



Nutrition modeling in LiST

February 2019



Birth outcomes

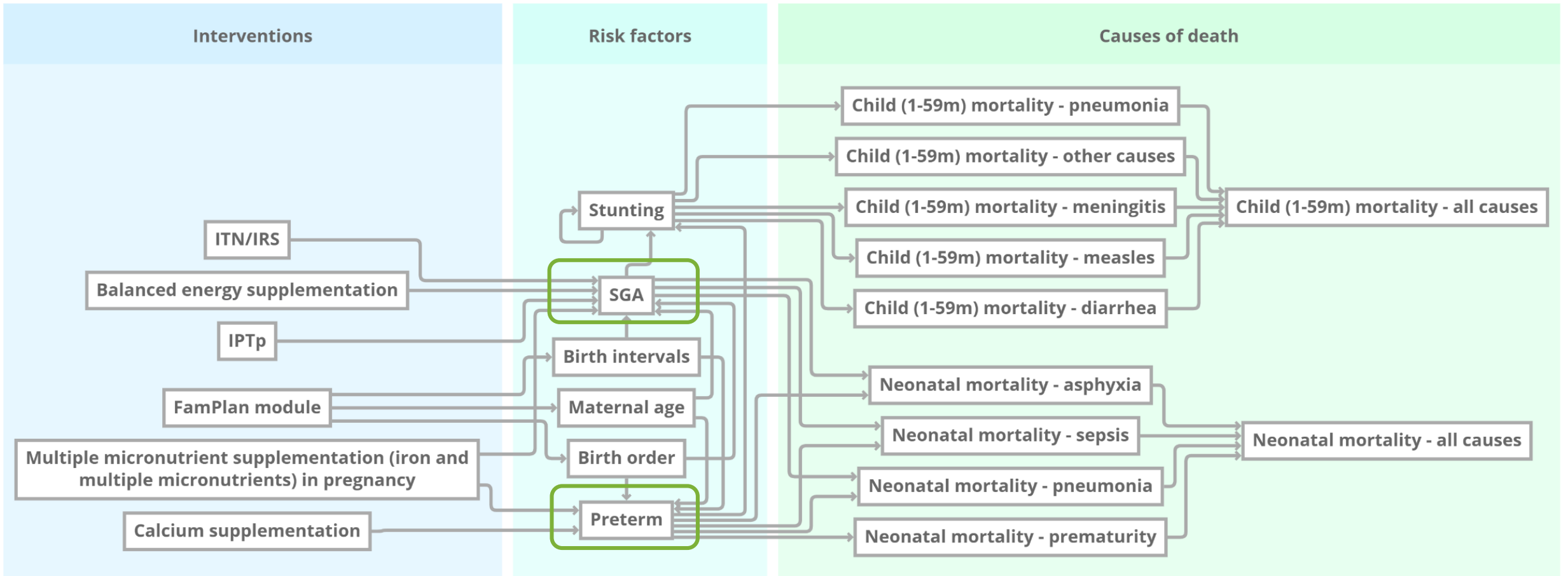
WHA target: 30% reduction in low birth weight

Low birth weight in LiST

- Most surveys (and most targets) use LBW as their metric
 - Typically difficult to collect data on SGA v. preterm
- LiST separates LBW into small-for-gestational-age (SGA) and preterm
 - Each has very different implications for mortality
 - Region-specific ratio between SGA and preterm allows to LiST to calculate prevalence of each based on prevalence of LBW



Low birth weight in LiST



Birth outcomes as an outcome

Effectiveness of nutrition interventions - test

Impacts on birth outcomes | Impacts on stunting | Impacts on wasting | Impacts on maternal anemia | Breastfeeding promotion

Maternal age and birth order

	Pre-term SGA	Pre-term AGA	Term SGA
	Relative risk	Relative risk	Relative risk
Less than 18 years			
First birth	3.140	1.750	1.520
Second and third births	1.600	1.400	1.200
Greater than third birth	1.600	1.400	1.200
18 - 34 years old			
First birth	1.730	1.750	1.520
Second and third births	1.000	1.000	1.000
Greater than third birth	1.000	1.000	1.000
35 - 49 years old			
First birth	1.730	1.750	1.520
Second and third births	1.570	1.330	1.000
Greater than third birth	1.570	1.330	1.000

