Diet modelling to examine the potential of animal-source foods to fill nutrient gaps for key target groups

Frances Knight

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WFP
World Food Programme
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LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE


Optifood


COST
OF THE DIET


Agrifood

Elements to explore using diet modelling:

- Problem nutrients in diets of specific target groups
- Best local food sources of nutrients
- Options for meeting nutrient gaps and potential impact on nutrient adequacy
- Cost and affordability of nutritious diets
- Impact of improving the availability and access to animal source foods on diet access


Optifood

A linear programming software tool used to determine extent to which local foods and dietary patterns can meet dietary requirements and develop and test food-based recommendations for specific target groups.

Optifood

Optifood: Data requirements

- List of foods eaten by members of target group
  - Portion sizes when eaten
  - Frequency of consumption

  (obtained from individual dietary questionnaire or re-distributed household consumption survey)
- Nutrient composition of foods
- Food prices (optional)
- Nutrient requirements of target group

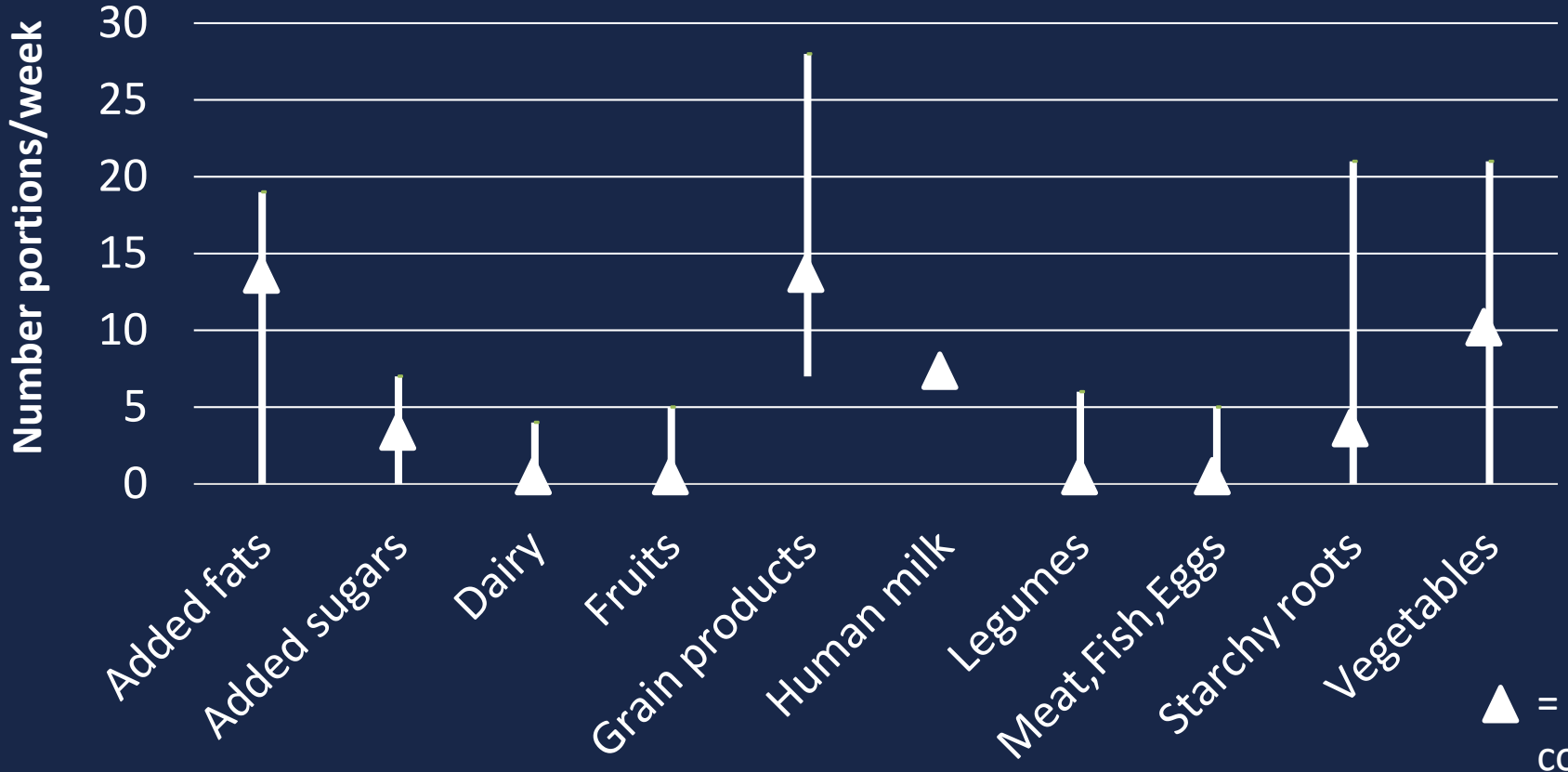
Optifood Analysis: Step One

- Is it possible to model a diet that meets nutrient requirements for target group using locally-available foods within acceptable dietary patterns?

- If not, which nutrient requirements cannot be met?

Food Group Constraints: 12-23mo Breastfeeding Children Sylhet

BANGLADESH



Nutrient adequacy achieved in optimised diets: 12-23mo Breastfeeding Children Sylhet

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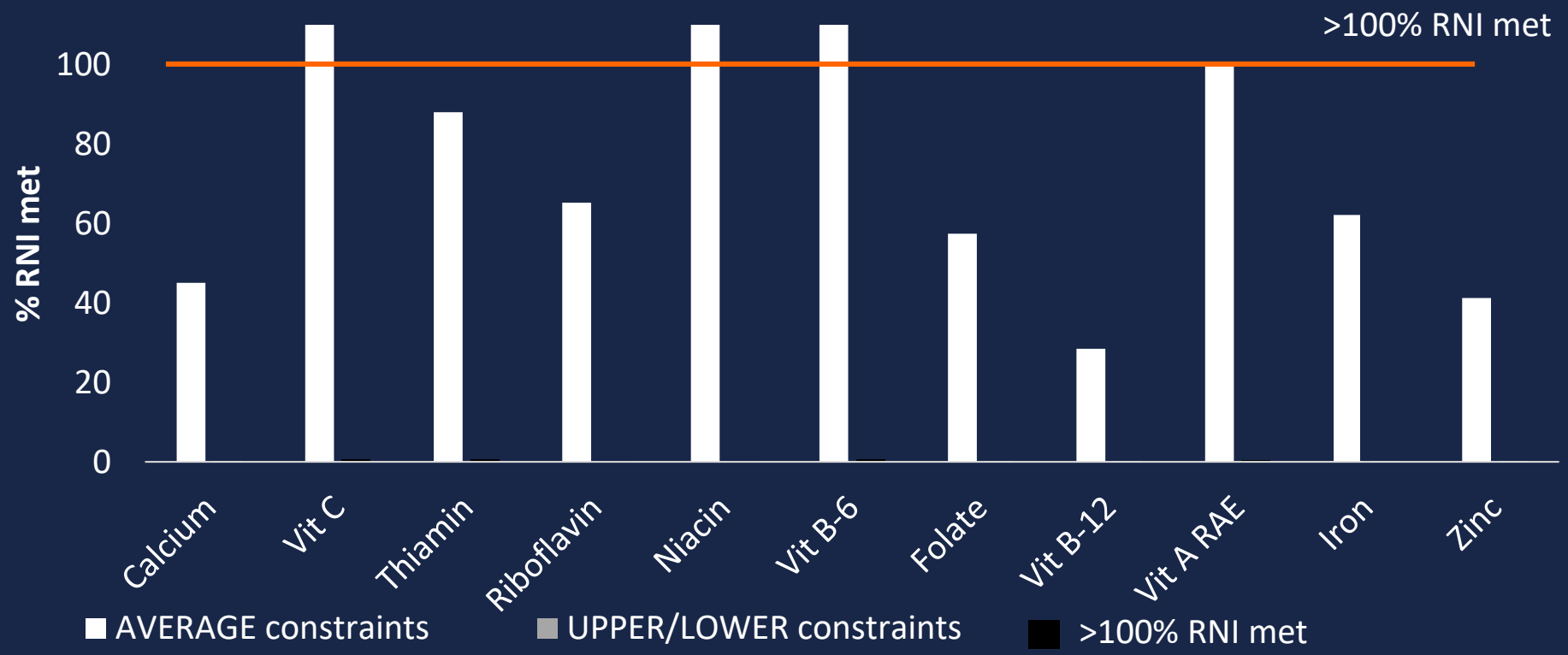

Nutrient adequacy achieved in optimised diets: 12-23mo Breastfeeding Children, Sylhet

