Source
Continued BF at 20-23m	84.2%	2.48	UNICEF
No breastfeeding 20-23 m	15.8%	100% - Continued BF at 20-23m	
Prevalence of overweight children under 5	2.1%		WHO
Total population by age 4, both sexes combined (thousands)	2,860,398		WPP

Table B.2.1 Number of cases of childhood obesity preventable with full breastfeeding

Variable	Value		Formula/Assumption
% Breastfeeding to 2 years	84.2%		Table B.1.1
Odds ratio	0.74		Horta et al., 2015b
Incidence	2,468		Percentage of 0-59m children overweight * Total population by age 4
Number of cases of childhood obesity preventable with full breastfeeding	2,468		Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
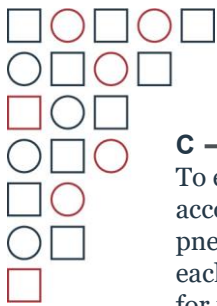
C — NUMBER OF CHILD DEATHS (DIARRHOEA AND ARI)

To estimate the number of child deaths averted each year (attributable to not breastfeeding according to recommendations), published relative risks for both the diarrhoea and pneumonia infection pathways were multiplied by the current percentage of households in each breastfeeding behaviour category, and then multiplied by the mortality for each disease for infants and young children (age 0−23 months).

Table C.1.1 List of inputs

Variable	Value	Formula/Assumption	Source
Exclusive breastfeeding <6m	62.6%		UNICEF/DHS
Non-exclusive breastfeeding (non-EBF) <6m	36.8%	100% – exclusive breastfeeding	
No breastfeeding <6m	0.6%	IF no data, then 10% of non-EBF	DHS
Partial breastfeeding <6m	9.2%	25% of non-EBF minus no breastfeeding is assumed to be partial breastfeeding; (Non-EBF - No BF)*0.25	
Predominant breastfeeding <6m	27.6%	75% of non-EBF minus no breastfeeding is assumed to be predominant breastfeeding; (Non-EBF - No BF)*0.75	
Continued BF at 20-23m	84.2%		UNICEF
No Breastfeeding 20-23 m	15.8%	100% - Continued BF at 20-23m	
Neonatal deaths due to diarrhoea	584		Global Burden of Disease
Post neonatal deaths due to diarrhoea	664		Global Burden of Disease
Neonatal deaths due to ARI	7,471		Global Burden of Disease
Post-neonatal deaths due to ARI	3,355		Global Burden of Disease

Table C.2.1 Projected mortality from suboptimal breastfeeding behaviours for infants aged 0-5 months

Diarrhoea	None	Partial	Predom	Source/Calculation
RR of mortality by infection pathway & breastfeeding behaviour	10.52	4.62	2.28	Lamberti (2011)
% Suboptimal breastfeeding behaviour	0.60%	9.2%	27.6%	Table C.1.1
PAR mortality from infection - individual	5.40%	24.98%	26.11%	(% Suboptimal BF behaviour * (RR-1)) / ((1 + % Suboptimal BF behaviour * (RR-1)))
PAR mortality from infection - hybrid	47.56%			1 - (1 - PAR Mortality~None) * (1 - PAR Mortality~ Partial) * (1 - PAR Mortality~Predom)
Infection share 0–5-month mortality	584			Table C.1.1
Mortality attributed to suboptimal breastfeeding	278			PAR Mortality~Hybrid * Infection Share 0-5m mortality
ARI	None	Partial	Predom	Source/Calculation
RR of mortality by infection pathway & breastfeeding behaviour	14.97	2.5	1.66	Lamberti (2013)
% Suboptimal breastfeeding behaviour	0.60%	9.2%	27.6%	Table C.1.1
PAR mortality from infection – individual	7.73%	12.13%	15.41%	(% Suboptimal BF behaviour * (RR-1)) / ((1 + % Suboptimal BF behaviour * (RR-1)))
PAR mortality from infection – hybrid	31.42%			1 - (1 - PAR Mortality~None) * (1 - PAR Mortality~ Partial) * (1 - PAR Mortality~Predom)
Infection share 0–5-month mortality	7,471			Table C.1.1
Mortality attributed to suboptimal breastfeeding	2,347			PAR Mortality~Hybrid * Infection Share 0-5m mortality

Table C.2.2 Projected mortality from suboptimal breastfeeding behaviours for children 6-23 months

Diarrhoea	Value	Formula/Assumption
RR of mortality by infection pathway & breastfeeding behaviour	2.18	Lamberti (2011)
% Suboptimal breastfeeding (Not breastfeeding at 2 years)	15.8%	Table C.1.1
PAR mortality from infection	15.71%	(% Suboptimal BF behaviour * (RR-1)) / ((1 + % Suboptimal BF behaviour * (RR-1)))
Diarrhoea share > 6-23m mortality	664	Table C.1.1
Mortality attributed to suboptimal breastfeeding	104	PAR Mortality * Diarrhoea Share >6-23m mortality
ARI	**Value**	**Formula/Assumption**
RR of mortality by infection pathway & breastfeeding behaviour	1.92	Lamberti (2013)
% Suboptimal breastfeeding (Not breastfeeding at 2 years)	15.8%	Table C.1.1
PAR mortality from infection	12.69%	(% Suboptimal BF behaviour * (RR-1)) / ((1 + % Suboptimal BF behaviour * (RR-1)))
ARI share > 6-23m mortality	3,355	Table C.1.1
Mortality attributed to suboptimal breastfeeding	426	PAR Mortality * ARI Share >6-23m mortality

Table C.3.1 Number of child deaths attributed to not breastfeeding according to recommendation

Variable	Value	Formula/Assumption
Number of child deaths (0-23mths) due to diarrhoea attributed to not breastfeeding according to recommendation	382	Mortality from Suboptimal BF (0-5m) due to diarrhoea + Mortality from Suboptimal BF (6-23m) due to diarrhoea
Number of child deaths (0-23mths) due to ARI/Pneumonia attributed to not breastfeeding according to recommendation	2,773	Mortality from Suboptimal BF (0-5m) due to ARI + Mortality from Suboptimal BF (6-23m) due to ARI
Total number of child deaths attributed to not breastfeeding according to recommendation	3,155	No. of child deaths (0-23m) due to diarrhoea + No. of child deaths (0-23m) due to ARI

Maternal Morbidity and Mortality

D — MATERNAL MORBIDITY ATTRIBUTED TO NOT BREASTFEEDING ACCORDING TO RECOMMENDATION

Table D.1.1 List of inputs

Variable	Value	Formula/Assumption	Source
Continued breastfeeding at 20-23m	84.2%		UNICEF
No breastfeeding 20-23 m	15.8%	100% - Continued BF at 20-23m	
Incidence of breast cancer in females	13,599		Global Burden of Disease
Incidence of ovarian cancer in females	2,437		Global Burden of Disease
Incidence of diabetes mellitus (15+ years)	2,494,869		Global Burden of Disease

Table D.2.1 Number of cases of breast cancer (incidence) preventable with breastfeeding

Variable	Value	Formula/Assumption
Percentage breastfeeding to 2 years	84.2%	Table E.1.1
Odds ratio	0.86	Chowdhury et al. 2015
Incidence	13,599	Table E.1.1
Number of cases of breast cancer (incidence) preventable with breastfeeding	301	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)

