

Optima Nutrition

Overview and example applications

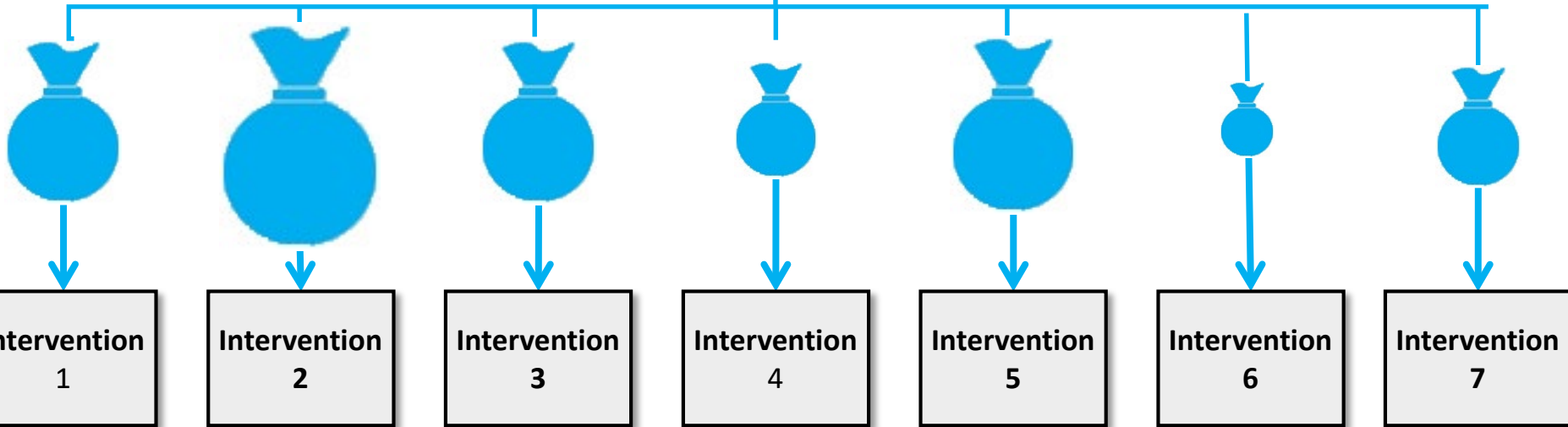
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Objective of Optima Nutrition

Optima Nutrition is a mathematical model designed to answer

“What combinations of investments in nutrition interventions can lead to optimal outcomes?”

Overall public health budget
available for nutrition

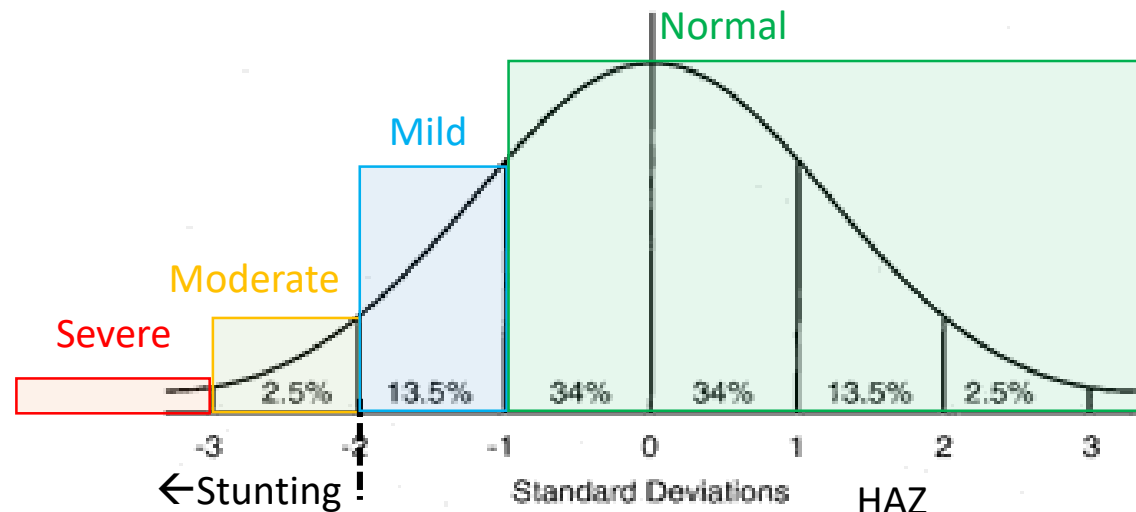


Overview of the Optima Nutrition model

- The underlying model tracks the under-5 population over a given period (e.g. 2018-2030)
- The model includes risk factors that contribute to mortality, stunting, wasting and anaemia
- The model includes a range of interventions
 - For children, pregnant women, non-pregnant women of reproductive age, or the general population.
- Key outcomes are the number of deaths (child and maternal), stunting, wasting and anaemia (number of cases as well as prevalence)
- An optimisation algorithm is used to allocate a given budget across the nutrition interventions to minimise a chosen objective
 - For example, maximise the number of alive and non-stunted children

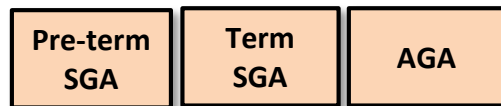
Definition of stunting in the model

- Risk factors for stunting are:
 - Birth outcomes
 - Breastfeeding practices
 - Diarrhoea incidence
 - Past stunting
- Stunting increases the risk of mortality for children who have diarrhoea, pneumonia, measles and other illnesses