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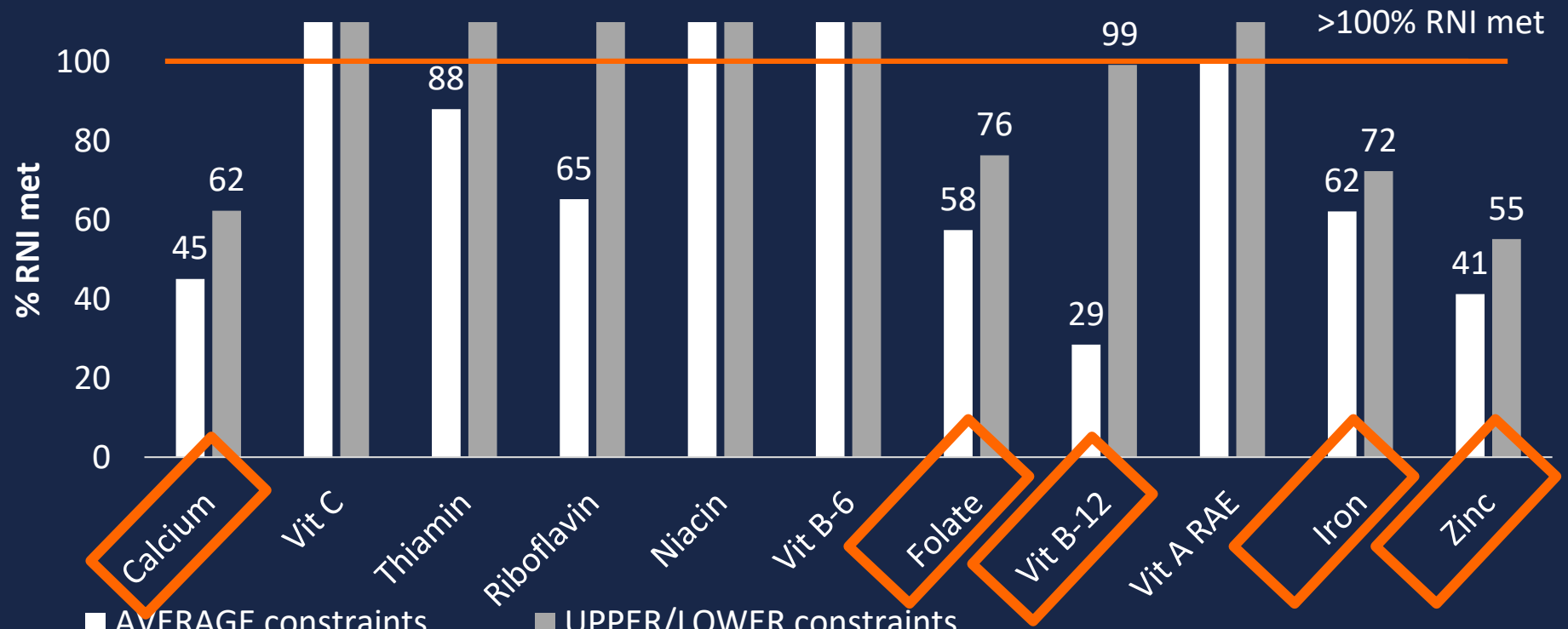
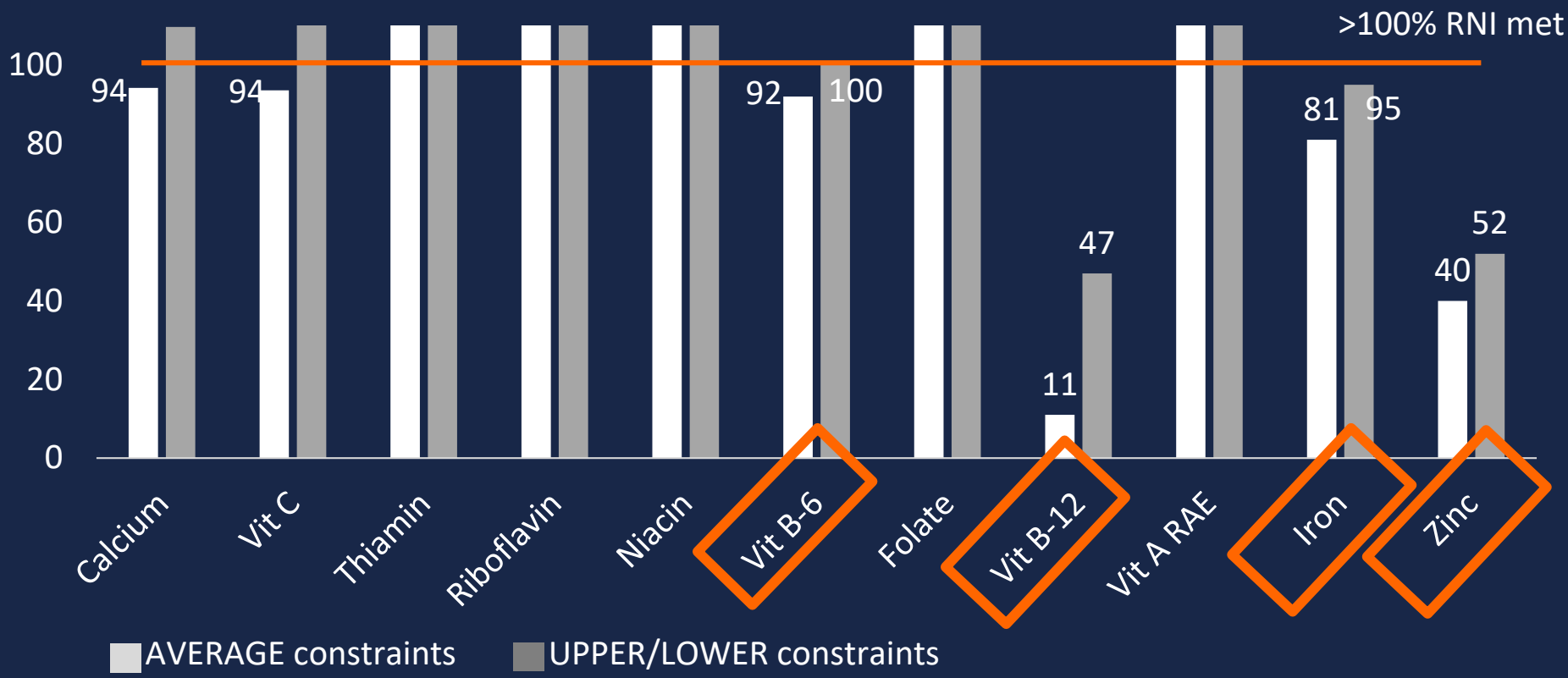


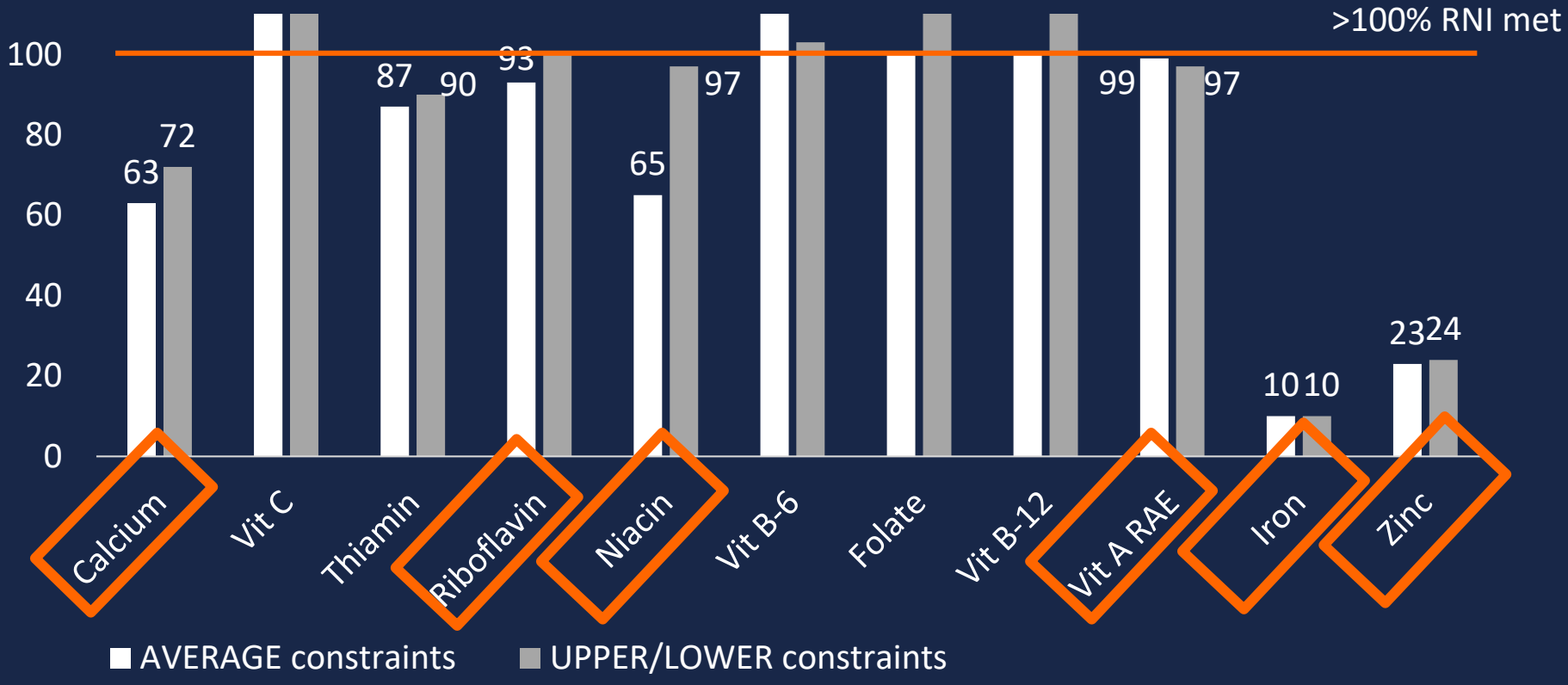
Nutrient adequacy achieved in optimised diets: Pregnant Women, Western Highlands

GUATEMALA



Nutrient adequacy achieved in optimised diets: 6-8mo Breastfeeding Children, Eastern Uganda

UGANDA



Optifood Analysis: Step Two

- Which foods are included in the ‘optimised diet’?
- Which foods are the best sources of problem nutrients?

Food Group portions/week in optimised diets: 12-23mo Breastfeeding Children Sylhet

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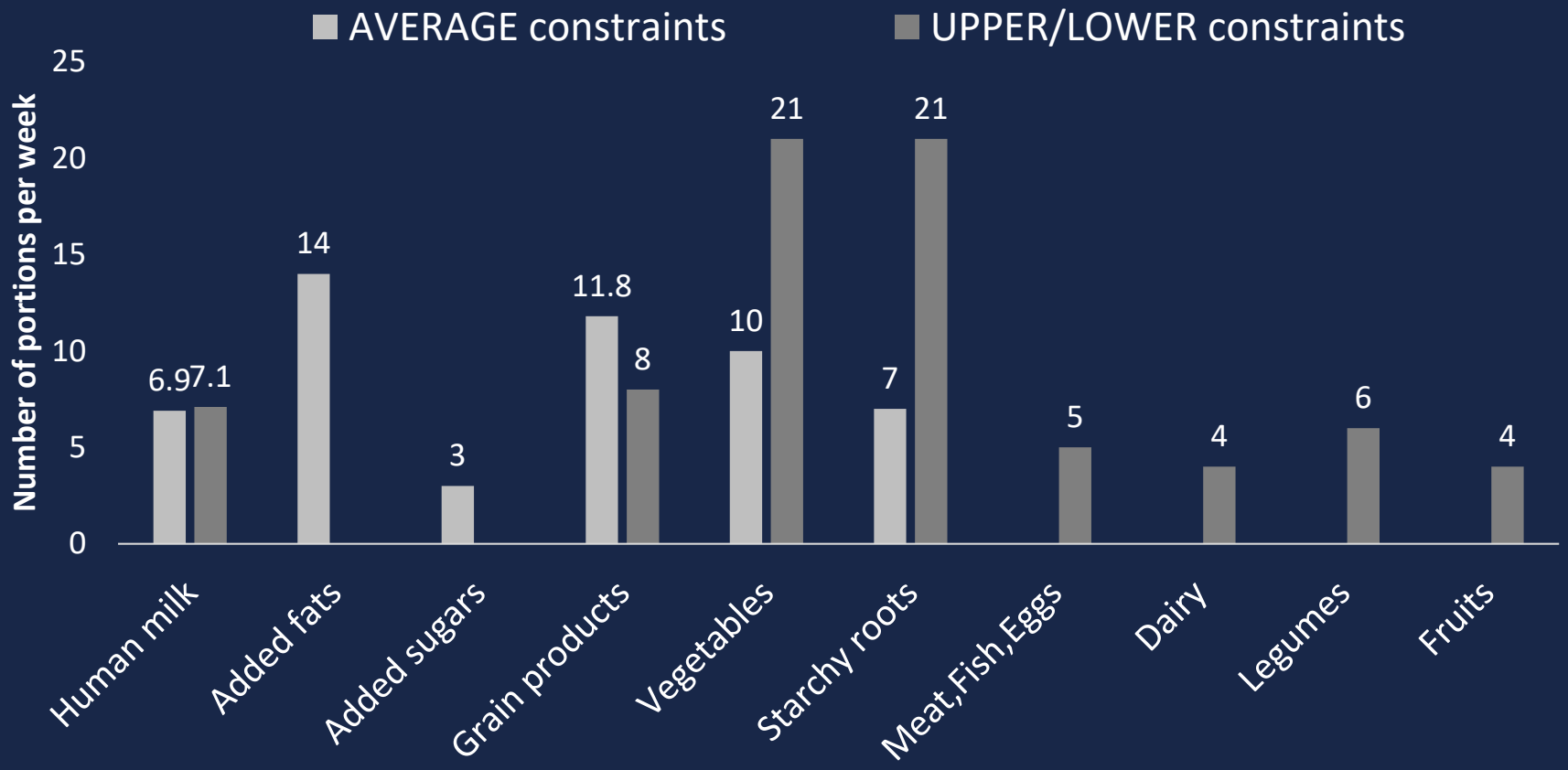