Table D.2.2 Number of cases of ovarian cancer (incidence) preventable with breastfeeding

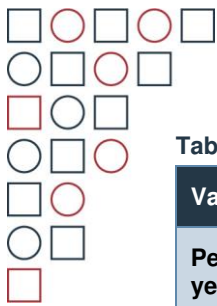| Variable	Value	Formula/Assumption
Percentage breastfeeding to 2 years	84.2%	Table E.1.1
Odds ratio	0.75	Chowdhury et al. 2015
Incidence	2,437	Table E.1.1
Number of cases of ovarian cancer (incidence) preventable with breastfeeding	96	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)

Table D.2.3 Incidence of maternal type II diabetes preventable with breastfeeding

| Variable	Value	Formula/Assumption
Percentage breastfeeding to 2 years	84.2%	Table E.1.1
Odds ratio	0.86	Horta et al., 2015b (Upper bound estimate since restrictive evidence.)
Incidence	2,494,869	Table E.1.1
Incidence of maternal type II diabetes preventable with breastfeeding	55,187	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)

E — MATERNAL MORTALITY ATTRIBUTED TO NOT BREASTFEEDING ACCORDING TO RECOMMENDATION

Table E.1.1 List of inputs

Variable	Value	Formula/ Assumption	Source
Continued breastfeeding at 20-23m	84.2%		UNICEF
No Breastfeeding 20-23 m	12.30%	100% - Continued BF at 20-23m	
Incidence of female diabetes deaths (15-19)	34.35		GBD
Incidence of female diabetes deaths (20-24)	27.42		GBD
Incidence of female diabetes deaths (25-29)	42.10		GBD
Incidence of female diabetes deaths (30-34)	56.52		GBD
Incidence of female diabetes deaths (35-39)	97.02		GBD
Incidence of female diabetes deaths (40-44)	253.07		GBD
Incidence of female diabetes deaths (45-49)	571.48		GBD
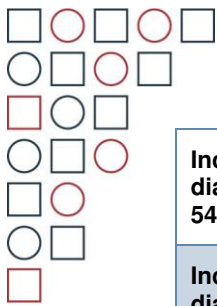
Incidence of female diabetes deaths (50-54)	933.49		GBD
Incidence of female diabetes deaths (55-59)	409.22		GBD
Incidence of female diabetes deaths (60-64)	762.06		GBD
Incidence of female diabetes deaths (65-69)	1,114.23		GBD
Incidence of female diabetes deaths (70-74)	725.01		GBD
Incidence of female diabetes deaths (75+)	7,312.52		GBD
Incidence of breast cancer deaths (15-19)	36.57		GBD
Incidence of breast cancer deaths (20-24)	51.97		GBD
Incidence of breast cancer deaths (25-29)	110.91		GBD
Incidence of breast cancer deaths (30-34)	151.72		GBD
Incidence of breast cancer deaths (35-39)	245.02		GBD
Incidence of breast cancer deaths (40-44)	528.86		GBD
Incidence of breast cancer deaths (45-49)	762.80		GBD
Incidence of breast cancer deaths (50-54)	1,449.79		GBD
Incidence of breast cancer deaths (55-59)	1,024.80		GBD
Incidence of breast cancer deaths (60-64)	765.26		GBD
Incidence of breast cancer deaths (65-69)	755.91		GBD
Incidence of breast cancer deaths (70-74)	726.49		GBD
Incidence of breast cancer deaths (75+)	913.38		GBD
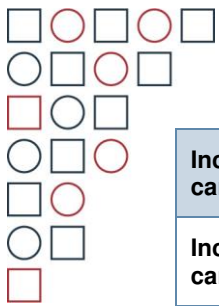
|			
Incidence of ovarian cancer deaths (15-19)	9.33		GBD
Incidence of ovarian cancer deaths (20-24)	14.16		GBD
Incidence of ovarian cancer deaths (25-29)	19.98		GBD
Incidence of ovarian cancer deaths (30-34)	27.22		GBD
Incidence of ovarian cancer deaths (35-39)	45.88		GBD
Incidence of ovarian cancer deaths (40-44)	84.91		GBD
Incidence of ovarian cancer deaths (45-49)	133.33		GBD
Incidence of ovarian cancer deaths (50-54)	210.34		GBD
Incidence of ovarian cancer deaths (55-59)	197.94		GBD
Incidence of ovarian cancer deaths (60-64)	210.70		GBD
Incidence of ovarian cancer deaths (65-69)	199.12		GBD
Incidence of ovarian cancer deaths (70-74)	193.70		GBD
Incidence of ovarian cancer deaths (75+)	327.31		GBD
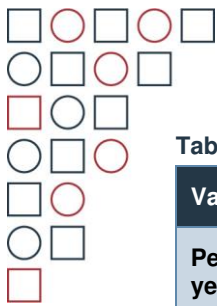
Table E.2.1 Number of maternal deaths due to breast cancer preventable with breastfeeding

Variable	Value	Formula/ Assumption
Percentage breastfeeding to 2 years	84.2%	Table F.1.1
Odds ratio	0.86	Chowdhury et al. 2015
Incidence of breast cancer deaths		Table F.1.1
Number of maternal deaths due to breast cancer preventable with breastfeeding (15-19)	0.81	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (20-24)	1.15	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (25-29)	2.45	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (30-34)	3.36	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (35-39)	5.42	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (40-44)	11.70	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (45-49)	16.87	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (50-54)	32.07	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (55-59)	22.67	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
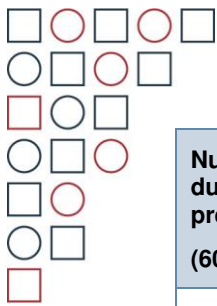
Number of maternal deaths due to breast cancer preventable with breastfeeding (60-64)	16.93	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (65-69)	16.72	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (70-74)	16.07	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to breast cancer preventable with breastfeeding (75+)	20.20	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Total number of maternal deaths due to breast cancer preventable with breastfeeding	166	

Table E.2.2 Number of maternal deaths due to ovarian cancer preventable with breastfeeding

Variable	Value	Formula/ Assumption
Percentage breastfeeding to 2 years	84.2%	Table F.1.1
Odds ratio	0.75	Chowdhury et al. 2015
Incidence of ovarian cancer deaths		Table F.1.1
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (15-19)	0.37	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (20-24)	0.56	Incidence * (100% - % BF at 2 years) * (1 – Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (25-29)	0.79	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (30-34)	1.08	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
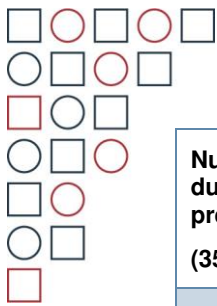
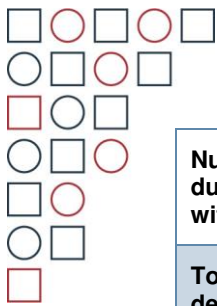|		
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (35-39)	1.81	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (40-44)	3.35	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (45-49)	5.27	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (50-54)	8.31	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (55-59)	7.82	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (60-64)	8.32	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (65-69)	7.87	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (70-74)	7.65	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to ovarian cancer preventable with breastfeeding (75+)	12.93	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Total number of maternal deaths due to ovarian cancer preventable with breastfeeding	66	
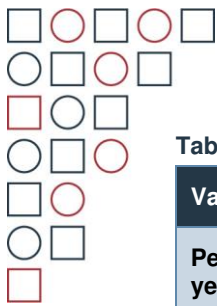
Table E.2.3 Number of maternal deaths due to type II diabetes preventable with breastfeeding