Birth intervals

	Pre-term SGA	Pre-term AGA	Term SGA
	Relative risk	Relative risk	Relative risk
First birth	1.000	1.000	1.000
less than 18 months	3.030	1.490	1.410
18-23 months	1.770	1.100	1.180
24 months or greater	1.000	1.000	1.000

Maternal nutrition


	Pre-term SGA		Pre-term AGA		Term SGA	
	Effectiveness	Affected fraction	Effectiveness	Affected fraction	Effectiveness	Affected fraction
IPTp - Intermittent preventive treatment of malaria during pregnancy	0.35	0.00	0.00	0.00	0.35	0.00
Balanced energy supplementation	0.21	0.53	0.00	0.53	0.21	0.53
Iron supplementation in pregnancy	0.15	1.00	0.00	1.00	0.15	1.00
Multiple micronutrient supplementation in pregnancy	0.23	1.00	0.00	1.00	0.23	1.00
Calcium supplementation	0.12	1.00	0.12	1.00	0.00	1.00
ITN/IRS - Households protected from malaria	0.35	0.00	0.00	0.00	0.35	0.00

- Birth outcomes can be considered as an intermediary outcome
- Relative risk for low birth weight is impacted by:
 - Maternal age
 - Birth intervals
 - Maternal health status



Birth outcomes as a risk factor

Birth outcomes also directly impact mortality

 Impact of under-nutrition on mortality - test

Impact of stunting on mortality

Impact of wasting on mortality

Impact of birth outcomes on mortality

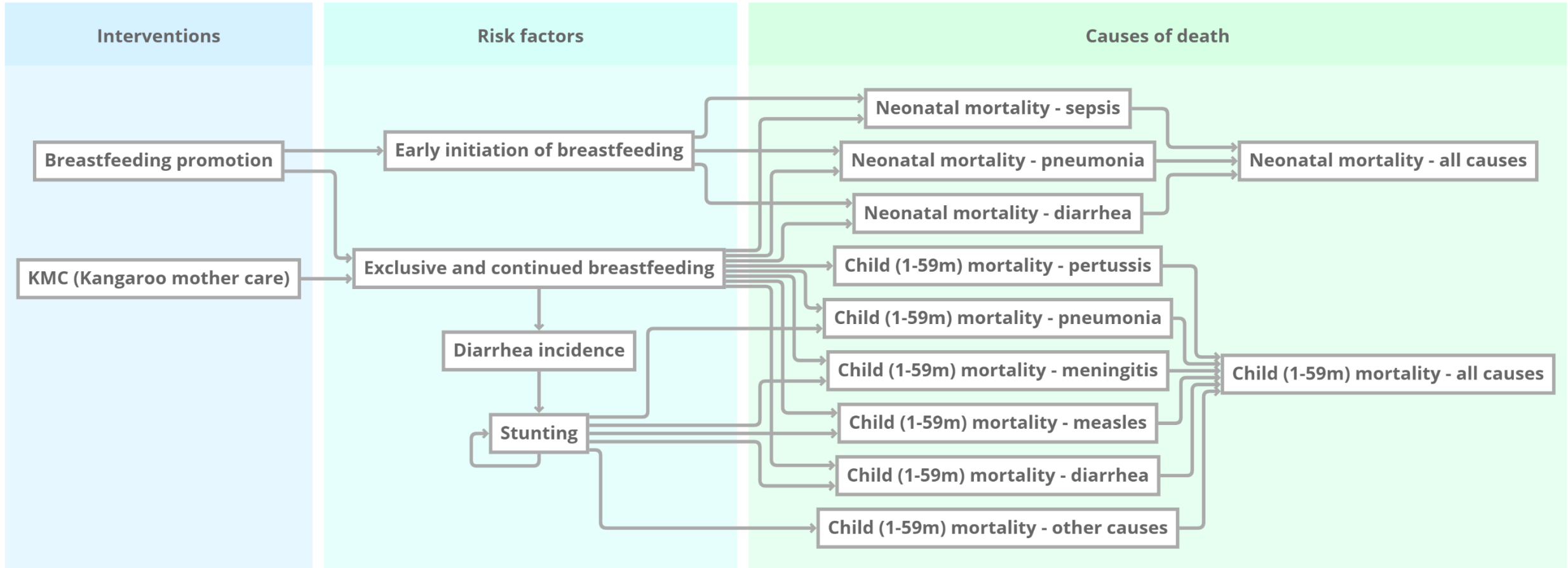
	Term AGA	Term SGA	Pre-term AGA	Pre-term SGA
	Relative risk	Relative risk	Relative risk	Relative risk
Neonatal - Diarrhea	1.000	1.000	1.000	1.000
Neonatal - Sepsis	1.000	2.070	8.020	11.540
Neonatal - Pneumonia	1.000	2.070	8.020	11.540
Neonatal - Asphyxia	1.000	2.070	8.020	11.540
Neonatal - Prematurity *	1.000	1.000	999.990	999.990
Neonatal - Tetanus	1.000	1.000	1.000	1.000
Neonatal - Congenital anomalies	1.000	1.000	1.000	1.000
Neonatal - Other	1.000	1.000	1.000	1.000