Number of nutrients for which Food Group is a good source (>5% of nutrient in diet)

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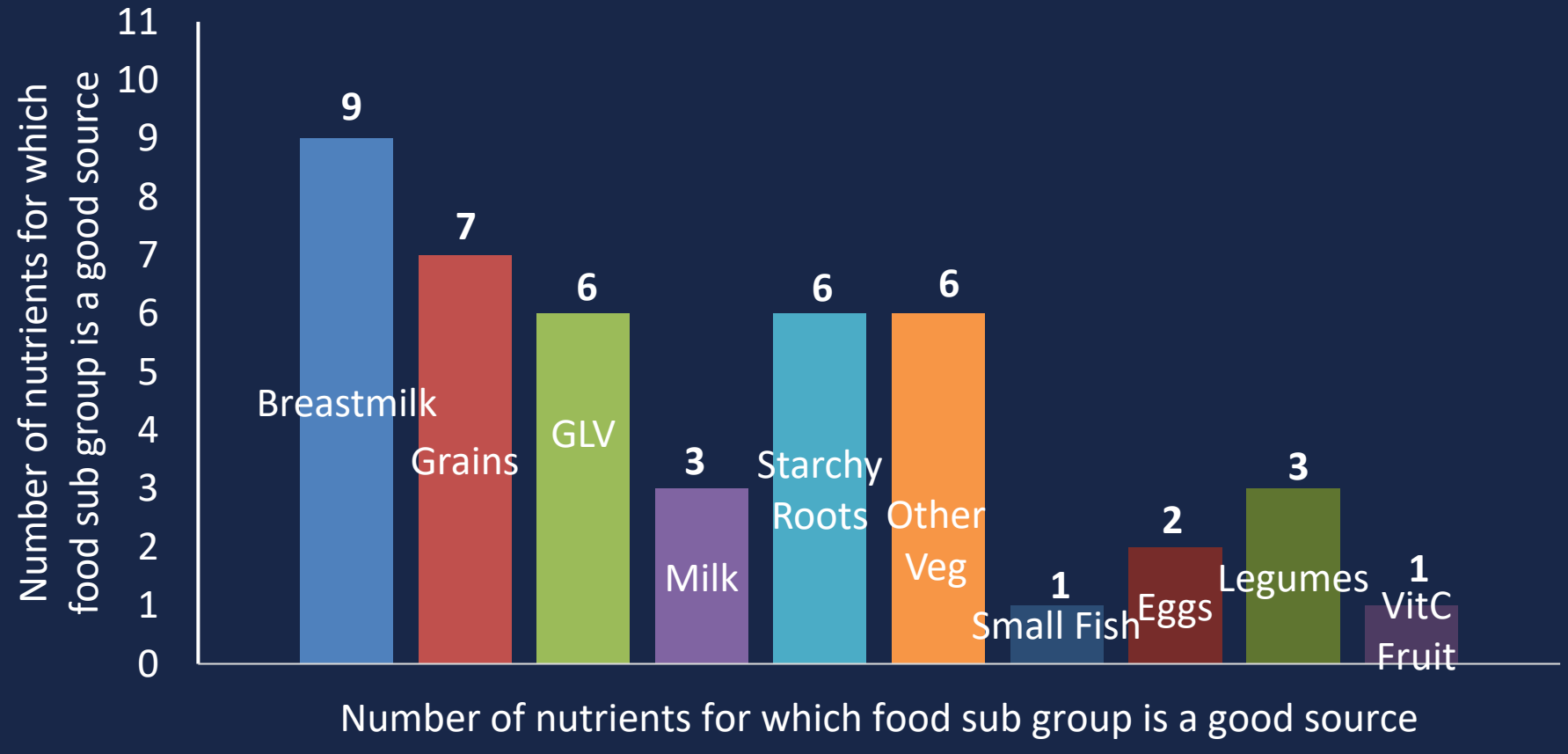


BANGLADESH

Best sources of Problem Nutrients

Sub Group	Calcium	Folate	Vit B12	Iron	Zinc
Breast milk					
Milk					
Other Veg					
GLV					
Grains					
Starchy					
Small Fish					
Eggs					
Legumes					

Optifood Analysis: Step Three

- To what extent could a set of food-based recommendations *within* dietary constraints improve nutrient adequacy

- To what extent could FBRs reflecting an improvement to food access/availability improve nutrient adequacy

Food Based Recommendations (within existing constraints)

BANGLADESH

Food Type	Recommendation
Breast milk	N/A (set amount)
Grains	8 servings per week
Starchy	21 servings per week
GLV	7 servings per week
Milk	4 servings per week
Legumes	6 servings per week
Eggs	2 servings per week
Small Fish	4 servings per week

Food Based Recommendations (within existing constraints)

BANGLADESH

Grains8

Starchy21

GLV7

Milk4

Legumes6

Eggs2

SmallFish4

Grains8+Starchy21

Grains8+GLV7

Grains8+Milk4

Grains8+Legumes6

Grains8+Eggs2

Grains8+SmallFish4

Starchy21+GLV7

Starchy21+Milk4

Starchy21+Legumes6

Starchy21+Eggs2

Grains8+Starchy21+GLV7

Grains8+Starchy21+Milk4

Grains8+Starchy21+Legumes6

Grains8+Starchy21+Eggs2

Grains8+Starchy21+SmallFish4

Starchy21+GLV7+Milk4

Starchy21+GLV7+Legumes6

Starchy21+GLV7+Eggs2

Starchy21+GLV7+SmallFish4

GLV7+Milk4+Legumes6

Grains8+Starchy21+GLV7+Milk4

Grains8+Starchy21+GLV7+Legumes6

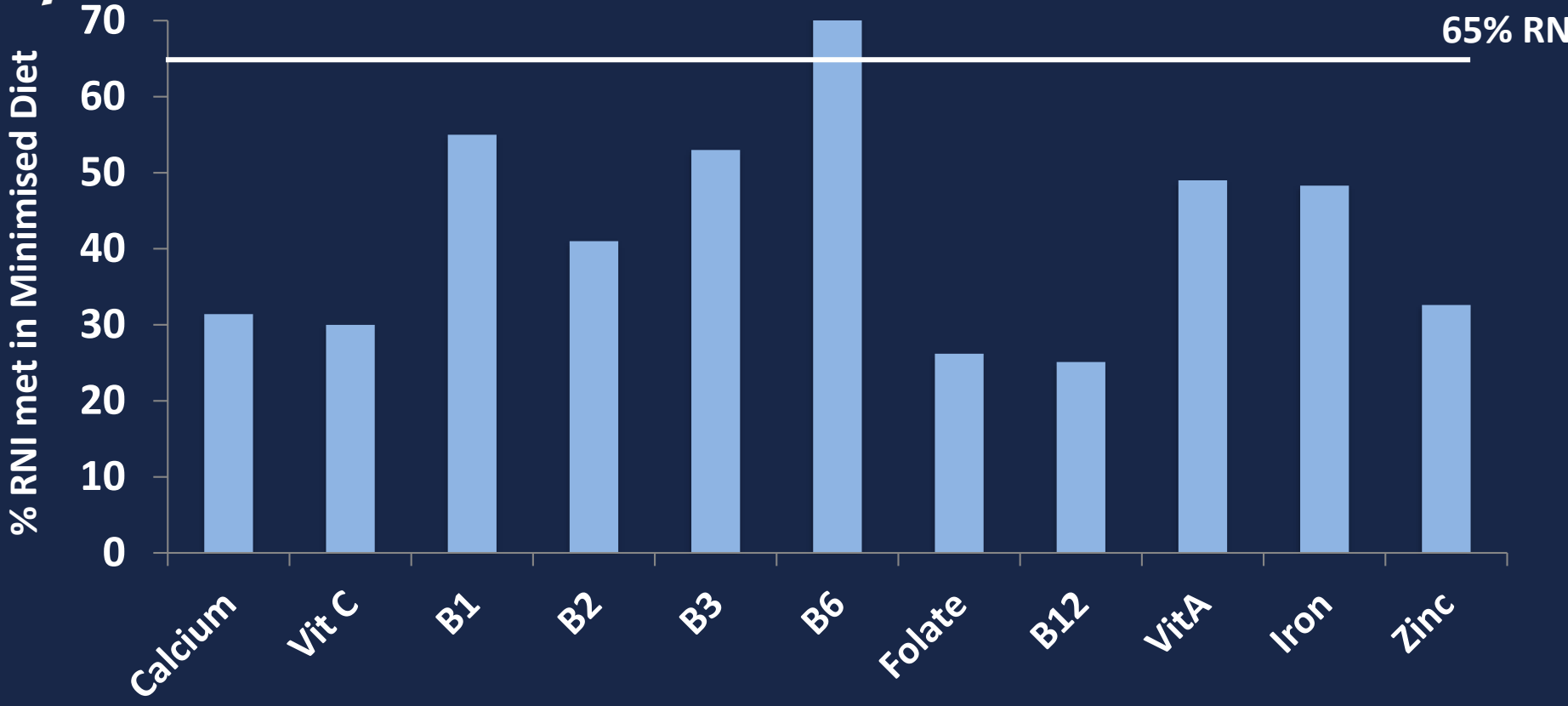
Grains8+Starchy21+GLV7+Eggs2

Grains8+Starchy21+GLV7+SmallFish4

Starchy21+GLV7+Milk4+Eggs2

Starchy21+GLV7+Milk4+SmallFish4

BANGLADESH


% RNI met in Minimised Diet
70
60
50
40
30
20
10
0
65% RNI
Calcium
Vit C
B1
B2
B3
B6
Folate
B12
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Iron
Zinc