Model populations and the ageing process

Births



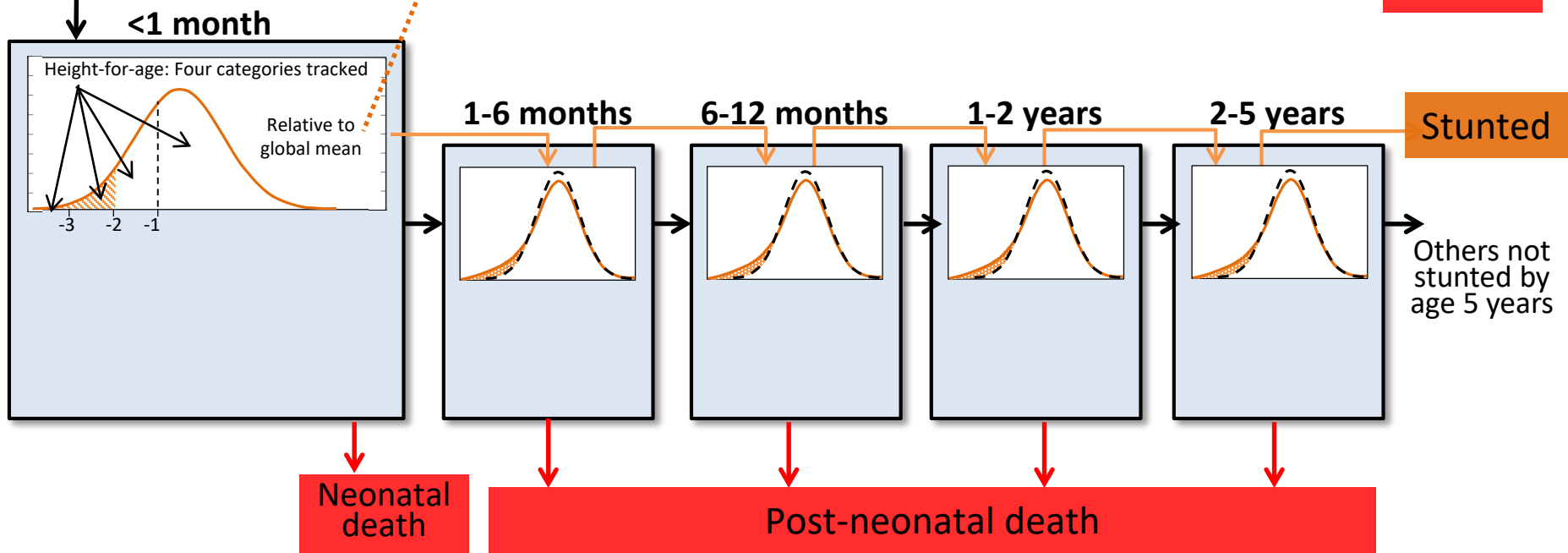
Risks of stunting include

- breastfeeding practices
- past stunting
- diarrhoea incidence

SGA: Small for gestational age
AGA: Appropriate for gestational age

Key endpoints

- Stunting
- Deaths



Stunting interventions

For pregnant women

Balanced energy protein supplementation

Multiple micronutrient supplementation

Improves birth outcomes
→ reduces stunting

For children

Lipid-based nutrition supplements

Public provision of complementary foods

Prophylactic zinc supplementation

Vitamin A supplementation

Reduces stunting

Reduces diarrhoea → reduces stunting

For pregnant women/
parents

Infant and young child feeding education

Increases breastfeeding and complementary feeding
→ reduces diarrhoea → reduces stunting

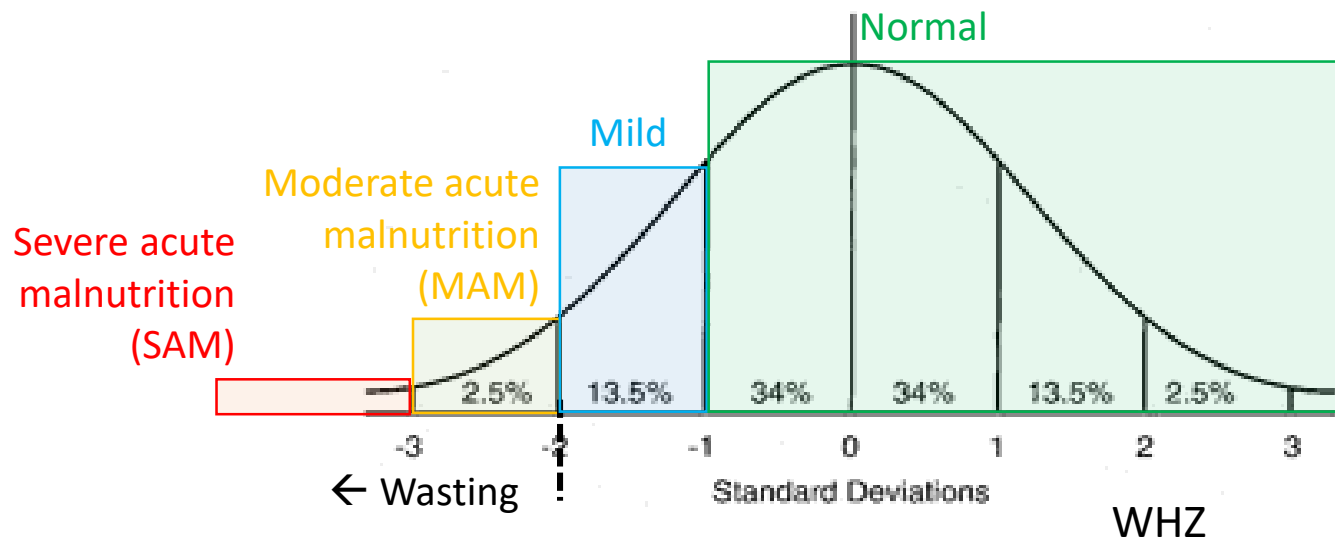
Infant and young child feeding education (IYCF) interventions

- Breastfeeding promotion and complementary feeding education interventions are modelled as user-defined (IYCF) packages