Breastfeeding

WHA target: increase the rate of exclusive breastfeeding in the first 6 months up to at least 50%

Breastfeeding in LiST



Breastfeeding in LiST

Promotion

- Is an intervention
- Is less commonly measured
- Impacts mortality through changes in breastfeeding behavior
- Effectiveness studies exist relating breastfeeding promotion to age-appropriate breastfeeding

Behavior

- Is not an intervention
- Measured in surveys
- Directly impacts cause-specific mortality
 - NN diarrhea, pneumonia, sepsis
 - U5 diarrhea, pneumonia, meningitis, measles and pertussis



Breastfeeding in LiST - promotion

Promotion

Prevalence

- Only have the option of entering single value for breastfeeding promotion
- Can be delivered through:
 - Health system promotion
 - Home/community promotion
- LiST then calculates coverage of (for each age group):
 - Exclusive breastfeeding
 - Predominant breastfeeding
 - Partial breastfeeding
 - Not breastfeeding
- Odds ratios are available in: Effectiveness of interventions -> Breastfeeding

Breastfeeding in LiST - prevalence

Promotion

Prevalence

- LiST calculates impact on cause-specific mortality directly (for neonatal and post-neonatal)
 - Diarrhea
 - Pneumonia
 - Meningitis
 - Measles
 - Pertussis
- LiST also calculates the impact of breastfeeding on diarrhea incidence, and then cause-specific mortality based on relative risk

Impact of BF behavior on incidence

Effectiveness of interventions on incidence - test

	Impacts on diarrhea incidence		Impacts on pneumonia incidence		Impacts on meningitis incidence	
		<1 month		1-5 months		1-5 months
	Effectiveness	Affected fraction	Effectiveness	Affected fraction	Effectiveness	Affected fraction
Preventive						
Improved water source	0.17	1.00	0.17	1.00	0.17	1.00
Water connection in the home	0.63	1.00	0.63	1.00	0.63	1.00
Improved sanitation - Utilization of latrines or toilets	0.36	1.00	0.36	1.00	0.36	1.00
Hand washing with soap	0.48	1.00	0.48	1.00	0.48	1.00
Hygienic disposal of children's stools	0.20	1.00	0.20	1.00	0.20	1.00
Zinc supplementation	0.00	0.18	0.00	0.18	0.00	0.18
Vitamin A supplementation	0.00	0.42	0.00	0.42	0.00	0.42
Vaccines						
Rotavirus vaccine	0.00	1.00	0.00	1.00	0.00	1.00
Diarrheal vaccine pathogen B	0.00	1.00	0.28	1.00	0.28	1.00

Scale up BF behavior →
LiST calculates impact
on diarrhea incidence
based on these RRs