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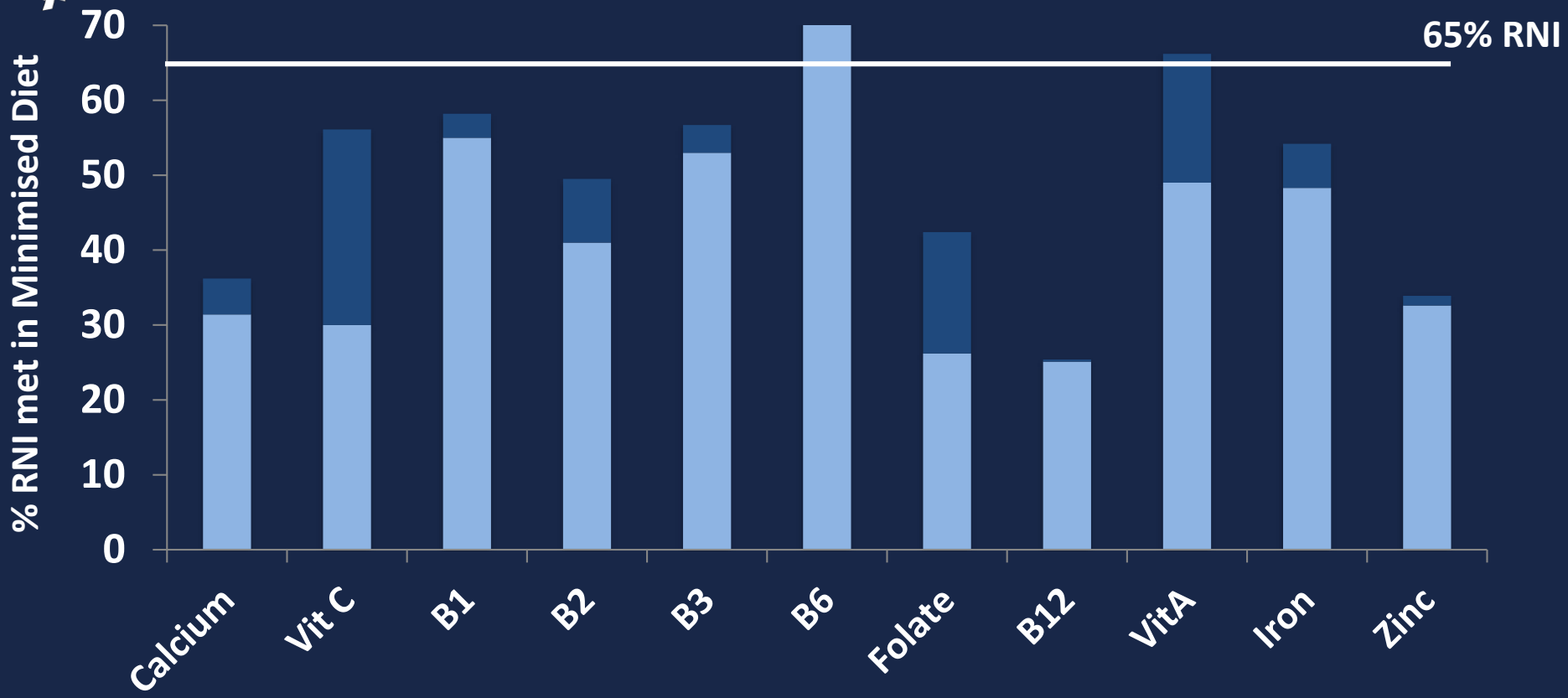
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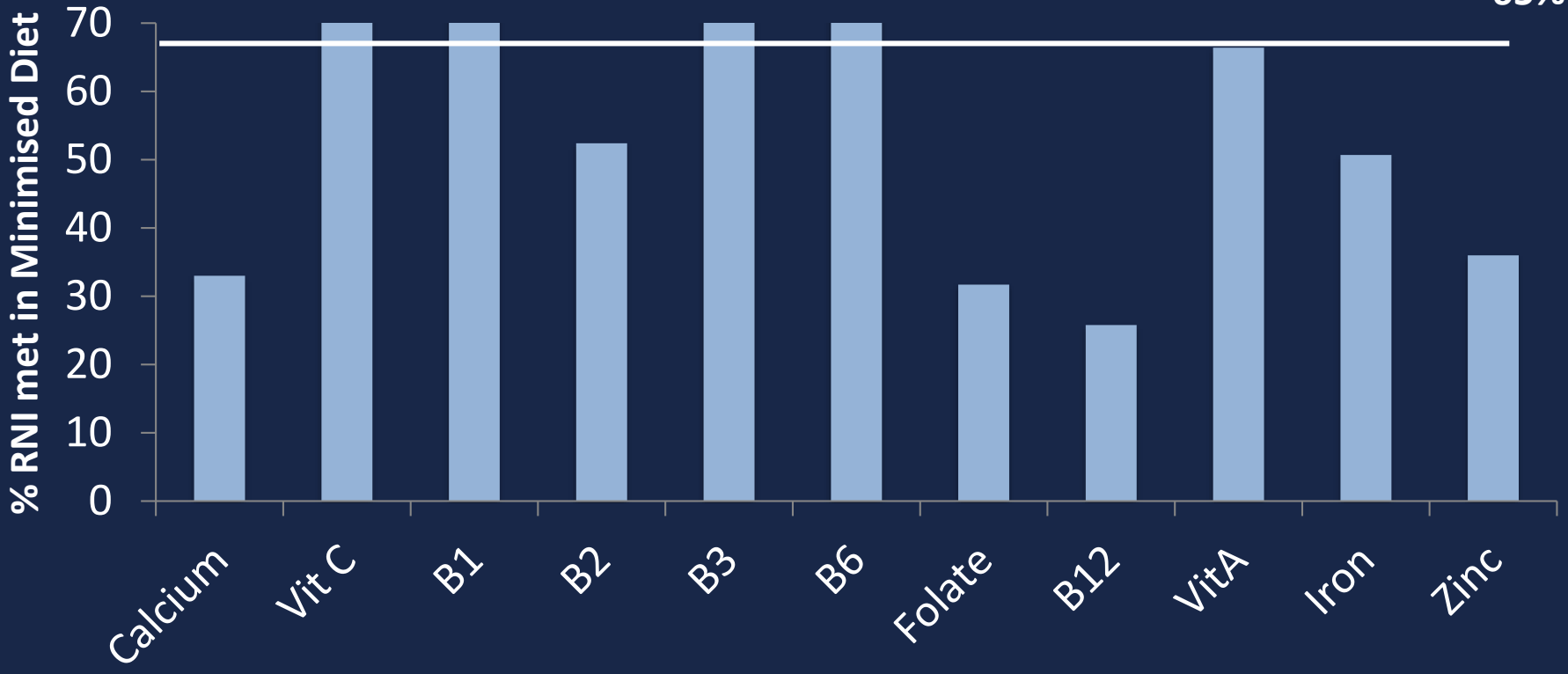
Food Based Recommendations (Outside of constraints)

BANGLADESH

Food Type	Recommendation
Grains	8 servings per week
Starchy	21 servings per week
GLV	~~7~~ 14 servings per week
Milk	~~4~~ 7 servings per week
Eggs	~~2~~ 7 servings per week
Small Fish	~~4~~ 7 servings per week
Red Meat	~~0~~ 2 serving per week

BANGLADESH

65% RNI



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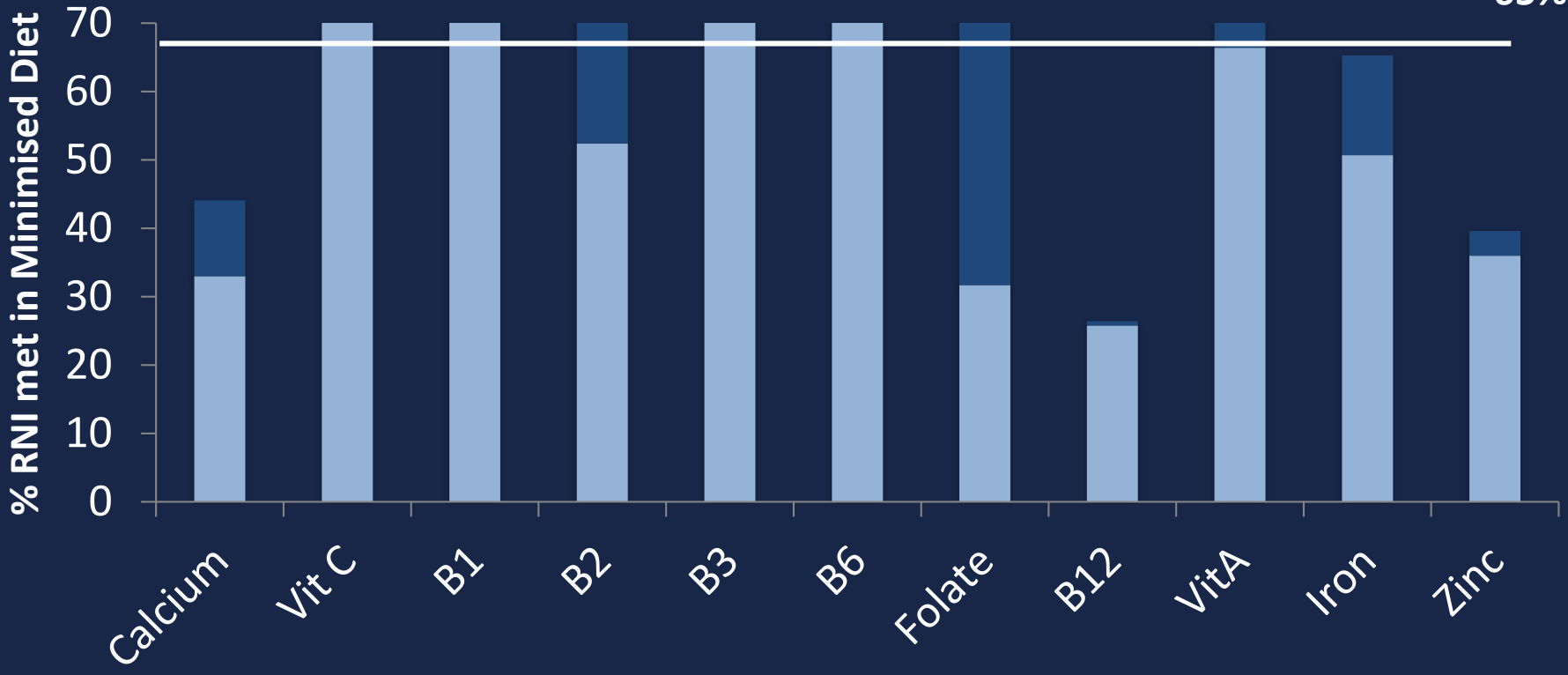