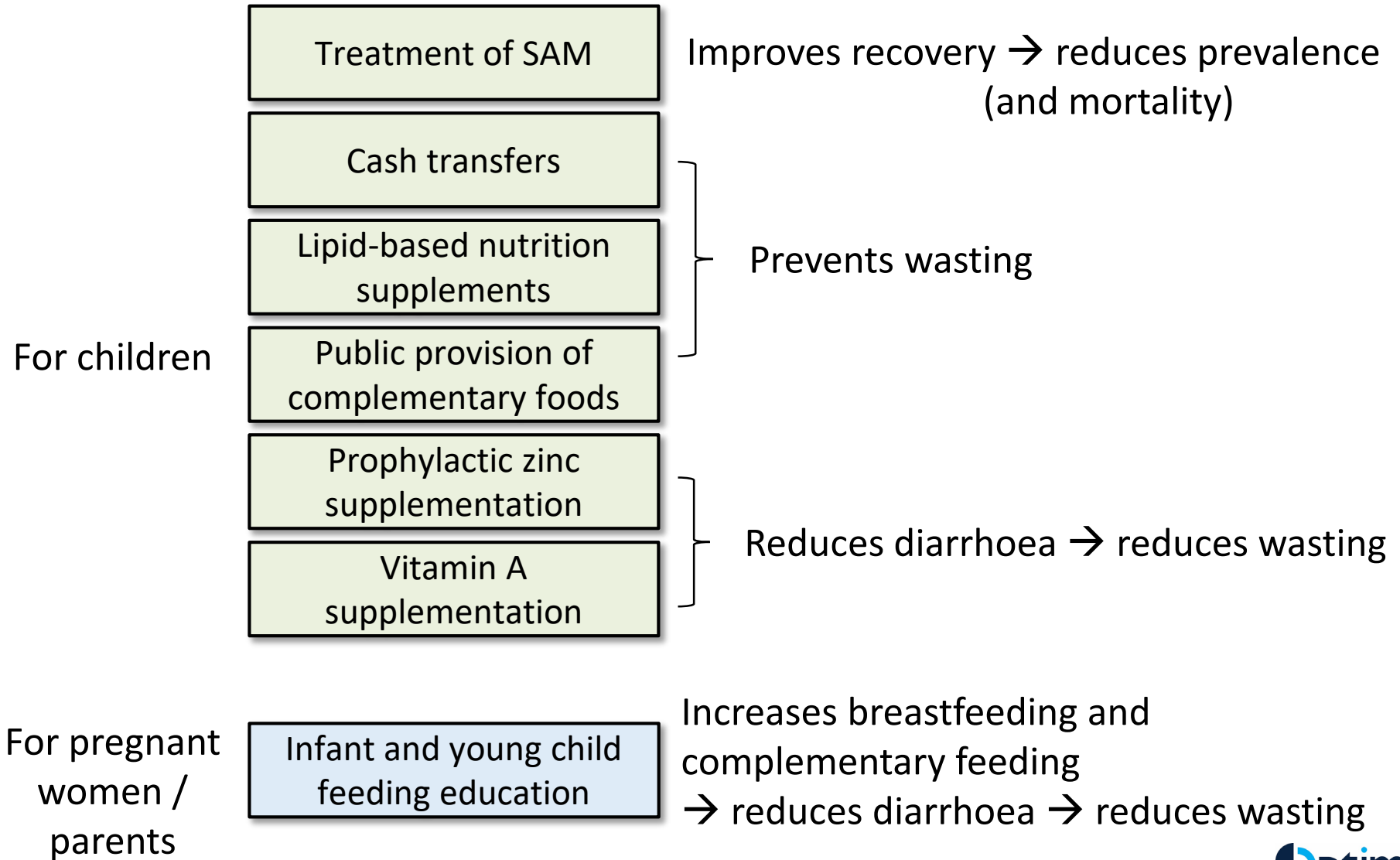
IYCF package	Target population	Health facility	Community	Mass media
IYCF 1	Pregnant women	x		
	<1 month	x	x	
	1-5 months	x	x	
	6-11 months	x	x	
	12-23 months	x	x	
	All			

Wasting implementation

- The weight-for-height distribution is tracked for children in each age band
- Split according to weight-for-height Z-scores (WHZ) as four categories (similar to stunting)
 - Wasting considered to be SAM + MAM categories
- Wasting is modelled as an incident (short-duration) condition