Variable	Value	Formula/ Assumption
Percentage breastfeeding to 2 years	84.2%	Table F.1.1
Odds ratio	0.86	Horta et al., 2015b (Upper bound estimate since restrictive evidence)
Incidence of maternal diabetes deaths		Table F.1.1
Number of maternal deaths due to diabetes preventable with breastfeeding (15-19)	0.76	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (20-24)	0.61	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (25-29)	0.93	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (30-34)	1.25	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (35-39)	2.15	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (40-44)	5.60	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (45-49)	12.64	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (50-54)	20.65	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (55-59)	9.05	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (60-64)	16.86	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due to diabetes preventable with breastfeeding (65-69)	24.65	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Number of maternal deaths due diabetes preventable with breastfeeding (70-74)	16.04	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)

Number of maternal deaths due to diabetes preventable with breastfeeding (75+)	161.75	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Total number of maternal deaths due to diabetes preventable with breastfeeding	272.93	

Table E.3.1 Number of maternal deaths attributed to not breastfeeding according to recommendation

Variable	Value	Formula/ Assumption
Total number of maternal deaths attributed to not breastfeeding according to recommendation	505	Number of maternal deaths due to breast cancer preventable with BF + Number of maternal deaths due to ovarian cancer preventable with BF + Number of maternal deaths due to type II diabetes preventable with BF

Health System and Household Cost

F — TOTAL HEALTH SYSTEM COST ATTRIBUTED TO NOT BREASTFEEDING ACCORDING TO RECOMMENDATION

The health system cost refers specifically to the direct medical costs for the treatment of cases of childhood diarrhoea and pneumonia, and cases of type II diabetes in women that can be attributed to not breastfeeding.

The number of cases of each childhood disease attributed to not breastfeeding was multiplied by the percentage of children with the disease who were taken to a health facility, the percentage of cases taken to a health facility that receive either outpatient care services or inpatient services (Lamberti et al., 2012; Niederman and Krilov, 2013) and the percentage of patients that seek care at each level of care (health centre, primary hospital, secondary hospital or teaching/tertiary hospital) in each country. The annual total cost of treatment of diarrhoea and pneumonia attributed to not breastfeeding is equal to the number of cases that receive outpatient and inpatient services at each level of care multiplied by the unit cost of treatment for children at each level of care.

The estimated health system cost of treatment for type II diabetes in women was calculated by multiplying the number of annual cases of type II diabetes attributed to not breastfeeding by an estimate on the percentage of cases of type II diabetes that are diagnosed. This figure represents the number of cases that are diagnosed and potentially treated, which is then multiplied by the health expenditure per case of type II diabetes in each country from the International Diabetes Federation Diabetes Atlas.
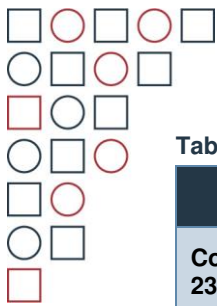
Table F.1.1 List of inputs (breastfeeding and diabetes)

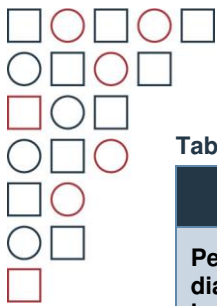| Variable	Value	Formula/ Assumption	Source
Continued BF at 20-23m	84.20%		UNICEF
No breastfeeding 20-23 m	15.80%	100% - Continued BF at 20-23m	
Annual number of cases attributed to suboptimal breastfeeding – diarrhoea (0-5m)	230,865		Table A.2.1
Annual number of cases attributed to suboptimal breastfeeding – diarrhoea (6-23m)	611,064		Table A.2.2
Annual number of cases attributed to suboptimal breastfeeding – ARI (0-5m)	21,660		Table A.2.1
Annual number of cases attributed to suboptimal breastfeeding – ARI (6-23m)	7,139		Table A.2.2
Incidence diabetes mellitus (female 15+)	2,494,869		Global Burden of Disease
Adults with undiagnosed diabetes [20-79] in 1,000s [uncertainty range]	5,712,300		IDF
Adults with diabetes [20-79] in 1,000s [uncertainty range]	13,136,300		IDF
Mean diabetes-related expenditure per person with diabetes [USD]	$76.50		IDF
Gross National Income (GNI), Atlas method (current USD)	$435,530,800,000		World Bank Group

Table F.1.2 List of inputs (health facility)

Variable	Value	Formula/ Assumption	Source
Percentage with diarrhoea taken to health facility	29.50%		UNICEF/ DHS
Percentage with pneumonia taken to health facility	46.40%		UNICEF/ DHS
Percentage of cases taken to health facility, who received outpatient care - diarrhoea	98.5%		Lamberti (2012)
Percentage of cases taken to health facility, who received inpatient care - diarrhoea	1.5%	100% - % of cases taken to health facility who received outpatient care (Diarrhoea)	Calculated
Mean # days of inpatient care - diarrhoea	8.40		Lamberti (2012)
Percentage of cases taken to health facility, who received outpatient care - ARI	87.0%		Niedermann (2013)
Percentage of cases taken to health facility, who received inpatient care - ARI	13.0%	100% - % of cases taken to health facility who received outpatient care (ARI)	Calculated
Mean # days of inpatient care - ARI	6.40		Zhang et al. (2016)
Percentage of outpatient in health centre	85%	Assumption	
Percentage of outpatient in primary level hospital	10%	Assumption	
Percentage of outpatient in secondary level hospital	5%	Assumption	
Percentage of inpatient in primary hospital	85%	Assumption	
Percentage of inpatient in secondary hospital	10%	Assumption	
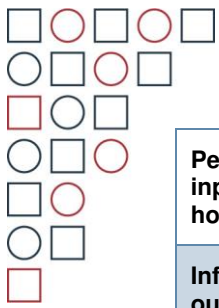
|			
Percentage of inpatient in teaching hospital	5%	Assumption	
Inflation adjusted outpatient visit cost - Cost per outpatient visit USD – health centre (no beds)	$2.23		WHO CHOICE
Inflation adjusted outpatient visit cost – cost per outpatient visit USD primary level hospital	$3.13		WHO CHOICE
Inflation adjusted outpatient visit cost - cost per outpatient visit USD- secondary level hospital	$3.26		WHO CHOICE
Inflation adjusted inpatient visit cost - cost per inpatient visit USD - primary level hospital	$8.17		WHO CHOICE
Inflation adjusted inpatient visit cost - cost per inpatient visit USD - secondary level hospital	$8.54		WHO CHOICE
Inflation adjusted inpatient visit cost - cost per inpatient visit USD - teaching hospital	$11.04		WHO CHOICE
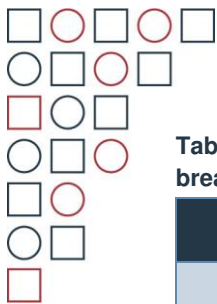
Table F.2.1 Cost of avoidable health care treatment of childhood diarrhoea attributed to not breastfeeding according to recommendation