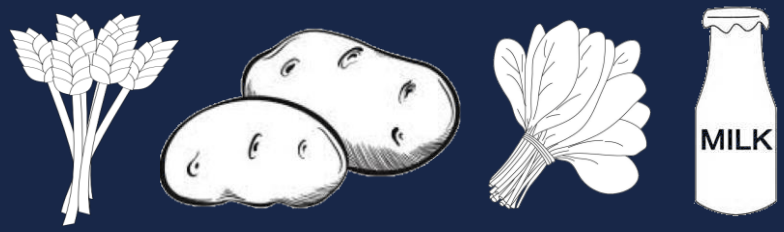

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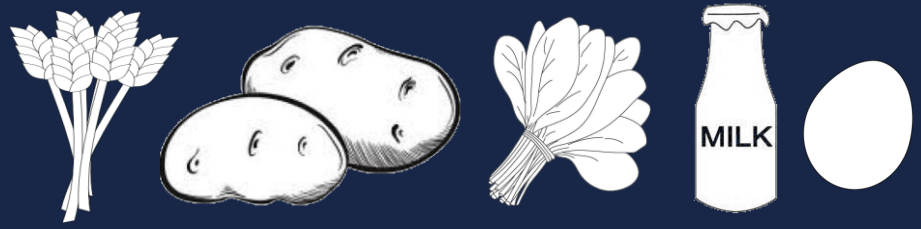

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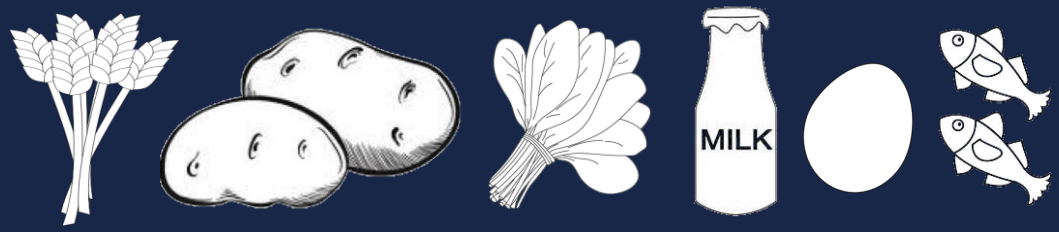

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Optifood Analysis: Step Four

- Which nutrient gaps persist in local diets even when food-based approaches are applied?
- What other programme options could fill these nutrient gaps?
- What would the combined impact of FBRs and other interventions be on nutrient adequacy?

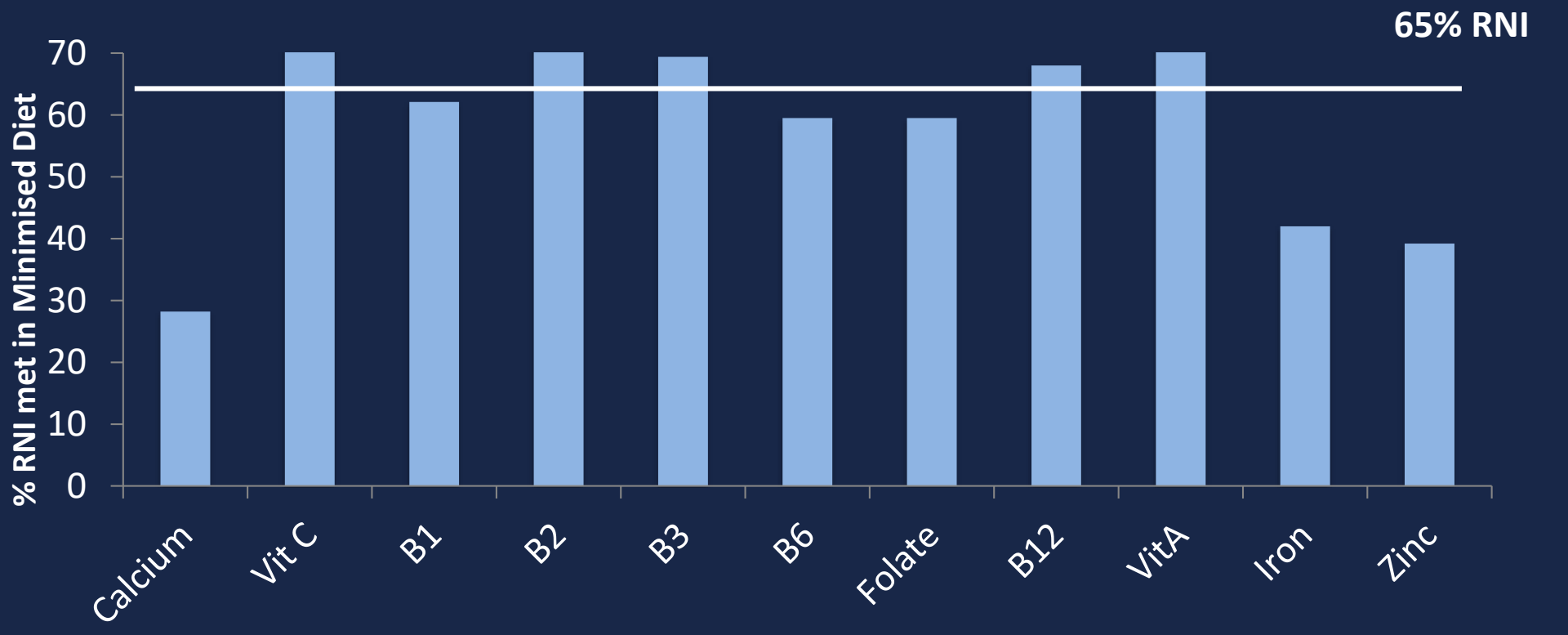
Food Based Recommendations (Outside of constraints)

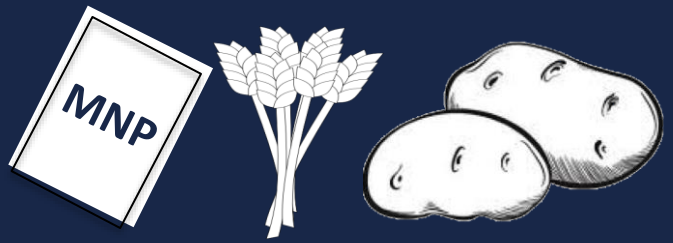
BANGLADESH

Food Type	Recommendation
Grains	8 servings per week
Starchy	21 servings per week
GLV	~~7~~ 14 servings per week
Milk	~~4~~ 7 servings per week
Eggs	~~2~~ 7 servings per week
Small Fish	~~4~~ 7 servings per week
Red Meat	~~0~~ 2 servings per week
Micronutrient powder	3-4 sachets per week

MNP

BANGLADESH





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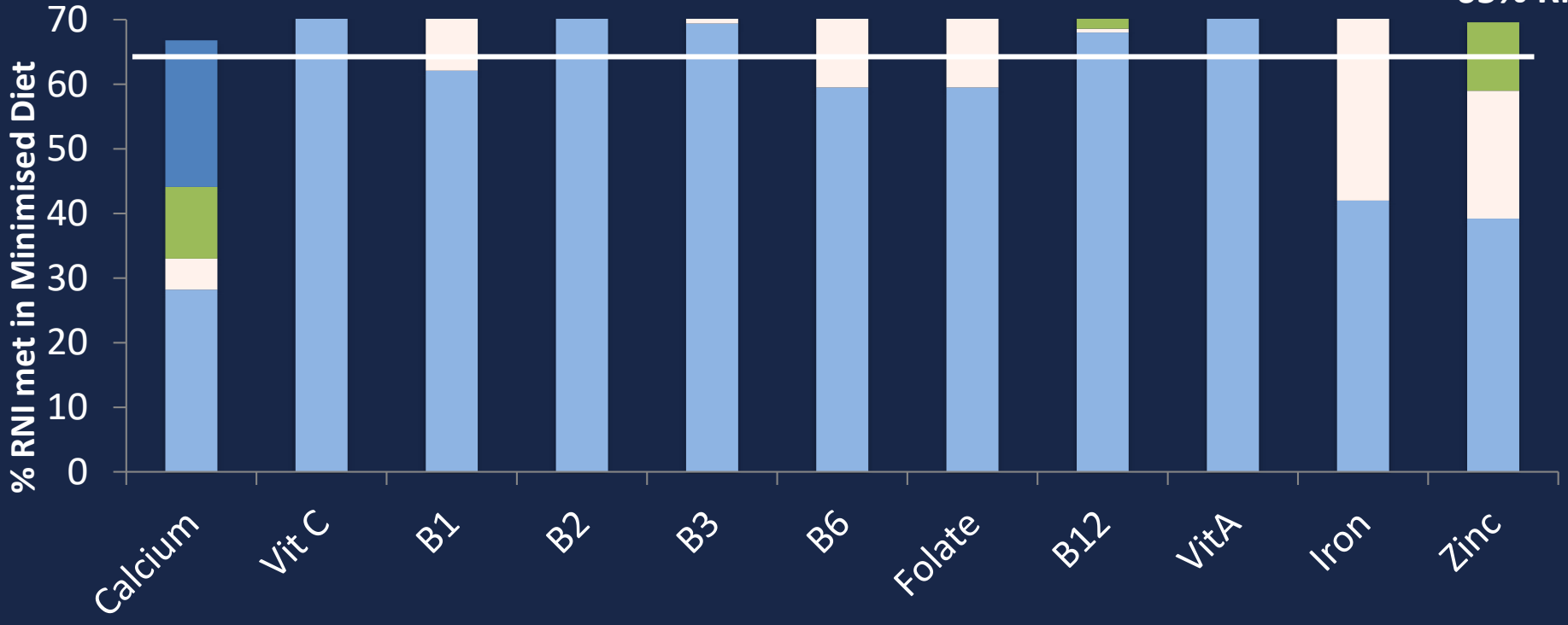