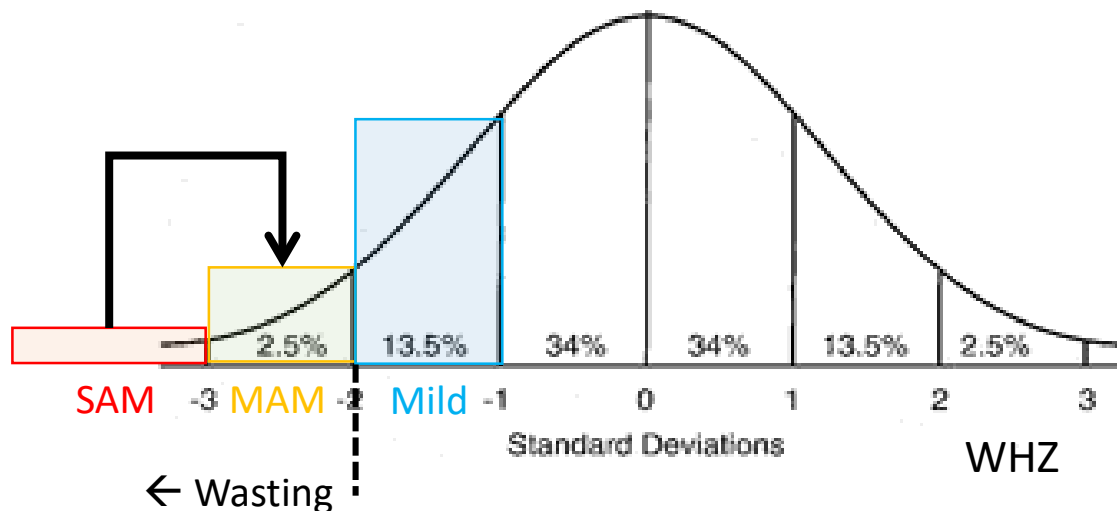


Wasting interventions



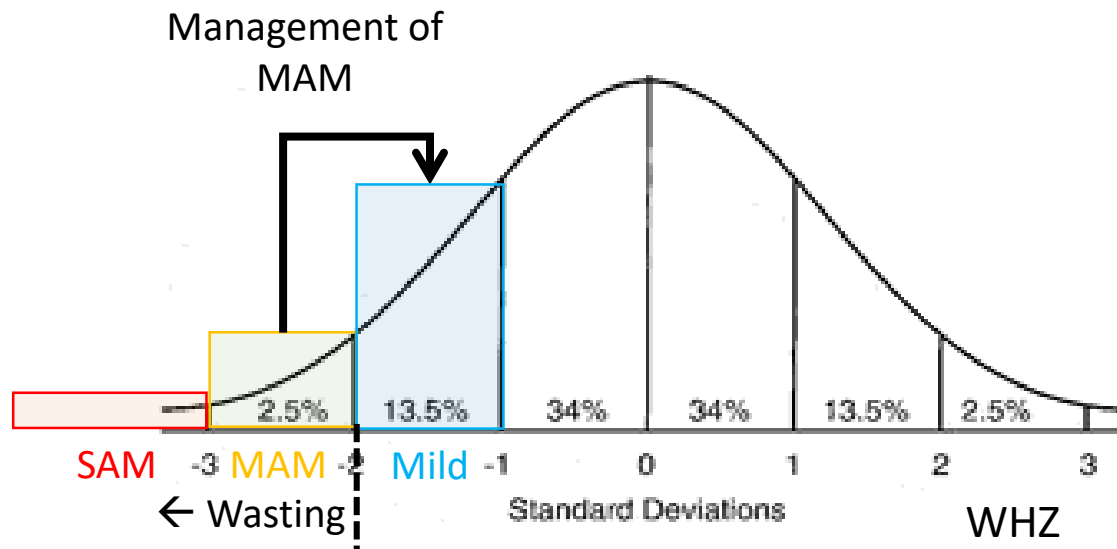
Interventions: treatment of SAM

- Treatment of severe acute malnutrition (SAM)
 - Target population is all children experiencing SAM
 - Treated children are moved to the MAM category

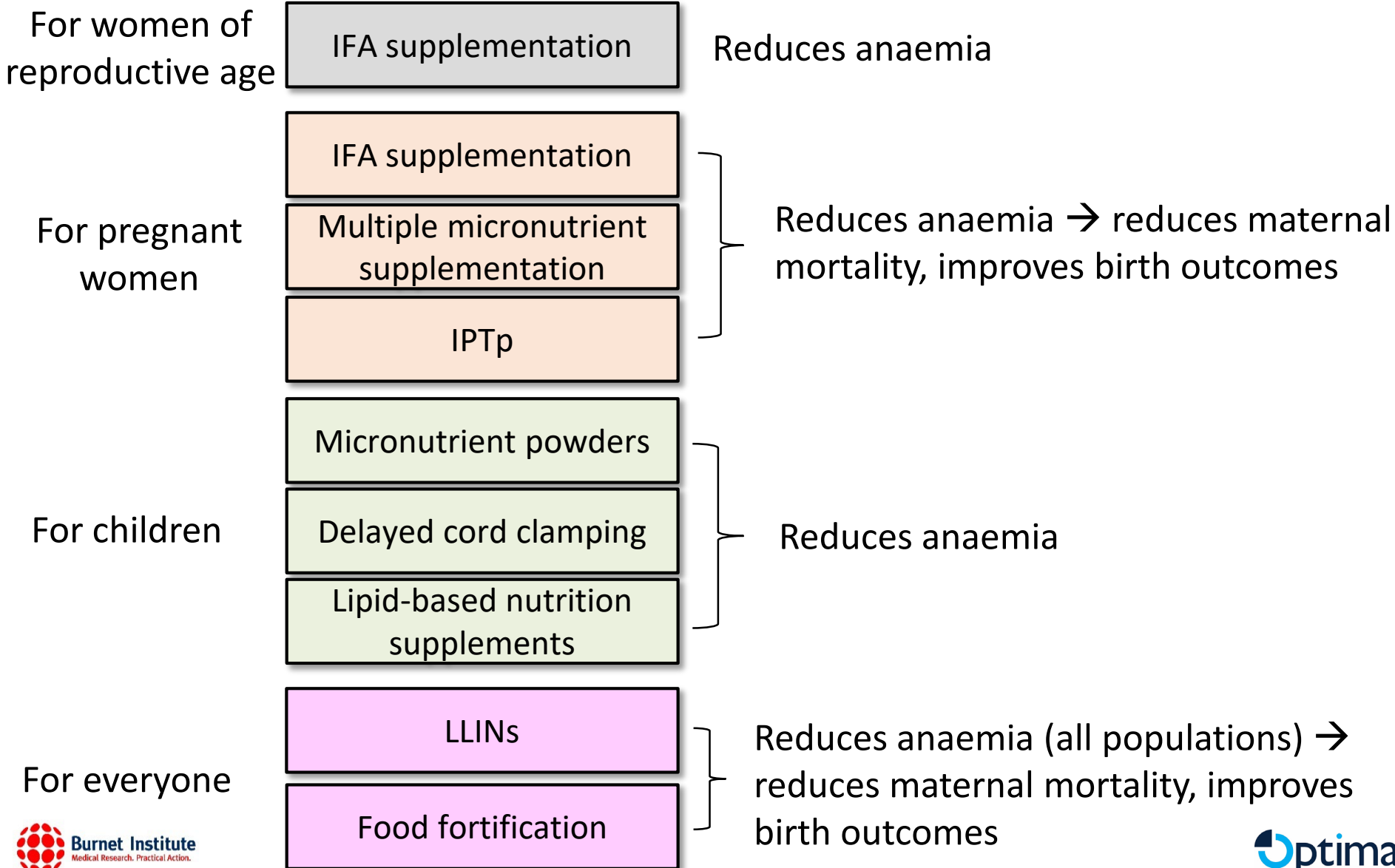


Extending treatment of SAM to include MAM

- Treatment of severe acute malnutrition (SAM)
 - Target population is all children experiencing SAM
 - Treated children are moved to the MAM category
- The treatment of SAM intervention has an option to include management of MAM.