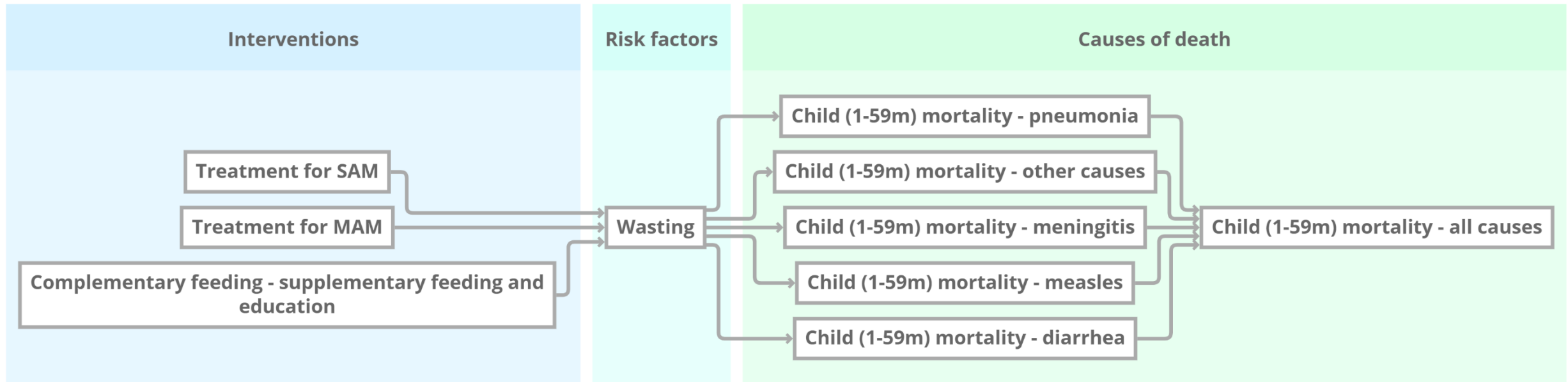
Risk of diarrhea incidence at different levels of breastfeeding (relative to exclusive breastfeeding)

	<1 month	1-5 months	6-11 months	12-23 months	24-59 months
	Relative risk	Relative risk	Relative risk	Relative risk	Relative risk
Exclusive breastfeeding	1.00	1.00	1.00	1.00	1.00
Predominant breastfeeding	1.26	1.26	1.00	1.00	1.00
Partial breastfeeding	1.68	1.68	1.00	1.00	1.00
Not breastfeeding	2.65	2.65	2.07	2.07	1.00