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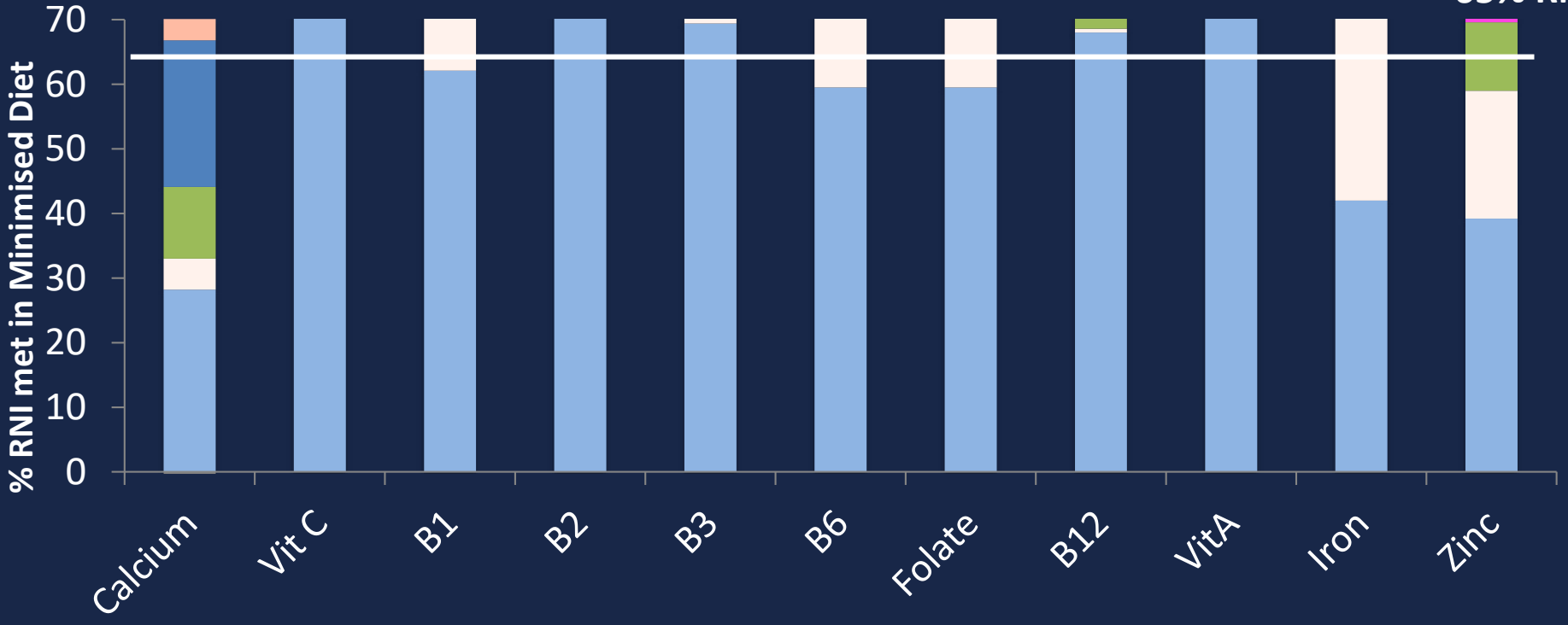


Key Questions

- Cost of implementing FBRs
- Feasibility and acceptability of FBRs
- Preference for/feasibility of local food-based options compared to provision of new products

Optifood: Uses

- Design of Food-Based recommendations, recipes or products based on local foods and dietary patterns
- Modelling dietary impact of proposed supplements, fortification etc.
- Testing potential impact of food systems changes or agricultural interventions on dietary adequacy
- Informing selection of commodities to promote for consumption or production

Cost of the Diet

Cost of the Diet

A linear programming tool to estimate the minimum cost of meeting nutrient requirements for specific populations, the affordability of nutritious diets and the potential of multi-sectoral interventions in terms of improving access to nutritious diets.

COST
OF THE DIET

CotD: Data requirements

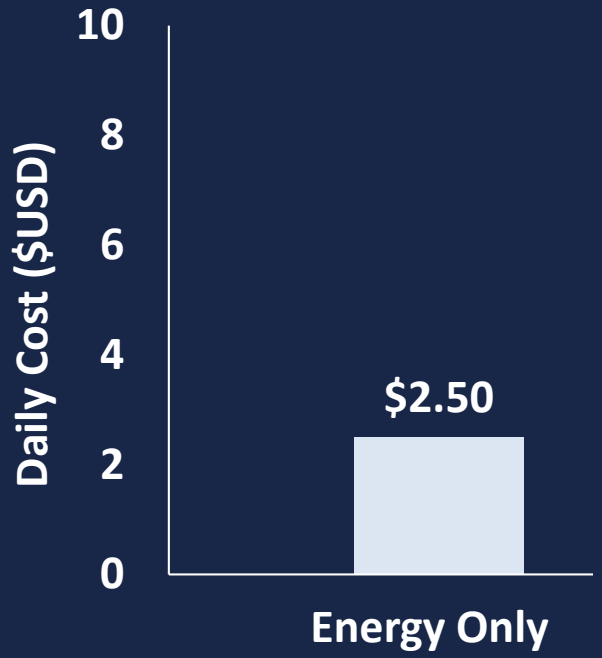
- List of **all** foods available in local food system (obtained from market survey or secondary household consumption survey)
  - Prices per 100g of each food
  - Estimated portion sizes and consumption limits target group (inbuilt in software)
- Nutrient composition of foods (inbuilt)
- Nutrient requirements of target group (inbuilt)

CotD: Step One

- What is the lowest cost combination of foods that would meet the energy requirements of a model household?
- What is the lowest cost combination of foods that would meet macro and micronutrient requirements for the model household?
- How much would these diets cost?

A diet meeting energy needs only would cost $ 2.50 per day for a household of 5 people

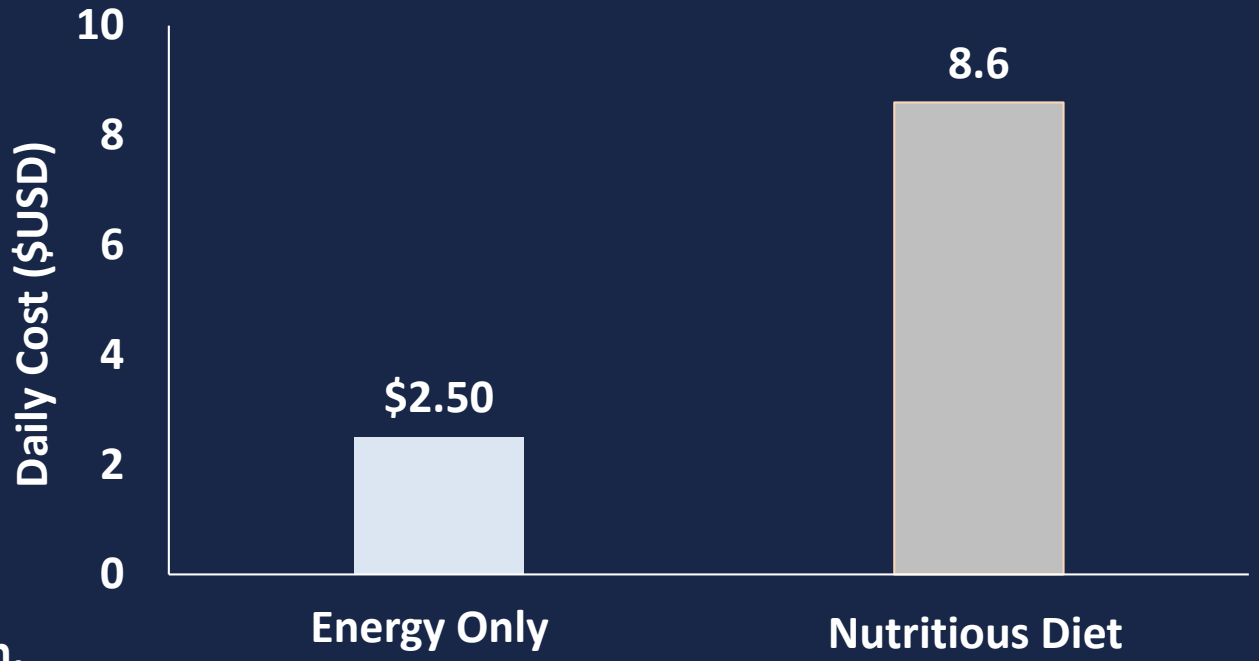
ECUADOR



WFP, 2018

A diet meeting requirements of macro and micronutrients† would cost 3.4 x more

ECUADOR



†Energy, protein,
9 vitamins and 4 minerals

WFP, 2018

A diet meeting requirements of macro and micronutrients† would cost 3.4 x more

ECUADOR

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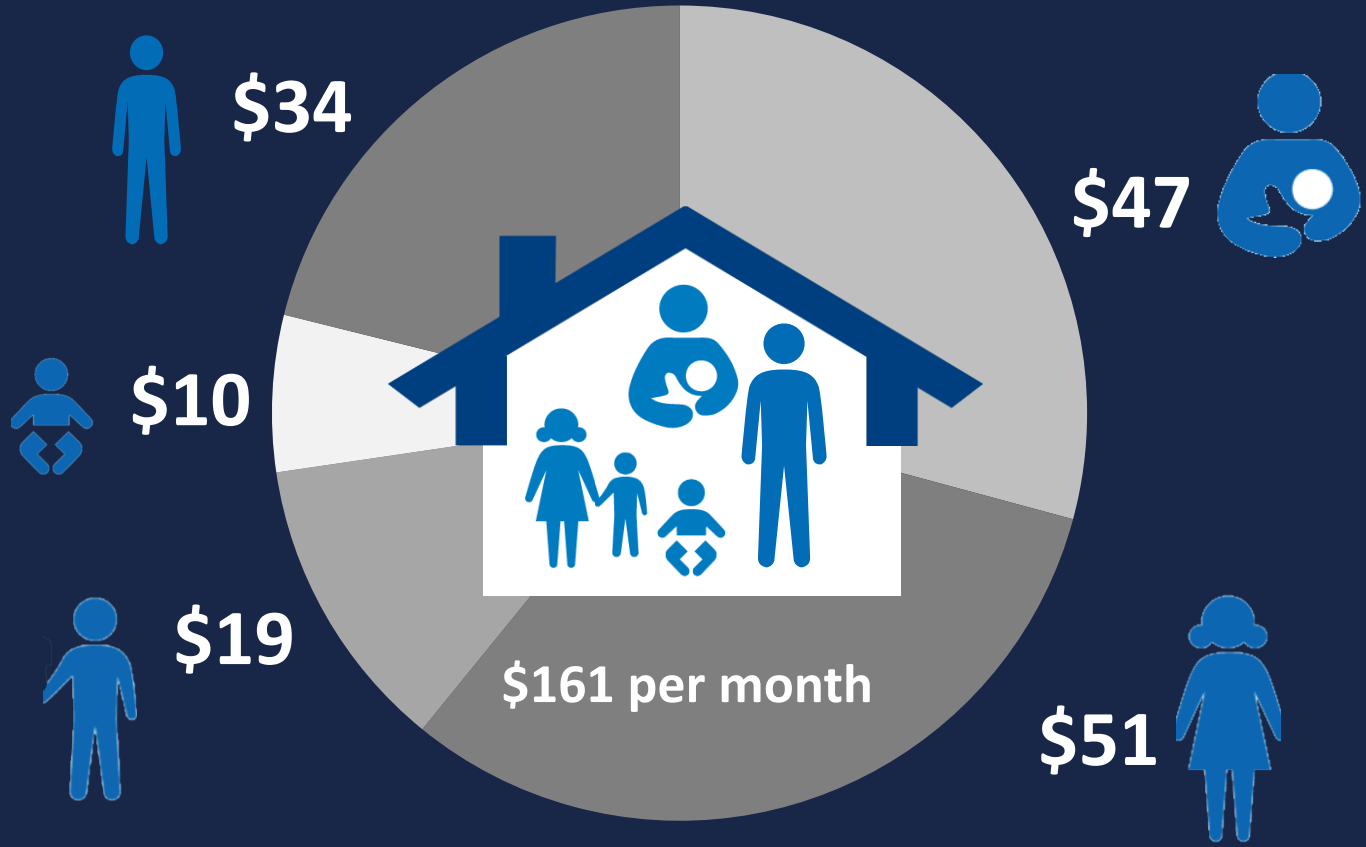
WFP, 2018

Nutrient requirements most expensive to meet for: Adolescent Girls and Lactating Women

INDONESIA



CotD: Step Two

- What proportion of households in the local population would be able to afford these diets?