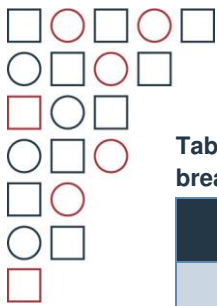| Variable	Value ($)		Formula/ Assumption
	0-5m	**6-23m**	
Total cost of outpatient care at health centre	$127,002	$336,155	Annual no. of cases * % with diarrhoea taken to health facility * % of cases who received outpatient care * % of outpatient in health care * Inflation adjusted outpatient visit cost
Total cost of outpatient care in primary level hospital	$21,017	$55,627	
Total cost of outpatient care in secondary level hospital	$10,919	$28,900	
Total cost of inpatient care in Primary hospital	$59,628	$157,826	Annual no. of cases * % with diarrhoea taken to health facility * % of cases who received inpatient care * % of inpatient in health care * mean no. days of inpatient care * Inflation adjusted outpatient visit cost
Total cost of inpatient care secondary hospital	$7,330	$19,402	
Total cost of inpatient care teaching hospital	$4,736	$12,536	
Cost of avoidable health care treatment of childhood diarrhoea (age group)	$230,632	$610,447	Total cost of outpatient care + Total cost of inpatient care
Cost of avoidable health care treatment of childhood diarrhoea attributed to not breastfeeding according to recommendation	$841,079		Cost of avoidable health care treatment (<6m) + Cost of avoidable health care treatment (6-23m)

Table F.2.2 Cost of avoidable health care treatment of childhood ARI/pneumonia attributed to not breastfeeding according to recommendation

Variable	Value ($)		Formula/ Assumption
	0-5m	**6-23m**	
Total cost of outpatient care at health centre	$16,553	$5,456	Annual no. of cases * % with ARI taken to health facility * % of cases who received outpatient care * % of outpatient in health care * Inflation adjusted outpatient visit cost
Total cost of outpatient care in primary level hospital	$2,739	$903	
Total cost of outpatient care in secondary level hospital	$1,423	$469	
Total cost of inpatient care in primary hospital	$58,102	$19,152	Annual no. of cases * % with ARI taken to health facility * % of cases who received inpatient care * % of inpatient in health care * mean no. days of inpatient care * Inflation adjusted outpatient visit cost
Total cost of inpatient care in secondary hospital	$7,143	$2,354	
Total cost of inpatient care in teaching hospital	$4,615	$1,521	
Cost of avoidable health care treatment of childhood ARI/Pneumonia (age group)	$90,575	$29,856	Total cost of outpatient care + Total cost of inpatient care
Cost of avoidable health care treatment of childhood ARI/pneumonia attributed to not breastfeeding according to recommendation	$120,430		Cost of avoidable health care treatment (<6m) + Cost of avoidable health care treatment (6-23m)

Table F.2.3 Cost of avoidable health care treatment of type II diabetes morbidity in mothers attributed to not breastfeeding according to recommendation

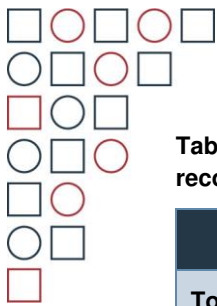| Variable	Value	Formula/ Assumption
Percentage breastfeeding to 2 years	84.20%	Table G.1.1
Odds ratio	0.86	Horta et al., 2015b (Upper bound estimate since restrictive evidence.)
Incidence	2,494,869.00	Table G.1.1
Incidence potentially averted at full BF rates	55,187	Incidence * (100% - % BF at 2 years) * (1 - Odds Ratio)
Health system cost of treating diagnosed incidence of type II diabetes potentially averted by BF	$2,385,938	Incidence potentially averted at full BF * (Adults with undiagnosed diabetes / Adults with diabetes) * Mean diabetes-related expenditure per person

Table F.3.1 Total health system cost attributed to not breastfeeding according to recommendation

| Variable	Value	Formula/ Assumption
Total health system cost attributed to not breastfeeding according to recommendation	$3,347,447	Cost of avoidable health care treatment of childhood diarrhoea + Cost of avoidable health care treatment of childhood ARI/pneumonia + Health System Cost of treating diagnosed incidence of type II diabetes potentially averted by BF
Total health system cost attributed to not breastfeeding according to recommendation as % of GNI	0.000769%	Total health system cost attributed to not breastfeeding according to recommendation / GNI, Atlas Method (current USD)

G — COST OF AVOIDABLE BREASTMILK SUBSTITUTE PURCHASED FOR CHILDREN NOT BREASTFED ACCORDING TO RECOMMENDATION

For this section only, the example of **Kenya** will be used as there is insufficient data for Bangladesh as of the time of creating this document.

COUNTRY OF EXAMPLE: KENYA *(THIS SECTION ONLY)*

Table G.1.1 List of inputs

Variable	Value	Formula/ Assumption	Source
Exclusive Breastfeeding (EBF) <6m	61.4%		UNICEF/DHS
Non-exclusive breastfeeding (non-EBF) <6m	38.1%	100% - Exclusive breastfeeding	
No breastfeeding <6m	0.5%	If no data, then 10% of non-EBF	DHS
Partial breastfeeding <6m	9.53%	25% of non-EBF minus no breastfeeding is assumed to be partial breastfeeding; (Non-EBF - No BF) * 0.25	
Predominant breastfeeding <6m	28.58%	75% of non-EBF minus no breastfeeding is assumed to be predominant breastfeeding; (Non-EBF - No BF) *0.75	
Continued BF at 20-23m	53.1%		UNICEF
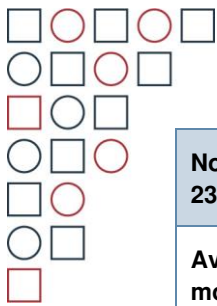
|			
No Breastfeeding 20-23 m	46.9%	100% - Continued BF at 20-23m	
Average nominal monthly earnings (local currency)	12,902.32		ILO
Official exchange rate (Local Currency Unit, LCU, per USD, period average)	109.64		World Bank Group
Average nominal monthly earnings (USD)	$117.68	Average nominal monthly earnings (local currency) / official exchange rate	
GNI, Atlas Method (current USD)	$110,400,900,000		World Bank Group
Price of economy infant formula (rural) (per 500g)	$27.01	For both 0-5m and 6-23m	Collected (see appendix A)
Quantity in a unit	500g	Assumption	
Units required for period (no breastfeeding 0-5m)	40	Assumption	
Units required for period (partial 0-5m)	30	Assumption	
Units required for period (predominant 0-5m)	10	Assumption	
Units required for period (no breastfeeding 6-23m)	36	Assumption	
Total population by age 0, both sexes combined	1,485,363		WPP
Total population by age 1, both sexes combined	1,455,451		WPP
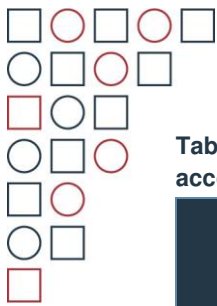
Table G.2.1 Cost of avoidable breastmilk substitute purchased for children not breastfed according to recommendation