Wasting

Wasting in LiST



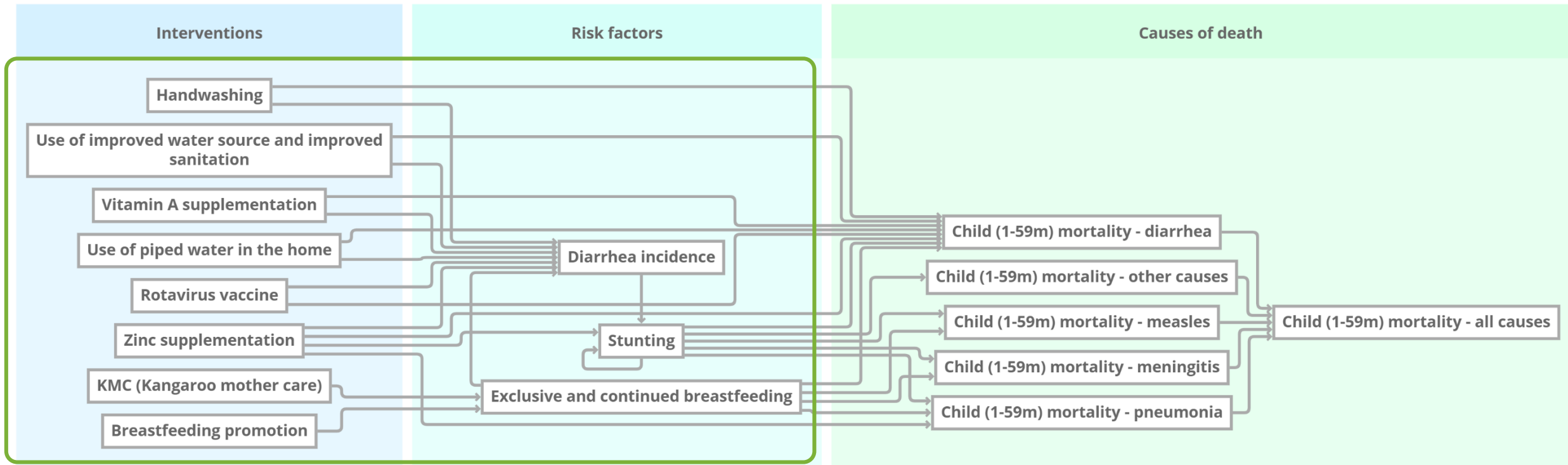
Wasting in LiST

- LiST calculates impact on cause-specific mortality directly (for each age groups)
 - Diarrhea
 - Pneumonia
 - Meningitis
 - Measles
 - Pertussis
- LiST also calculates the impact wasting on cause-specific mortality based on relative risk

Effectiveness of nutrition interventions on wasting

- LiST calculates impact on cause-specific mortality directly (for each age groups)
 - Therapeutic feeding – severe acute malnutrition recovery rate
 - Moderate acute malnutrition recovery rate
 - Impact of complementary feeding on wasting differs depending on category:
 - Food secure with promotion
 - Food secure without promotion
 - Insecure with promotion and supplementation
 - Insecure with neither promotion nor supplementation

Diarrhea incidence



Impact of interventions on diarrhea incidence

Impact of interventions on diarrhea incidence

Effectiveness of interventions on incidence - test

Impacts on diarrhea incidence		Impacts on pneumonia incidence		Impacts on meningitis incidence				
	<1 month		1-5 months		6-11 months		12-23 months	
	Effectiveness	Affected fraction	Effectiveness	Affected fraction	Effectiveness	Affected fraction	Effectiveness	Affected fraction
Preventive								
Improved water source	0.17	1.00	0.17	1.00	0.17	1.00	0.17	1.00
Water connection in the home	0.63	1.00	0.63	1.00	0.63	1.00	0.63	1.00
Improved sanitation - Utilization of latrines or toilets	0.36	1.00	0.36	1.00	0.36	1.00	0.36	1.00
Hand washing with soap	0.48	1.00	0.48	1.00	0.48	1.00	0.48	1.00
Hygienic disposal of children's stools	0.20	1.00	0.20	1.00	0.20	1.00	0.20	1.00
Zinc supplementation	0.00	0.18	0.00	0.18	0.00	0.18	0.00	0.18
Vitamin A supplementation	0.00	0.42	0.00	0.42	0.38	0.42	0.38	0.42
Vaccines								
Rotavirus vaccine	0.00	1.00	0.00	0.27	0.00	0.27	0.00	0.27
Diarrheal vaccine pathogen B	0.00	1.00	0.28	0.18	0.28	0.18	0.28	0.18
Diarrheal vaccine pathogen C	0.00	1.00	0.00	0.12	0.00	0.12	0.00	0.12
Impacts on severe diarrhea incidence								
Rotavirus vaccine	0.00	1.00	0.50	1.00	0.50	1.00	0.50	1.00

Risk of diarrhea incidence at different levels of breastfeeding (relative to exclusive breastfeeding)