Few households would be unable to afford* a diet that met energy requirements.

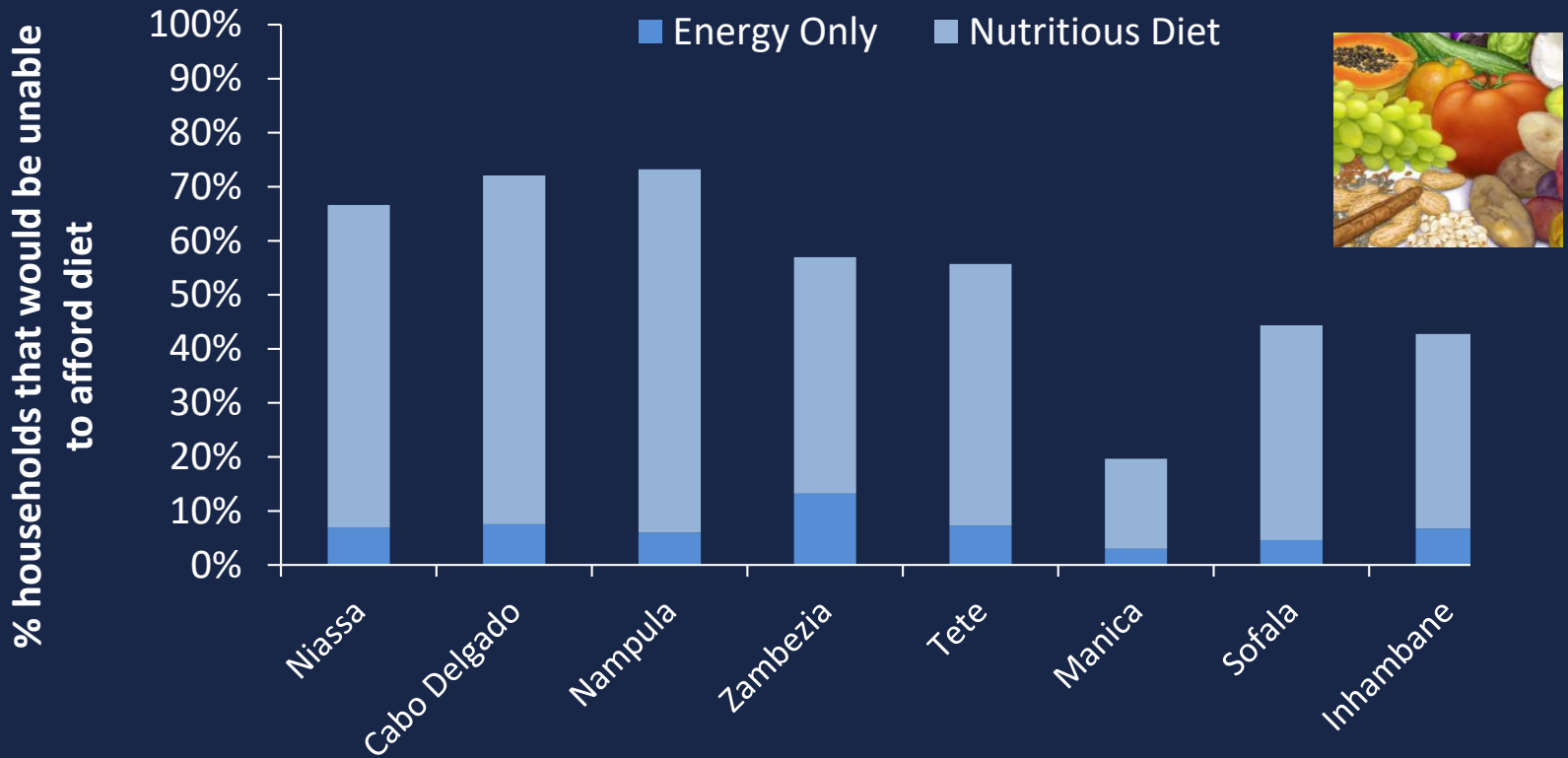
MOZAMBIQUE

*Based on current expenditure on food

WFP 2017

However, a nutritious diet would be unaffordable for most households

MOZAMBIQUE

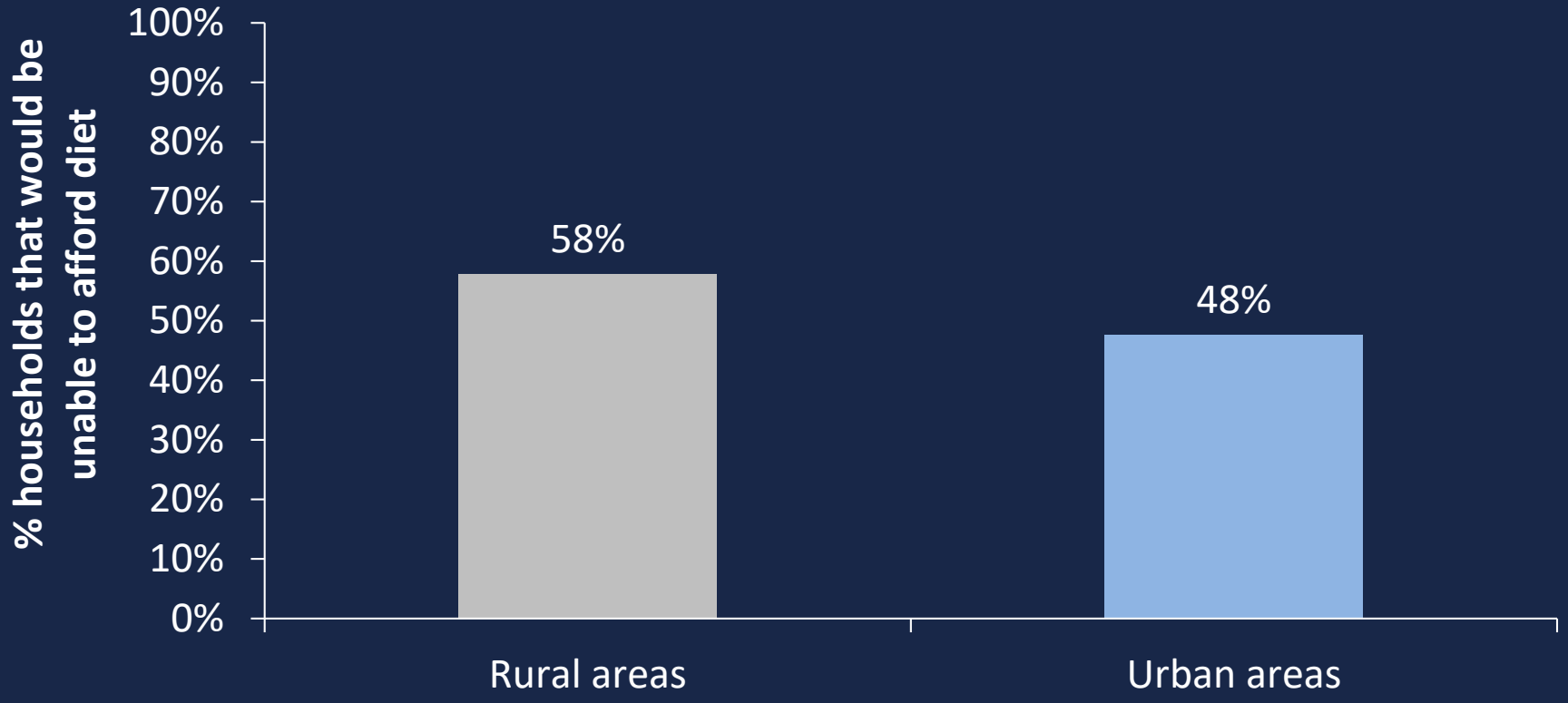


*Based on current expenditure on food

WFP 2017

Nutritious diets are particularly difficult to access for rural households

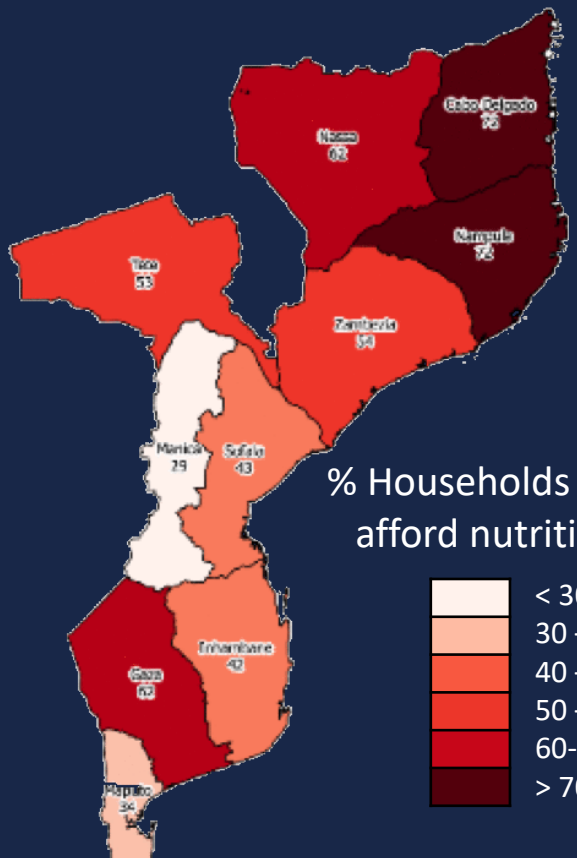
MOZAMBIQUE



WFP 2017

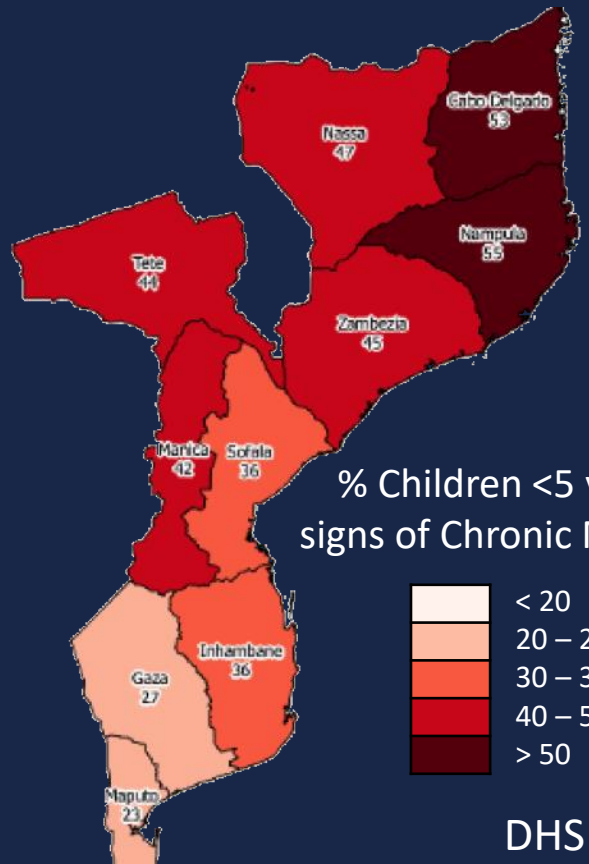
Access to nutritious diets is often lowest in areas with the highest malnutrition.