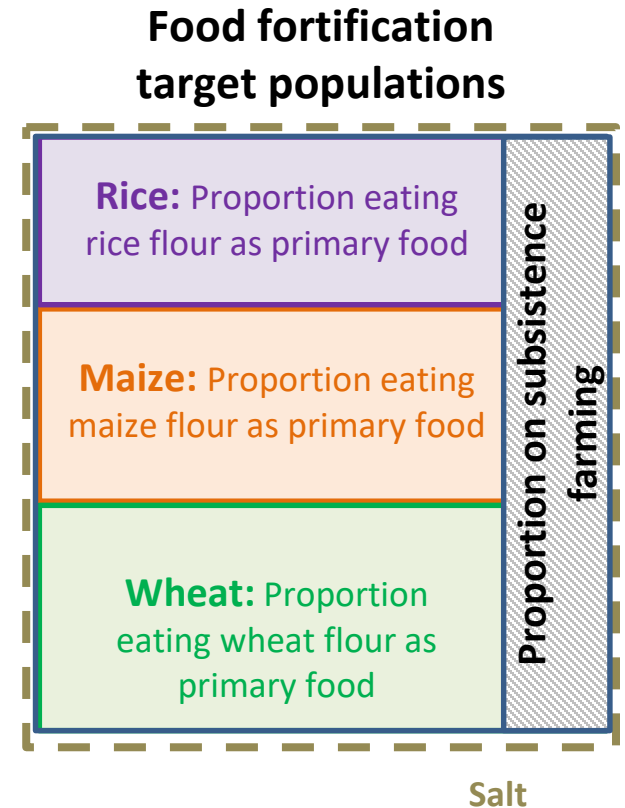


Anaemia interventions



Interventions: fortification of foods

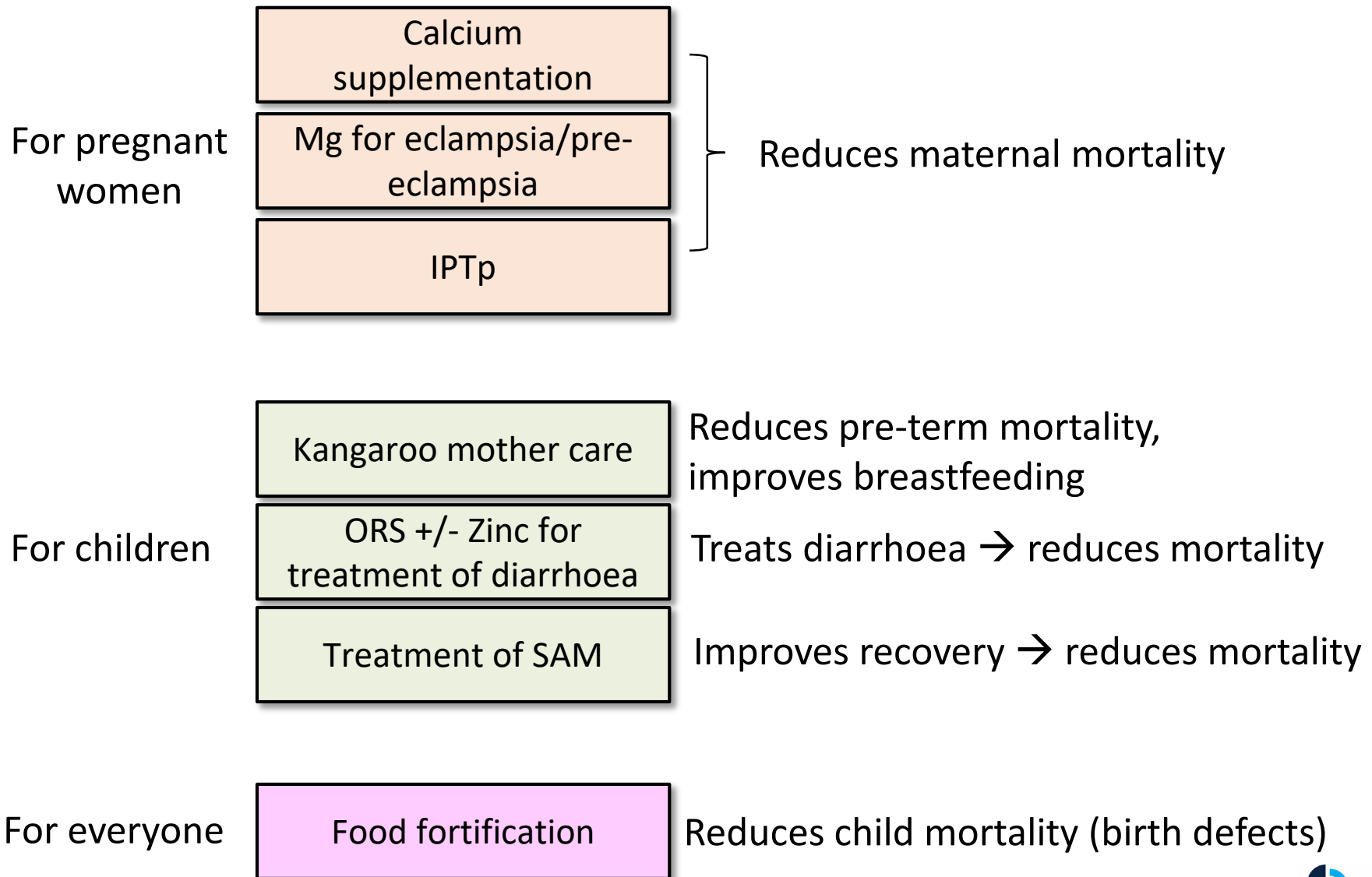
- All population groups
- **Fortification with iron and folic acid:**
 - Fortification of wheat, rice and maize flour
 - Coverage restricted to fraction who eat each food as their staple
 - Does not reach the fraction on subsistence farming
- Double fortification of salt (iron + iodine)
 - Targets entire population



*Coloured areas represent 100% coverage of a particular food fortification.