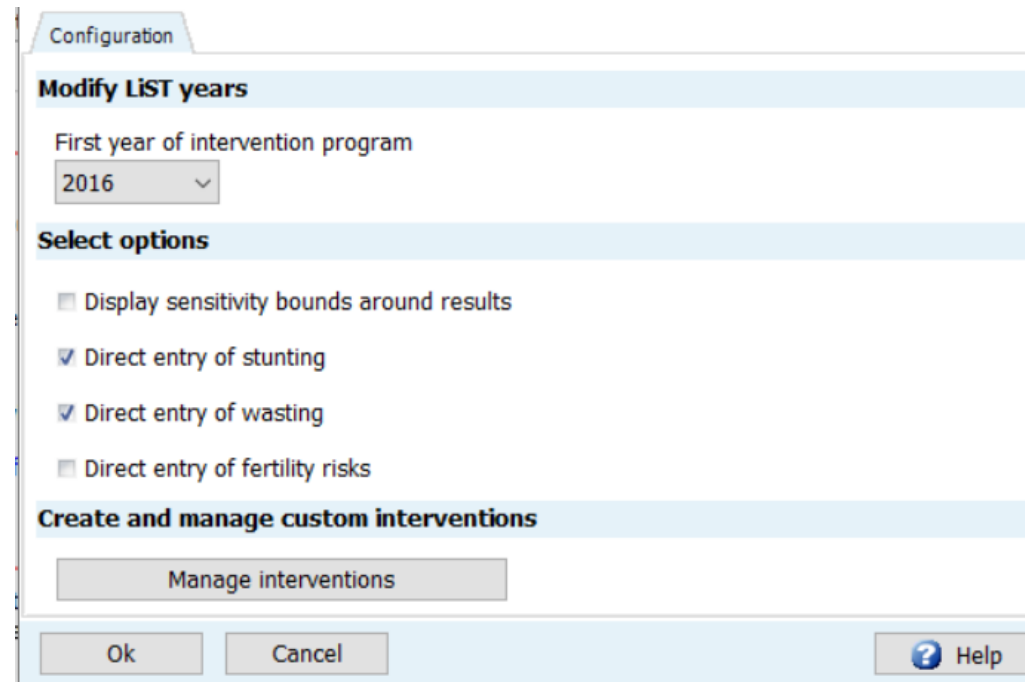
	<1 month	1-5 months	6-11 months	12-23 months	24-59 months
	Relative risk	Relative risk	Relative risk	Relative risk	Relative risk
Exclusive breastfeeding	1.00	1.00	1.00	1.00	1.00
Predominant breastfeeding	1.26	1.26	1.00	1.00	1.00
Partial breastfeeding	1.68	1.68	1.00	1.00	1.00
Not breastfeeding	2.65	2.65	2.07	2.07	1.00

Direct entry of stunting and wasting

Understanding “direct entry”

If stunting and/or wasting coverage values are available, they can be entered directly

LiST treats them as interventions



The screenshot shows a configuration window for LiST. It has a 'Configuration' tab at the top. Below the tab, there are three main sections: 'Modify LiST years', 'Select options', and 'Create and manage custom interventions'. In the 'Modify LiST years' section, there is a dropdown menu for 'First year of intervention program' set to '2016'. In the 'Select options' section, there are four checkboxes: 'Display sensitivity bounds around results' (unchecked), 'Direct entry of stunting' (checked), 'Direct entry of wasting' (checked), and 'Direct entry of fertility risks' (unchecked). In the 'Create and manage custom interventions' section, there is a 'Manage interventions' button. At the bottom of the window, there are 'Ok', 'Cancel', and 'Help' buttons.

Direct entry:

ON

OFF

“Stunting” and “Wasting” tabs appear in the software, and coverage data can be entered directly in the software

The screenshot shows the Spectrum software interface. The top navigation bar includes 'File', 'Home', 'Modules', and 'Tools'. The 'Modules' section contains icons for 'Set Active', 'Manager', 'Projection Sources', 'DemProj', 'AIM', 'LIST', 'FamPlan', 'Group', and 'Favorites'. The 'LIST' module is highlighted. Below this, a breadcrumb trail shows 'Configuration' > 'Health status, mortality and economic status' > 'Coverage' > 'Effectiveness' > 'Results'. The 'Coverage' tab is active, and the 'Stunting' and 'Wasting' sub-tabs are visible. The 'Stunting' sub-tab is selected, and a table displays coverage data for various interventions from 2016 to 2023. The 'Folic acid supplementation/fortification' row is highlighted, and its 2016 value is 0.0. Green arrows point to the 'Stunting' and 'Wasting' sub-tabs.

Intervention (%)	2016	2017	2018	2019	2020	2021	2022	2023
Contraceptive use								
Folic acid supplementation/fortification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Safe abortion services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Post abortion case management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ectopic pregnancy case management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blanket iron supplementation/fortification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Direct entry:

ON

OFF

Link between nutrition interventions with impact on mortality via stunting or wasting is 'broken'

Two options to enter stunting or wasting data:

Single indicator for stunting
(or wasting)

LiST automatically calculates the stunting/wasting severity distribution, per age cohort

Detailed indicators for stunting (or
wasting)