|	No Breastfeeding 0-5m	Partial 0-5m	Predom 0-5m	No Breastfeeding 6-23m	Source/ Calculation
Total cost over period (USD)	$600	$450	$150	$540	Price of infant formula * Units required for period * 5/9
% Suboptimal breastfeeding behaviour	0.50%	9.53%	28.58%	46.9%	Table H.1.1
Total no. children in age groups	742,682			2,198,133	0-5m: Total population (Age 0) / 2 6:23m: Total population (Age 1) + (Total population age 0 / 2)
Total cost for group ($)	$2,228,687	$31,842,367	$31,842,367	$556,859,593	Total cost over period * Total no. of children in age group * percentage of suboptimal breastfeeding behaviour
Cost of avoidable breastmilk substitute purchased for children not breastfed according to recommendation	$622,773,014				Total cost for group (no BF 0-5m) + Total cost for group (partial) + Total cost for group (predom) + Total cost for group (no BF 6-23m)
Cost of formula feeding children 0-23 months as percent of nominal wages	61.6%				{Total cost over period (no BF 0-5m) + Total cost over period (no BF 6-23m)} / {Average nominal monthly earnings (USD) * 24}

Human Capital Losses

H — IQ POINTS AND YEARS OF EDUCATION LOST

The formulae for calculating projected number of IQ points and Years of Education lost have been replicated from the Nutrition International Investment Case tool. The IQ points effect size has been changed to Victora et al. (2015) to be consistent with the calculation of economic losses.

Table H.1.1 Projected number of IQ points and years of education lost

| Variable	Value	Formula/ Assumption
Exclusive breastfeeding <6m	62.6%	UNICEF/DHS
Non-exclusive breastfeeding (non-EBF) <6m	37.4%	100% - Exclusive breastfeeding <6m
Population of age 0	2,797,078	UN/UNICEF
Total number of child deaths attributed to not breastfeeding according to recommendation	3,155	Table C.3.1
Number of age 0 children not breastfeeding	1,049,262	(Population of Age 0 * Non-EBF <6m) + Total number of child deaths attributed to not BF
IQ points gained from EBF	2.62	Victora et al. (2016)
Years of education gained from EBF	0.91	Victora, et al. (2015).
Number of IQ points lost due to not breastfeeding according to recommendation	2,749,067	Number of age 0 children not BF * IQ points gained from EBF
Number of years of education lost due to not breastfeeding according to recommendation	954,828	Number of age 0 children not BF * Years of education gained from EBF
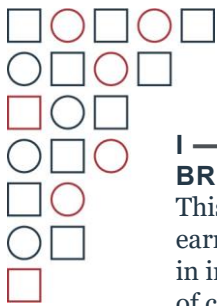
I — ECONOMIC LOSSES DUE TO COGNITIVE LOSSES ATTRIBUTED TO NOT BREASTFEEDING ACCORDING TO RECOMMENDATION

This estimation reflects the potential contribution to a country's economy through increased earnings over a person's productive years that will be lost due to not achieving cognitive gains in intelligence (provided by being breastfed according to recommendations) in the early years of childhood. This analysis calculated the cognitive losses by assuming that exclusive breastfeeding in children younger than six months of age compared with non-exclusive breastfeeding can achieve the same cognitive gains equal to a 2.62 IQ increase compared with not being breastfed (Horta et al., 2015; Victora et al., 2016). The 2.62 IQ increase point estimate was adjusted for maternal IQ and used in the tool in order to be conservative (Horta et al., 2015).

The potential future income lost due to cognitive losses is equal to multiplying the number of children not breastfed by GNI per capita (World Bank, 2016), the 2.62 IQ point increase lost per child not breastfed (Horta et al., 2015; Victora et al., 2016) and 1.067 percent increase in earnings lost for each IQ point lost (Hanushek and Woessmann, 2008). The total future income lost in a country is equal to the sum of this calculation for each year from the point that the children would have turned 18 years of age until expected retirement at age 65 or the country's age of life expectancy (World Bank, 2016), whichever comes first.

Table I.1.1 List of inputs

Variable	Value	Formula/ Assumption	Source
Exclusive Breastfeeding <6m	62.6%		UNICEF/DHS
Non-exclusive breastfeeding (non-EBF) <6m	37.4%	100% - EBF<6m	Calculated
Percentage of lifetime earning actually realized (child cognitive and mortality benefits)	90.0%		Hoddinott et al., 2013
Increase in IQ due to EBF	2.62		Victora et al. 2016
Increase in earnings due to increase in 1 IQ pt.	1.07%		Hanushek & Wossman 2008
% Wages account for GNI	42.20%	52% (Lubkner) for LMIC if ILO data not available	ILO
Labour Force Participation Rate, females %	36.35%		ILO
Discount rate costs	3.00%	Assumption	
Discount rate benefits	3.00%	Assumption	
Long-run GNI growth rate	3%	Assumption	
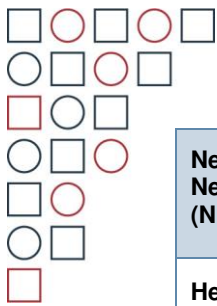
Net discount rate for Net Present Value (NPV) calculations	0%	(1+discount rate benefits)/ (1+GNI growth rate) - 1	
Healthy life expectancy (HALE) at birth	64.3		WBG WDI
Age for start of productivity	15	Assumption	
Age for end of productivity	64.3		If HALE is less than 65, then use HALE or else use 65
GNI, Atlas Method (current USD)	$435,530,800,000		World Bank Group
GNI per capita	$2,620.00		WBG WDI
Population of children Age 0	2,797,078		WPP
Age of Death for 15-19	17.0	Assumption	
Age of Death for 20-24	22.0	Assumption	
Age of Death for 25-29	27.0	Assumption	
Age of Death for 30-34	32.0	Assumption	
Age of Death for 35-39	37.0	Assumption	
Age of Death for 40-44	42.0	Assumption	
Age of Death for 45-49	47.0	Assumption	
Age of Death for 50-54	52.0	Assumption	
Age of Death for 55-59	57.0	Assumption	
Age of Death for 60-64	62.0	Assumption	
Age of Death for 65-69	67.0	Assumption	
Age of Death for 70-74	72.0	Assumption	
Age of Death for 75+	75.0	Assumption	
Child mortality (Diarrhoea/ARI)	2,946		Table C.3.1
Maternal deaths due to suboptimal breastfeeding (15-19)	1.9		Summation of breast cancer, ovarian cancer, and diabetes deaths
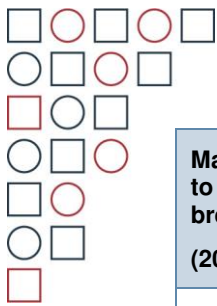
Maternal deaths due to suboptimal breastfeeding (20-24)	2.3		from Tables F.2.1, F.2.2, and F.2.3
Maternal deaths due to suboptimal breastfeeding (25-29)	4.2		
Maternal deaths due to suboptimal breastfeeding (30-34)	5.7		
Maternal deaths due to suboptimal breastfeeding (35-39)	9.4		
Maternal deaths due to suboptimal breastfeeding (40-44)	20.7		
Maternal deaths due to suboptimal breastfeeding (45-49)	34.8		
Maternal deaths due to suboptimal breastfeeding (50-54)	61.0		
Maternal deaths due to suboptimal breastfeeding (55-59)	39.5		
Maternal deaths due to suboptimal breastfeeding (60-64)	42.1		