**Depending on the country, the target population of a particular food vehicle may be zero

Mortality interventions

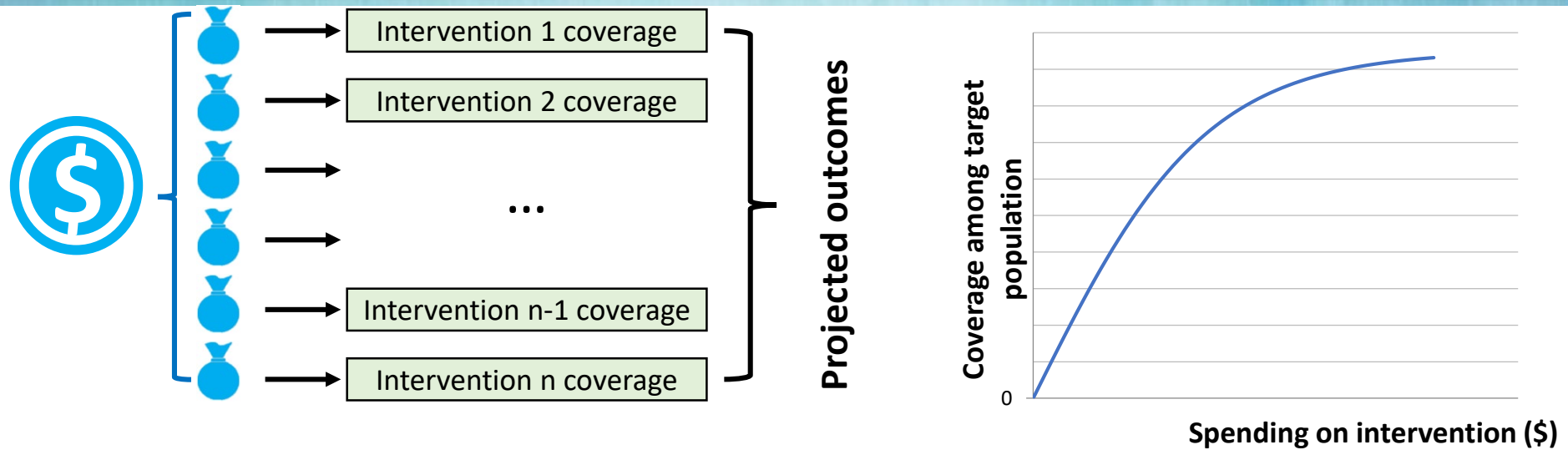


Other nutrition-sensitive interventions

- Family planning:
 - When family planning services are scaled up this decreases the number of projected births (restricted by unmet need)
 - Family planning also decreases the odds of suboptimal birth spacing
- Five WASH interventions*:
 - Improved water source
 - Piped water
 - Improved sanitation
Hygienic disposal of stools
 - Handwashing with soap

*Evidence on the effectiveness of these interventions is mixed and unclear, in particular given some recent large studies

Linking investment in interventions to impact



- The spending on interventions is linked to their coverage
- For each intervention, increasing investment:
 - Increases the number of people receiving the intervention
 - Leads to reductions in stunting and deaths according to estimated effectiveness / odds ratios from the literature
- **The model is given inputs on how much to spend on each intervention, and produces estimates for stunting and mortality (among other things).**

Example: Pakistan

How is Optima Nutrition applied?

1. Burden of malnutrition

- Data on undernutrition
- Data on breastfeeding behaviours

2. Programmatic responses

- Data on intervention costs and coverage
- Identify constraints on interventions

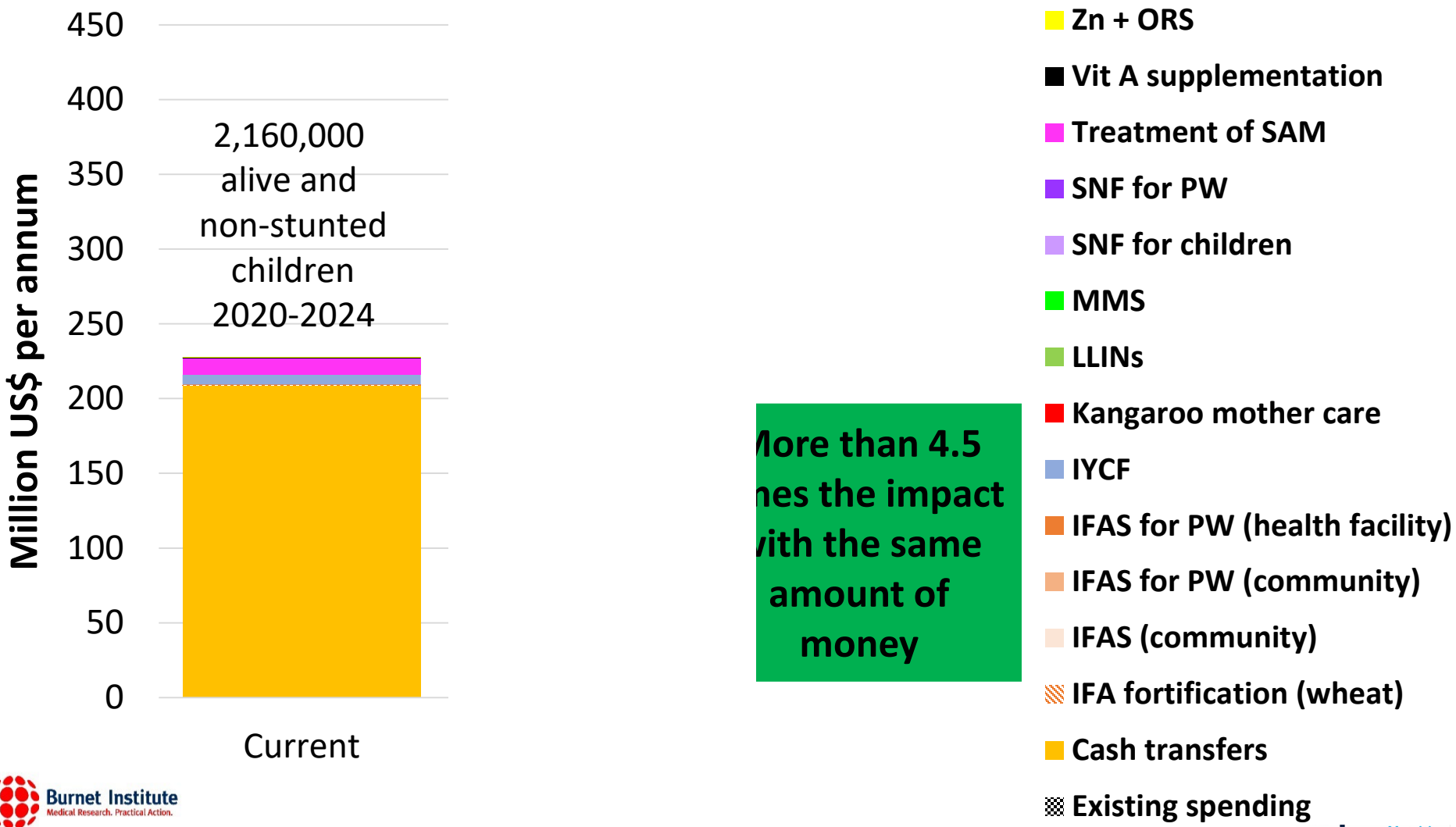
3. Objectives and constraints

- Strategic goals
- Ethical, logistic & economic constraints

4. Optimization algorithm

Pakistan: potential impact of additional US\$180m p.a.