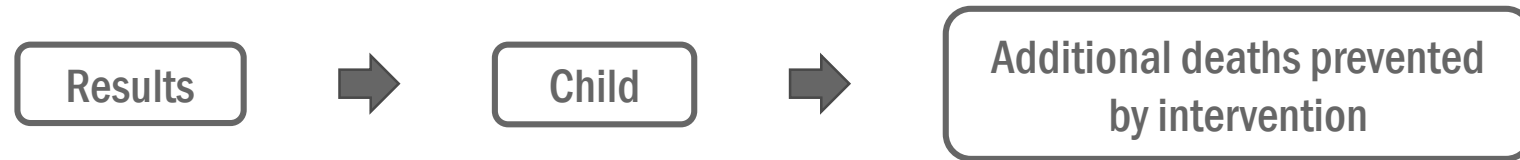
Users provide coverage data for the stunting/wasting severity distribution, per age cohort

Note: in the case of stunting, zinc can still be edited because it has pathways to mortality other than via stunting

Direct entry:

ON

OFF



Changes in mortality are attributed to changes in stunting or wasting prevalence (i.e. lives saved by decreasing stunting or wasting prevalence)

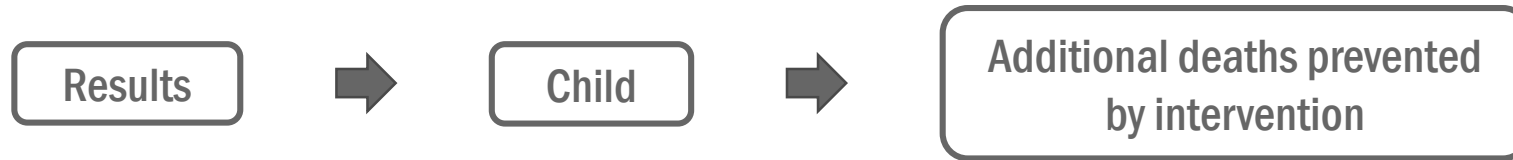
Direct entry:

ON

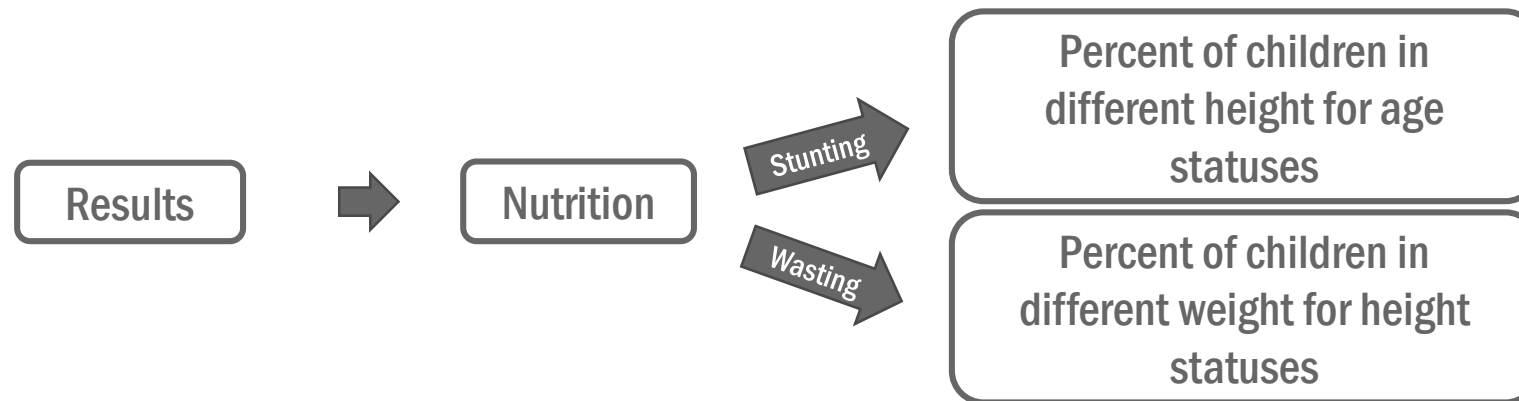
OFF

- User does not have option to enter data on stunting or wasting distribution
- Changes in stunting and wasting distribution are calculated based on changes in coverage of interventions linked to stunting and wasting, respectively

Direct entry:



Lives saved will be listed by intervention instead of in a stunting or wasting category