CALCULATION OF COGNITIVE GAINS (EBF VS. NON-EBF) FOR A GIVEN YEAR:
(Population of Children Aged 0 * Non-Exclusive Breastfeeding <6m * increase in IQ due to EBF * Increase in earnings due to increase in 1 IQ point *Percentage wages account for GNI * (GNI per capita * (1 + GNI growth rate) ^Age) * Percentage of lifetime earning actually realized)

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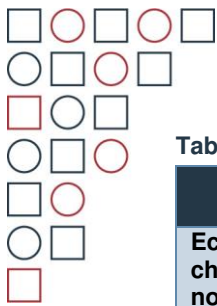(1/ (1 + Discount rate for benefits) ^Age)

Table I.2.1 Net benefits discounted – Mortality

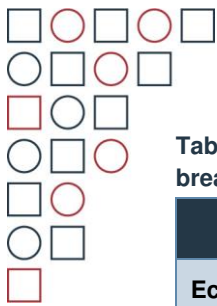| Variable	Value	Formula/Assumption[1]
Economic losses due to child mortality attributed to not breastfeeding according to recommendation	$154,799,974	Child mortality * Percentage of lifetime earning actually realized * {PV(Net discount rate, Age for end of productivity, GNI per capita) – PV(Net discount rate, Age for beginning of productivity, GNI per capita 2020)}
Economic losses due to maternal mortality attributed to not breastfeeding according to recommendation	$2,842,447	Maternal mortality * LFPR (female) * {PV(Net discount rate, Age of end of productivity – mean age of maternal death, GNI per capita}
Combined economic losses due to maternal and child mortality attributed to not breastfeeding according to recommendation	$157,642,421	Economic losses due to child mortality attributed to not breastfeeding according to recommendation + Economic losses due to maternal mortality attributed to not breastfeeding according to recommendation
Combined economic losses due to maternal and child mortality attributed to not breastfeeding according to recommendation as % of GNI	0.036%	Combined economic losses due to maternal and child mortality attributed to not breastfeeding according to recommendation / GNI, Atlas Method (current USD)

Table I.2.2 Net benefits discounted – Economic losses due to cognitive losses attributed to not breastfeeding according to recommendation

Variable	Value	Formula/Assumption[1]
Economic losses attributable cognitive losses attributed to not breastfeeding according to recommendation (NPV of future potential earnings with increased breastfeeding at full coverage)	$1,443,215,598	Population of Children Aged 0 * Non-Exclusive Breastfeeding <6m * increase in IQ due to EBF * Increase in earnings due to increase in 1 IQ point *Percentage wages account for GNI * Percentage of lifetime earning actually realized * **{**PV(Net discount rate, Age for end of productivity, GNI per capita) – PV(Net discount rate, Age for beginning of productivity, GNI per capita)**}**
Economic losses attributable cognitive losses attributed to not breastfeeding according to recommendation as % of GNI	0.331%	Economic losses attributable cognitive losses attributed to not breastfeeding according to recommendation / GNI, Atlas Method (current USD)
Total future cost (health system, mortality and cognitive) attributed to not breastfeeding according to recommendation	$1,600,858,019	Total health system cost attributed to not breastfeeding according to recommendation + Combined economic losses due to maternal and child mortality attributed to not breastfeeding according to recommendation + Economic losses attributable cognitive losses attributed to not breastfeeding according to recommendation; **Note**: Health system cost not available for Bangladesh and thus not included in this calculation
Total future cost (health system, mortality and cognitive) of suboptimal breastfeeding as % of GNI	0.368%	Total future cost (health system, mortality and cognitive) attributed to not breastfeeding according to recommendation / GNI, Atlas Method (current USD)
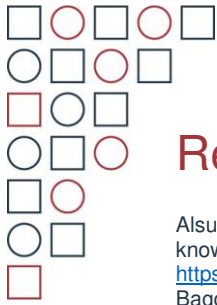
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Appendix

TABLE A: EXCLUSIVE BREASTFEEDING RATE FOR SELECT COUNTRIES

Exclusive breastfeeding rate for select countries for whom UNICEF or DHS data are not available.

Country	Year	Value	Source
Australia	2010	15.4	2010 Australian national infant feeding survey
Austria	2006	32.6	Bosi et al. (2015)
Belgium	2012	11.8	Bosi et al. (2015)
Bulgaria	2010	2	Bosi et al. (2015)
Croatia	2011	52.4	Bosi et al. (2015)
Cyprus	2004	12.4	Bosi et al. (2015)
Czech Republic	2011	17.8	Bosi et al. (2015)
Denmark	2012	17.2	Bosi et al. (2015)
Estonia	2015	30	Sarki et al. (2018)
Finland	2011	1	Bosi et al. (2015)
France	2003-2006	18	Sarki et al. (2018)
Germany	2003-2006	22.4	Bosi et al. (2015)
Greece	2009	0.7	Bosi et al. (2015)
Hungary	2007	43.9	Bosi et al. (2015)
Iceland	2011	13	Bosi et al. (2015)
Israel	2016	20	State of Israel Ministry of Health
Italy	1999	5	Bosi et al. (2015)
Latvia	2011	16.4	Bosi et al. (2015)
Lithuania	2015	31	Sarki et al. (2018)
Luxembourg	2008	6	Bosi et al. (2015)
Malta	2004-2005	35.9	Bosi et al. (2015)
Netherlands	2015	39	Sarki et al. (2018)
New Zealand	2014	15.7	Castro et al. (2017)
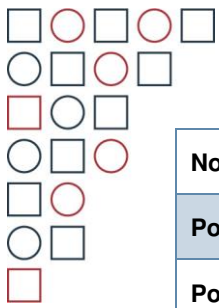
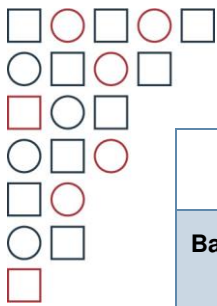|			
Norway	2003	7	Bosi et al. (2015)
Poland	2013	3.7	Bosi et al. (2015)
Portugal	2003	34	Bosi et al. (2015)
Republic of Korea	2015	9.4	Park et al. (2018)
Saudi Arabia	2019	16.3	Alsulaimani (2019)
Singapore	2011	0.8	National Breastfeeding Survey
Slovakia	2010	49.3	Bosi et al. (2015)
Spain	2011-2012	28.5	Bosi et al. (2015)
Sweden	2011	14	Bosi et al. (2015)
Switzerland	2003	14	Bosi et al. (2015)
United Kingdom	2010	1	Bosi et al. (2015)
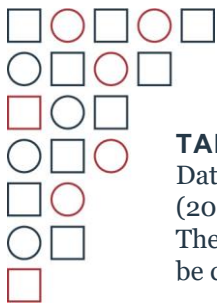
TABLE B: COST OF BREASTMILK SUBSTITUTES