Additional alive and non-stunted children 2020-2024:



Example: Tanzania

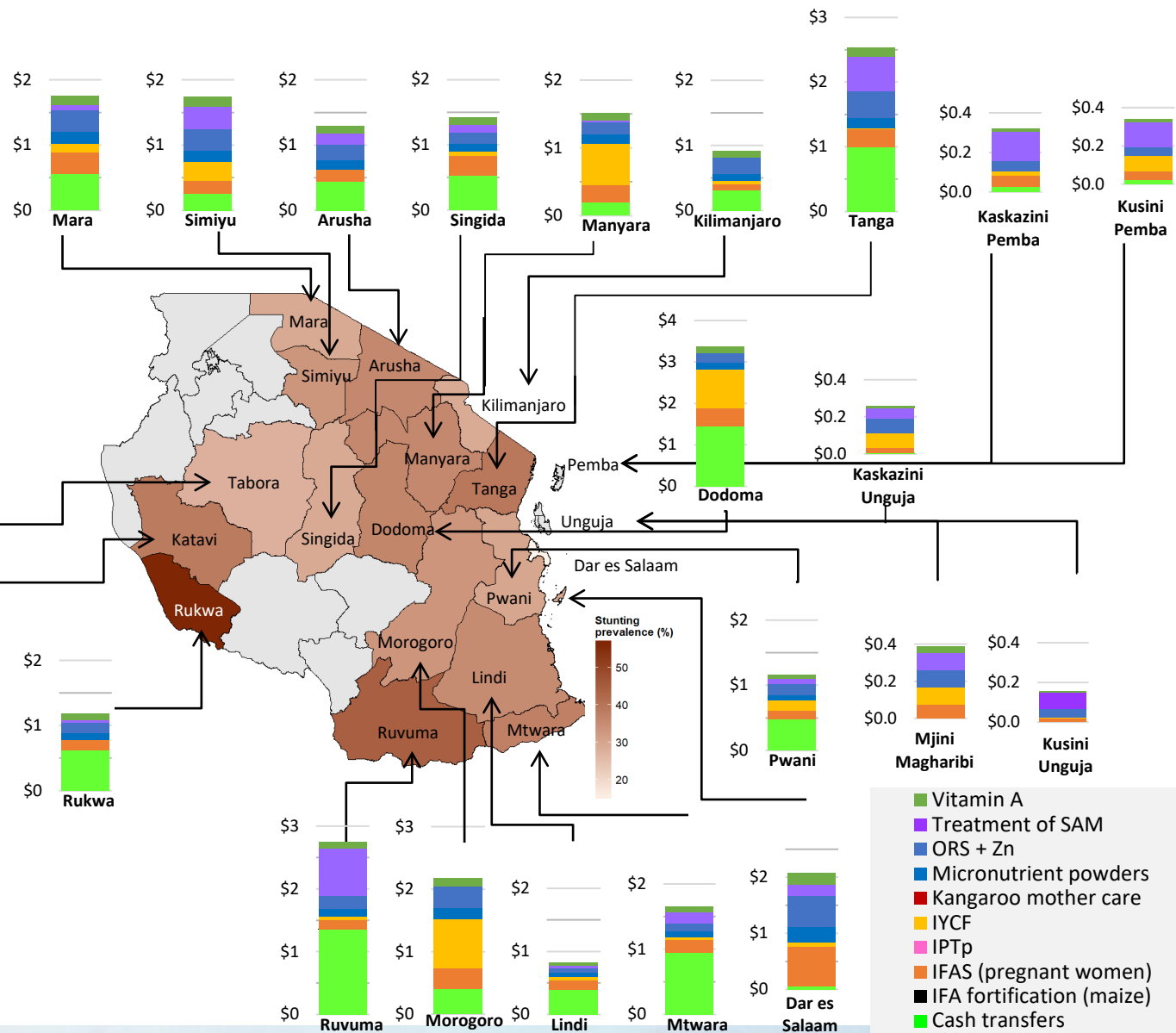
Estimated 2017 spending

Projections:

2017 spending across the 22 regions was estimated at US\$31 million per annum, based on intervention coverages and unit costs.

If continued between 2019-2025, this was estimated to lead to:

- 5,092,000 alive and healthy* children
- 1,064,000 child deaths
- 3,765,000 stunted children (29.6% under-5 prevalence)
- 51% under-5 anaemia prevalence
- 4.68% under-5 wasting prevalence



Estimated 2017 funding allocation (million US\$)



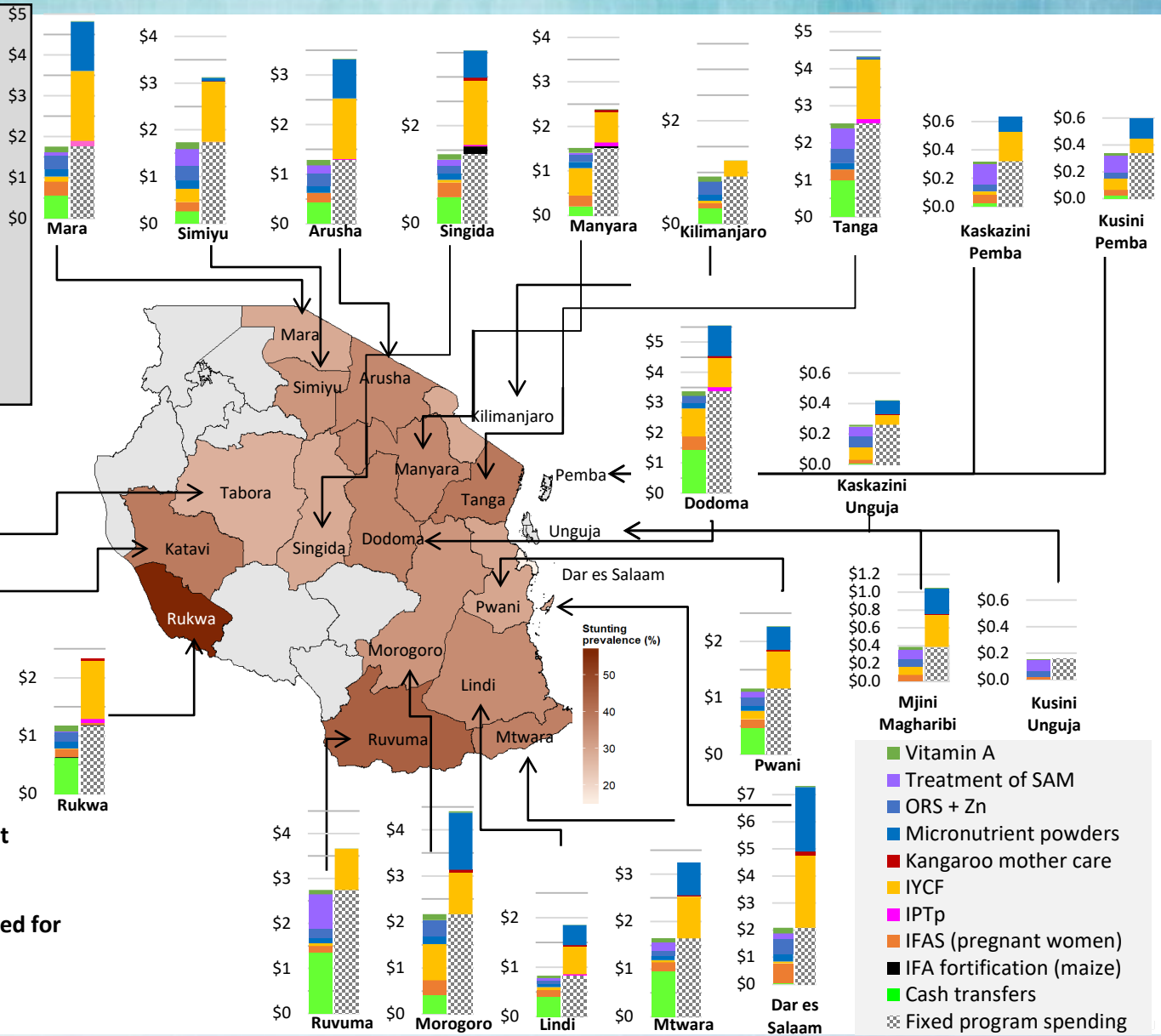
*Alive and non-stunted, non-wasted and non-anaemic children leaving the model 2019-2025