Can see changes in stunting or wasting distribution (due to changes in intervention coverage)

Conclusions

Additional features



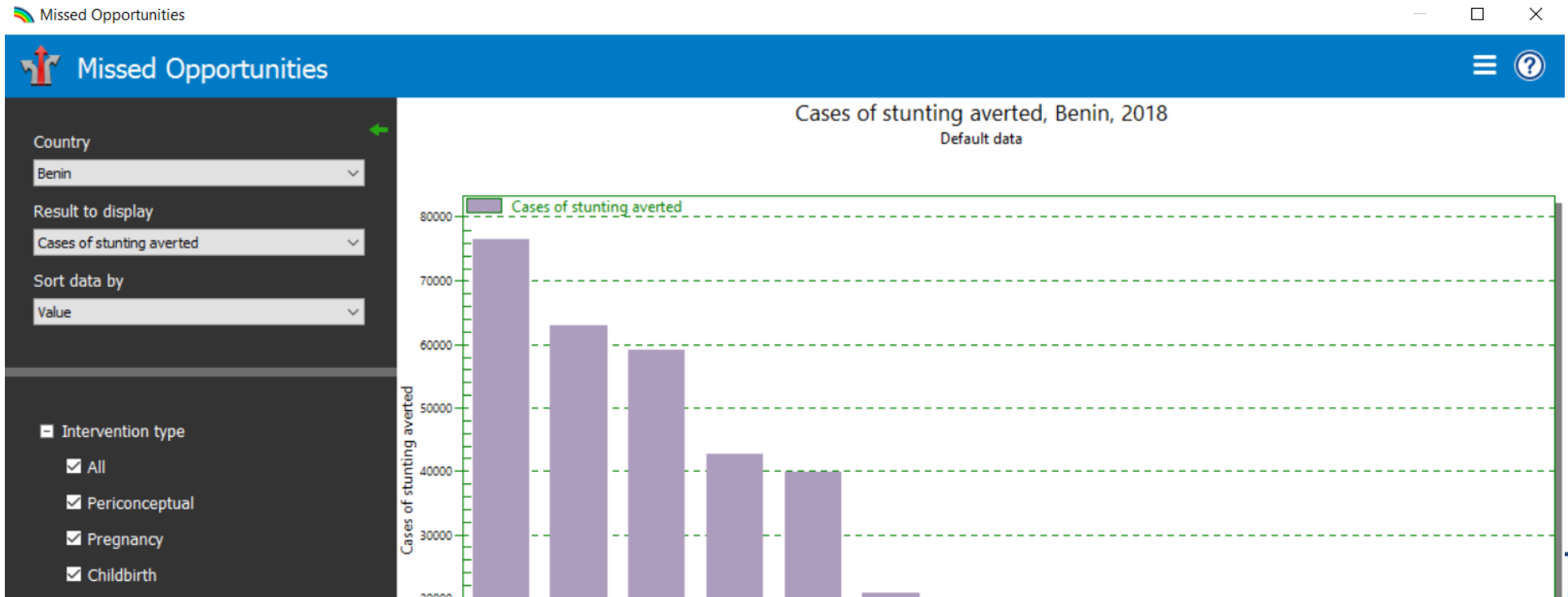
- Birth outcomes
- Percentage of children stunted
- Number of stunted children
- Percentage of children wasted
- Global stunting rate
- Global wasting rate
- Number of stunting cases averted
- Number of stunting cases averted by intervention
- Breastfeeding prevalence
- Percent of children (<6mo) exclusively breastfed
- Prevalence of early initiation of breastfeeding
- Percent of women with anemia
- Number of women with anemia
- Number of anemia cases prevented

Additional features

Tools



Missed opportunities



Challenges

- Lack of data on many key nutrition interventions
- Not all interventions are being implemented at public health scale (e.g. calcium supplementation)
- Incomplete understanding of link between promotion and practice
- Difficulty of interpreting wasting numbers

What's not in the model

- Deworming
- Nutrition-sensitive interventions (agriculture, home gardens, etc.)
- Salt iodization

→ Mostly due to lack of data for effect size



The Lives Saved Tool

-  Help files
-  Training material
-  User forum
-  Webinars

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