Data on the unit price of infant formula from 97 countries was collected for the Walters et al. (2019) study through an online search of e-commerce vendors based in each country.
The lowest price of an economy brand of infant formula was selected for this analysis to be conservative since the average price paid is unknown.

| Country	Official exchange rate (LCU per USD, period average)- (WDI) [2020]	Lowest cost of BMS (900g) local currency	Cost of BMS (900g) USD	Source
Algeria	126.7768	1350	10.65	ardis.dz, March 8, 2017, 2.25 x Nestle Nan 1, 400g.
Argentina	70.53916667	107.45	1.52	disco.com.ar , Mar 8 2017, Nestle Nan 1, 900g.
Armenia	489.0088586	8977.5	18.36	en.sas.am, Mar 8, 2017, Friso brand "friso Gold", 400g
Aruba	1.79		20.67	http://www.packabarrel.com/store-gloria-supermarket-ltd-products-antiguabarbuda-34, Nestle Good Start Supreme, 32 oz/900g
Australia	1.453085118	30	20.65	Woolworths.com.au, Aptamil 900g Profutura Baby formula Stage 1
Austria	12.379065	14.61375	1.18	Merkurmarkt.at, Nestle BEBA, 800g
Azerbaijan	1.7	37.0575	21.80	bravosupermarket.az, Friso VOM 0-6m, 400g
Bahamas	1	16.99	16.99	nassaugrocery.com, Nestle Lactogen 1 900g
Bahrain	0.376	8.31375	22.11	http://alosraonline.com/, Nestle Nan 1 Optipro 0-6 months.
Bangladesh	84.87139167	2350	27.69	directfreshbd.com, Cow and Gate No. 1