An additional US\$33M per annum, distributed optimally across regions and interventions

Impact (compared to continued 2017 spending, 2019-2025):

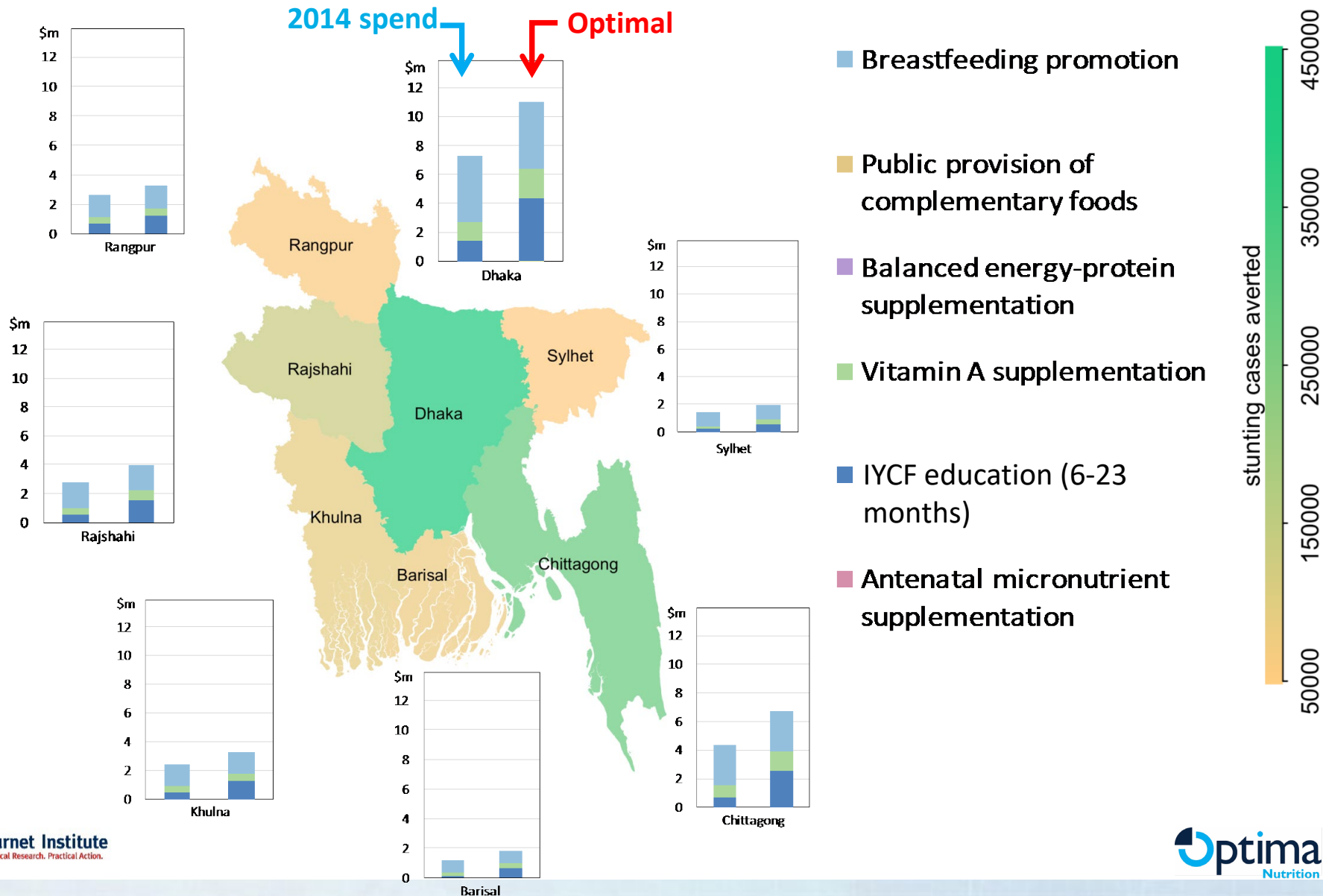
- 484,000 (10%) additional alive and healthy children
- 67,900 (6.4%) fewer child deaths
- 311,000 (8.3%) additional non-stunted children
- 14.6% relative reduction in under-5 stunting prevalence (from 29.6% to 25.3%)
- 15% relative reduction in under-5 anaemia prevalence (from 51% to 43%)
- 1.1% relative reduction in under-5 wasting prevalence (from 4.68% to 4.63%)

Estimated 2017 funding allocation (million US\$) vs Fixed current spending but additional funding geographically and programmatically optimised for NMNAP



Example: Bangladesh

Example: Geospatial optimization of additional US\$10 million per annum in Bangladesh



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