MOZAMBIQUE



% Households unable to afford nutritious diet

- < 30
- 30 – 39
- 40 – 49
- 50 – 59
- 60-69
- > 70



% Children <5 years with signs of Chronic Malnutrition

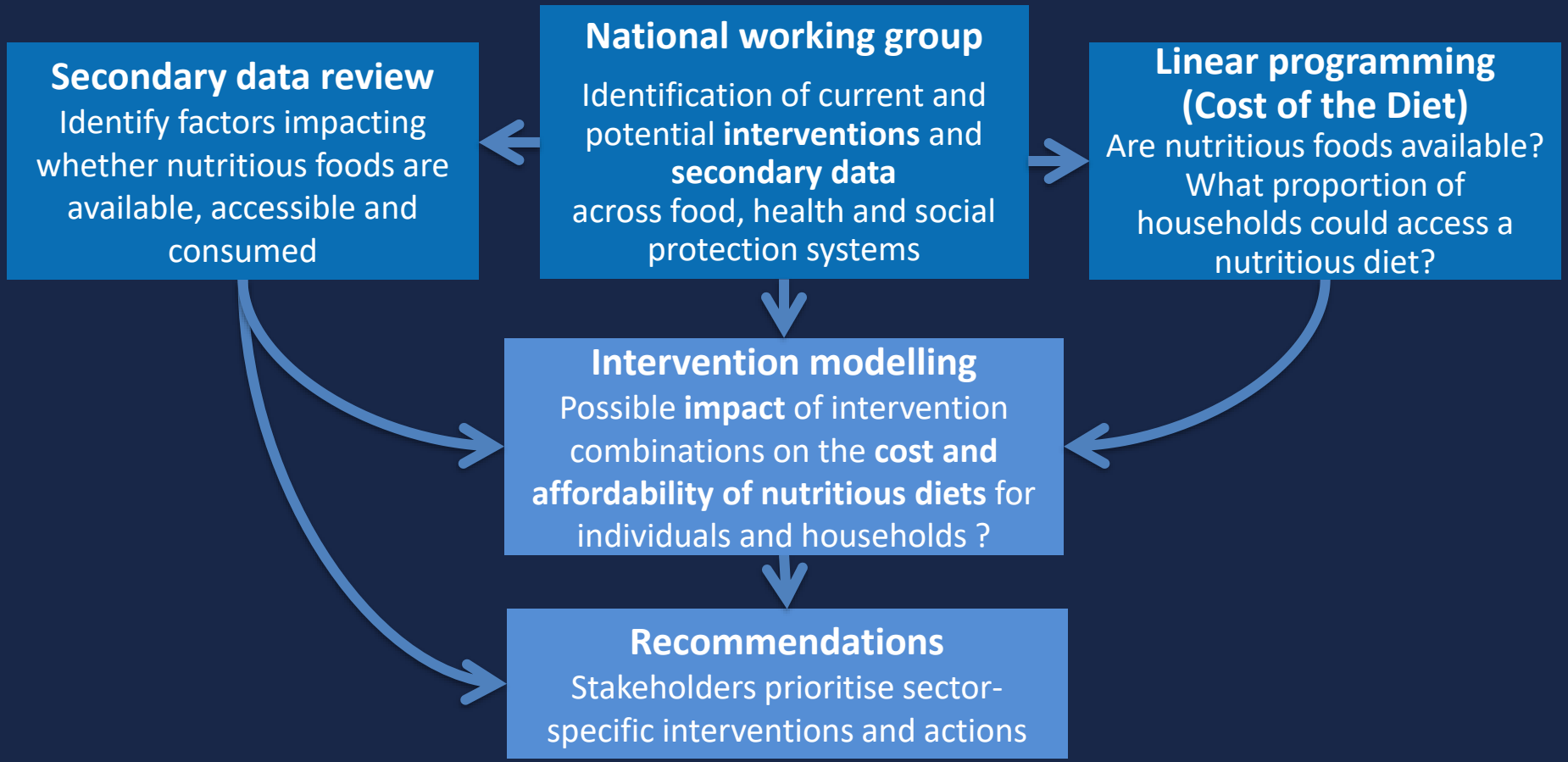
- < 20
- 20 – 29
- 30 – 39
- 40 – 50
- > 50

DHS 2011 and WFP 2017

CotD: Step Three

- Estimate impact of improving availability of and access to nutritious foods on the cost and affordability of nutritious diets

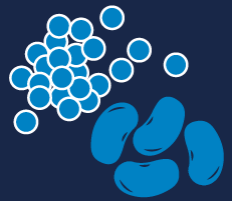
Components of the Fill the Nutrient Gap analysis:



Impact of targeted interventions on the cost of a nutritious diet: School feeding options

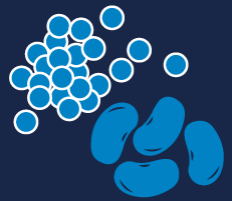
MOZAMBIQUE

1. Maize, Legumes, Oil + Milk



OR

2. Fortified Maize, Legumes, Fortified oil + Yoghurt Snack



Targeted interventions can increase nutritious diet access in specific contexts: School feeding

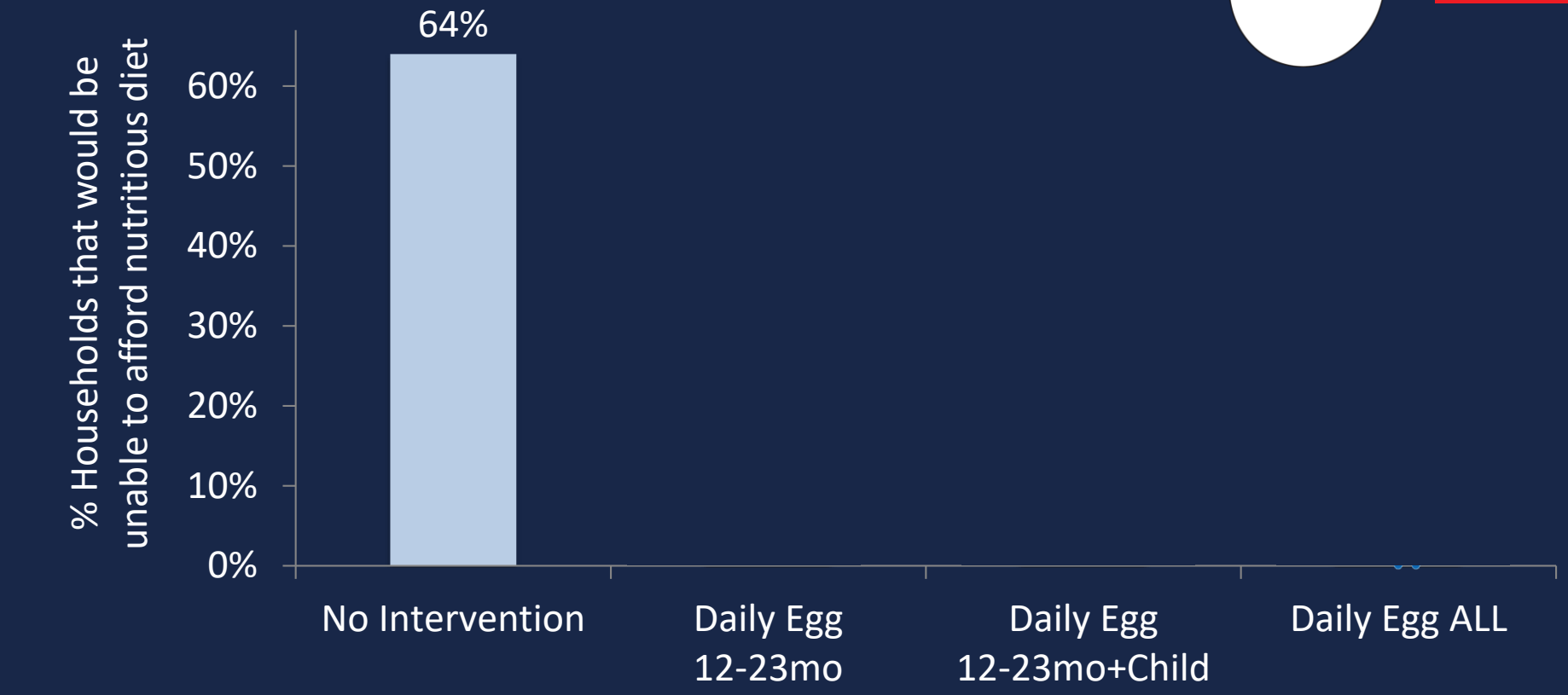
MOZAMBIQUE

Estimated impact of provision of eggs for 12-23mo children on nutritious diet cost

ECUADOR

Estimated impact of daily egg provision on household diet non-affordability

ECUADOR



Cost of the Diet: Uses

- Advocacy for actions across sectors to address poor access to nutritious diets
- Provision of evidence on the potential of actions in health, social protection, agriculture and markets to improve access to nutritious diets


AgriFOOD

Agrifood

A NEW Multi-Criteria Decision Analysis (MCDA) tool to support the selection of food combinations to promote for production and consumption across nutrition and agricultural criteria and stakeholder values.

Agrifood

Final points: Diet Modelling

- Provides ability to estimate nutritional impacts of changes to food systems in the context of real diets and the system itself.
- Allows testing of particular foods or interventions of interest.
- While based on local data, still a simulation. Feasibility studies are needed.

More Information:

Nutrition Modeller's Consortium:

https://www.nyas.org/programs/nutrition-modeling-consortium/

frances.knight@lshtm.ac.uk

The New York Academy of Sciences


Thank you