				First Infant Milk, 900g
Barbados	2	44.9775	22.49	http://www.commerce.gov.bb/, SMA Gold Infant Formula 400g *2.25
Belarus	2.439575	30.4875	12.50	e-dostavka.by, Friso Gold Stage 1 400g x 2.25
Belgium	36.29864083	12.8025	0.35	colruyt.collectandgo.be, Nutrilon 1 milk 800g x 9/8
Bermuda	1		43.69	goceriesbermuda.com, Gerber Good Start Baby Formula 350g *90/35
Botswana	11.45624167	115.5375	10.09	sefalanaonline.com, Melegi infant formula 0-12m, 400g. Nestle Nan 1 = 51.95
Brazil	5.155178788	44.8875	8.71	www.paodeacucar.com, Nestle Nestogeno 1 Nestle Lata 800g x. 9/8
Bulgaria	1.716333333	28.7775	16.77	www.ebag.bg, Ganchev Probiotivc 1 0-6 months , Friso 1 15.69 400g, Nestle Nan 1 16.99lev 400g.
Cambodia	4092.783219		14.63	Delimarket.asia Nestle Lactogen 1 400g, x 2.25
Canada	1.341152672	22.77	16.98	Amazon Canada, Similac Non Omega Powder Step 1, 850g
Chile	792.7272061	24747.75	31.22	www.jumbo.cl, Nestle Nan 1, 400g x 2.25
China	6.900767269	99	14.35	Taobao.com July 2017
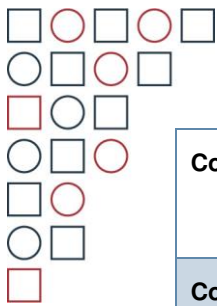
|				
Colombia	3694.854072	101925	27.59	rappi.com, Formula S-26 Gold 1, 400g x 2.25
Costa Rica	584.900855	12660	21.64	automercado.co.cr, Nestle Nan Infantil 1 900g
Croatia	6.6140555	141.7275	21.43	konzum.hr, Nestle Nan H.A. 1, 400g x 2.25
Cyprus	0.426125	17.0775	40.08	supermarketcy.com.cy, Nestle Nan 1 400g * 2.25
Czech Republic	23.21025	370.125	15.95	albert.cz, Nestle Beba Optipro 3, 800g x 9/8
Denmark	6.542152204	85.44375	13.06	nemlig.com, Nestle Nan Pro 1 800g x 9/8
Dominican Republic	56.52453333	546	9.66	alsuper.do, Nestle Nestogeno 1 900g
Egypt	15.75917292	225	14.28	knockmart.com, Nestle Nan 1 Optipro 400g x 2.25
El Salvador	1		18.49	superselectos.com, FORMULA INFANTIL NESTOGENO 1 900 GRS
Estonia	11.80684823		14.37	Hipp 1 Combiotic 800g * 9/8 * EU exchange
Fiji	2.168804924	25.77	11.88	rbpatel.com.fj, SMA Baby Milk 900g
Finland	5.344065833	10.04	1.88	suomikauppa.fi, Nutricia Standard 1 Milk, 400g, x 2.25
France	5.899515667	13.45	2.28	auchandirect.fr, Bledilait Age 1 900g
Germany	1.7596676	14.0625	7.99	amazon.de, Nestle Optipro 1 800g * 9/8
Ghana	5.595708333		19.21	UNICEF Ghana
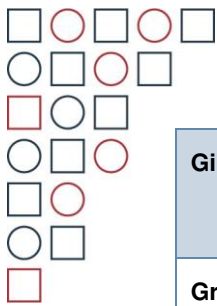
|				
Gibraltar	0.779999577	20.1375	25.82	compraonline.grupo eroski.com, Hero baby 1 400g * 2.25
Greece	365.3985608	18.7875	0.05	e-frsh.gr, Sanilac 1 400g * 2.25
Hong Kong SAR, China	7.75725	243	31.33	parknshop.com, Nutrilon Gold Stage 1, 900g
Hungary	307.9966667	3299	10.71	bevasarias.tesco.hu , Milumil 1 Optima Breastmilk substitute)+ M 900g
India	74.09956688	826	11.15	Amazon India, Mar. 8. 2017 Farex Stage 1, 450 g X 2.
Indonesia	14582.20347	115920	7.95	happyfresh.id, Nestle Lactogen 1 750g * 90/75
Iran	42000			hyperka.com not selling formula yet
Ireland	0.702270998	11.87	16.90	tesco.ie, SMA Staydown Infant Milk from birth 900g
Israel	3.442405852	79.9	23.21	mega.co.il, Similac Advance Step 1 Plus
Italy	1736.207383	21.09375	0.012	myshop.carrefour.it, Nestle Nidina 1 Optipro 800g * 9/8
Jamaica	142.4028328		28.75	shopsampars.com, SMA Gold Stage 1 900g
Japan	106.7745823	1797.75	16.84	the-seiyu.com, Yes Levens milk 810g from 0 months* 9/8
Kenya	106.4507802	2875	27.01	foodplus.co.ke, March 8, 2017 SMA 900G First Infant Milk
Republic of Korea	1180.265833	19125	16.20	corners.gmarket.co. kr, XO World class 3 Cans 51,000$ 800g each /3*9/8
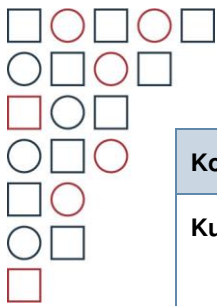
Kosovo	0.877475207			
Kuwait	0.306233122	6.65	21.72	taw9eel.com, S26 Gold Infant Formula 900g Stage 1
Latvia	0.529391667		11.56	prisma.lv, Apatmil 1 800g, * 9/8 * EU exchange
Lebanon	1507.5	22999	15.26	spinneysdelivery.com, Aptajunior 3 900g, no stage 1 available.
Lithuania	2.600291667		13.47	prisma.lt, Aptamil 1 From bith 800g * 0.94 * 9/8
Luxembourg	36.29864083	13.09	0.36	auchandrive.lu, Hipp Combiotik 900g Stage 1
Malaysia	4.203481949	53.775	12.79	eshop.tesco.com.my, Dumex Bebelac Infant Formula 0-12 month 800g *9/8
Malta	0.311675		15.53	maltasupermarket.com, SMA comfort 800g X 9/8
Mauritius	39.34693333	346.5	8.81	theshop.mu, Bledina Nursie baby Milk Stage 1 400g *2.25
Mexico	21.48560833	219.375	10.21	super.malmart.com.mx, Nestle Nan 1 optipro 800g * 9/8
Mongolia	2813.289835	26998.2	9.60	eshop.nomin.mn, Milasan Baby Milk 1-5 months Stage 1, Germany
Myanmar	1381.619167	18000	13.03	dailymart.com.mm, Dumex Dulac infant formula Step 1
Nepal	118.3451873	1109.25	9.37	bhatbhatenionline.com, Nestle Lactogen Stage 1 400g * 2.25
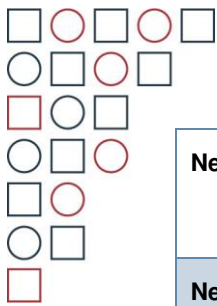
Netherlands	1.983733	7.30125	14.48	ah.nl, Albert Heijn (AH) H Infants Milk standard 1
New Zealand	1.542058333	20	12.97	shop.countdown.co.nz, Blackmores Starters Formula From Birth 900g
Nigeria	358.8107973	4837.5	13.48	Gloo.ng, Nestle Nan Stage 1 400g * 2.25
Norway	9.415833333	157	16.67	kolonial.no, HIPP combiotik 1 Infant Formula, 450g * 2
Oman	0.3845			
Pakistan	161.8384797	1597.5	9.87	tazamart.pk, Similac Advance with Eye Q
Panama	1		16.81	ribasmith.com, Nutriben Formula Natal 900g
Peru	3.337265547	138.825	41.60	wong.com.pe, Enfamil premium 1 dairy formula 800g * 9/8
Philippines	49.624096	496	10.00	grocerydelivery.com.ph Walter Mart, Bonna Infant Formula 900g
Poland	3.899741667	49.4775	12.69	en.dodomku.pl, Nestle Nan 1 400g * 2.25
Portugal	180.10448	14.85	0.08	continente.pt, Aptamil 1 800g *9/8
Puerto Rico				
Qatar	3.64	73.75	20.26	dohassoq.com, S-26 Gold Baby Milk 1 900g
Romania	4.243991667	62.67375	14.77	emag.ro, Nestle Nan 1 800g * 9.8
Russia	72.10490833	1134	15.73	av.ru, Dry mix Nutricia Nutrilon 1 with prebiotics from birth 400g *2.25
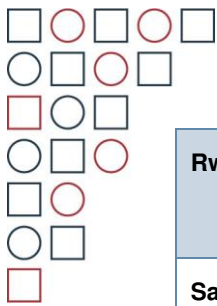
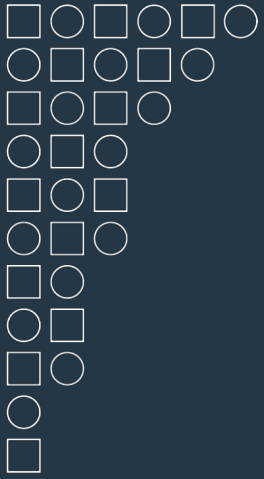| Rwanda	943.2780482	18675	19.80	grocewheels.com, Nestle Nan 1 400g *2.25
Samoa	2.664960845		17.32	mypacific.online, SMA infant milk from birth 900g NZD 24.83
Saudi Arabia	3.75	63	16.8	salatty.com, Similac Advance 1 baby milk
Serbia	103.1632917	1529.9775	14.83	Bebelac Stage 1, 400g x 2.25.
Singapore	1.379741667	29.9	21.67	redmart.com, Cow and Gate Stage 3 1-2 years 900g, No Stage 1 available.
South Africa	16.45910539	110.95	6.74	Woolworths.co.ca, March 8, 2017, Nestle Lactogen Stage 1 900g
Spain	149.3953317	11.64375	0.08	tudespensa.com, Nestle Nativa 1 Optipro 800g * 9/8
Sri Lanka	185.5925578	2565	13.82	keellssuper.com, Nestle Nan 1 400g * 2.25
Eswatini	16.47025587	114.99	6.98	shop.pnp.co.za, Nestle Lactogen 1 900g
Sweden	9.210309028	101.25	10.99	ccop.se, Nestle Nan Pro 1 800g * 9/8
Switzerland	0.938841667	26.4375	28.16	coopathome.ch, Milupa Aptamil 1 infant formula
Thailand	31.29367321	946.125	30.23	tops.co.th, ENFALAC A PLUS1 INFANT MILK POWDER 800G *9/8
Trinidad and Tobago	6.751052687	102.99	15.26	gofuhme.com, Nestle Lactogen 1 900g
Tunisia	2.812358333	53.775	19.12	jadopado.com, Wyeth S-26 Gold
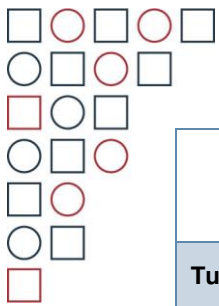
				Stage 1 Baby Food Infant Formula - 400g * 2.25
Turkey	7.008605416	61.95	8.84	sanalmarket.tr, SMA 1 STARTING MILK 900 GR
Uganda	3718.248923		25.43	supermarket.co.ug, March 8, 2017, 2.25 X price of Nestle Nan 1, 400g.
Ukraine	26.95752438	614.25	22.79	novus.zakaz.ua, Nestle Nan 1 400g x 2.25
United Arab Emirates	3.6725	78.46875	21.37	trolley.ae, Nan 1 Optipro 800g * 9/8
United Kingdom	0.779999577	11.25	14.42	tesco.com, Sma Pro First Infantmilk From Birth 800G *9/8
United States	1	17.608	17.60	walmart.com, Parents Choice Parent's Choice Premium Formula, milk based powder with Iron: 35ox *31/35
Vietnam	23208.36833	868541.0334	37.42	
Zambia	18.34409265	87.75	4.78	shop4me.biz, NESTLE Nan1 Optipro One (400g) * 2.25
Zimbabwe	51.32901312		15.39	foodworld.co.zw, Nestle Lactogen 1 500g *2.25

TABLE C: CHANGE LOG

Future changes or repairs to the Cost of Not Breastfeeding (CONBF) data and model will be tracked and displayed in the following table:

Change No.	Effective Date	Change Description	Implications
1			
2			
3			
4			

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