

MULTI-SECTORAL NUTRITION

Global Learning and Evidence Exchange

Washington, DC

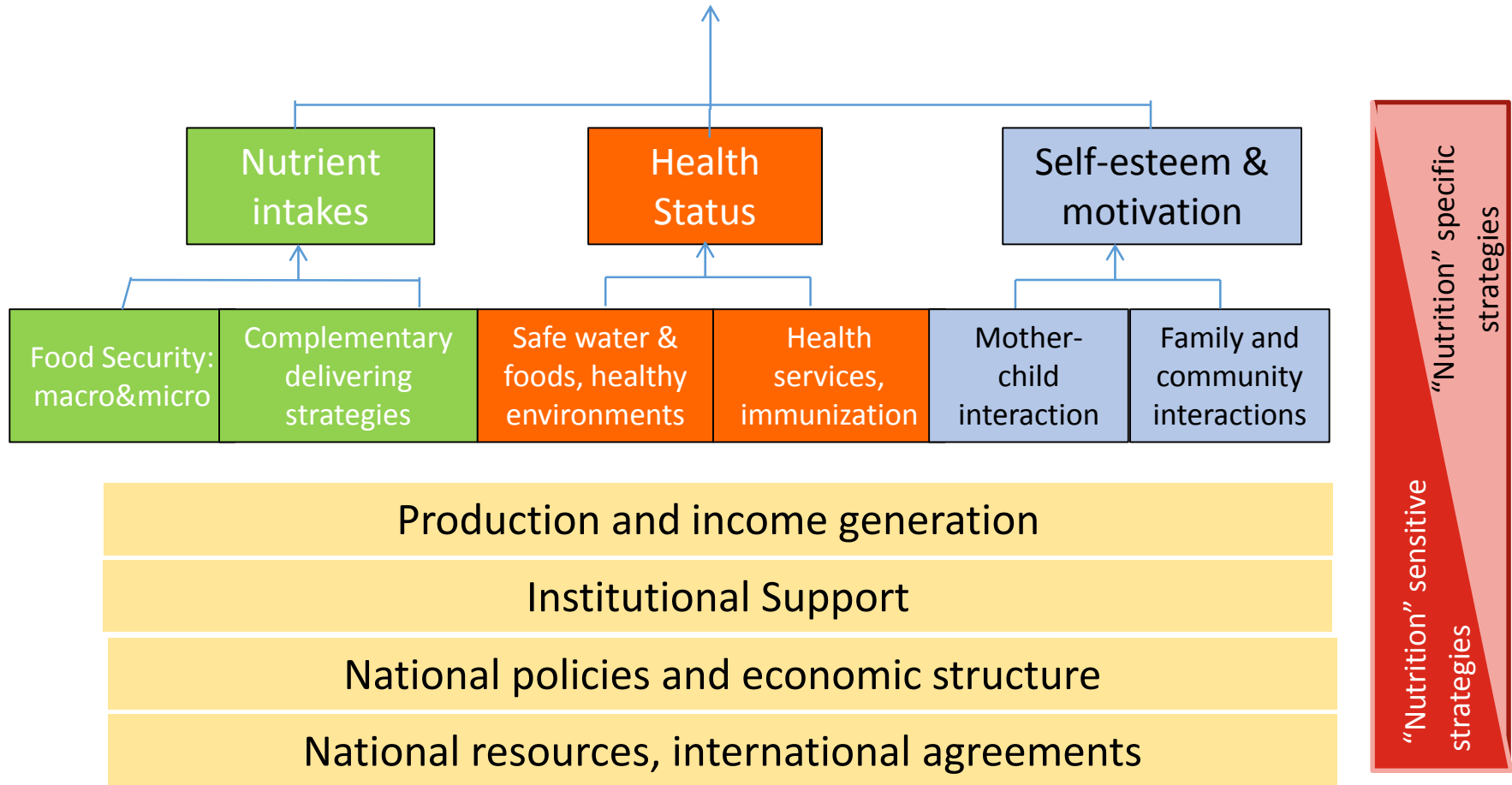


Position of Dietary Diversity on Public Health Nutrition and Potential Interventions

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Causal determinants for physical, mental and emotional development



Modified from: UNICEF, Strategies for improving nutrition in developing countries, 1990; and Ruel, 2008.

Immediate determinants for “good nutrition”

Food

Health

Care

Macronutrients:	Micronutrients:
Energy Protein Ess.fatty acids Ca, Mg P, K, Na	Vitamins Minerals
Protecting: fiber, antioxidants, non-digestible oligosaccharides, others	

Hygienic environments Safe water Immunization	Treatment when sick Medicines Control of contaminants
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Stimulation Love Self-confidence Physical activity	Interaction with mother, siblings, family, community
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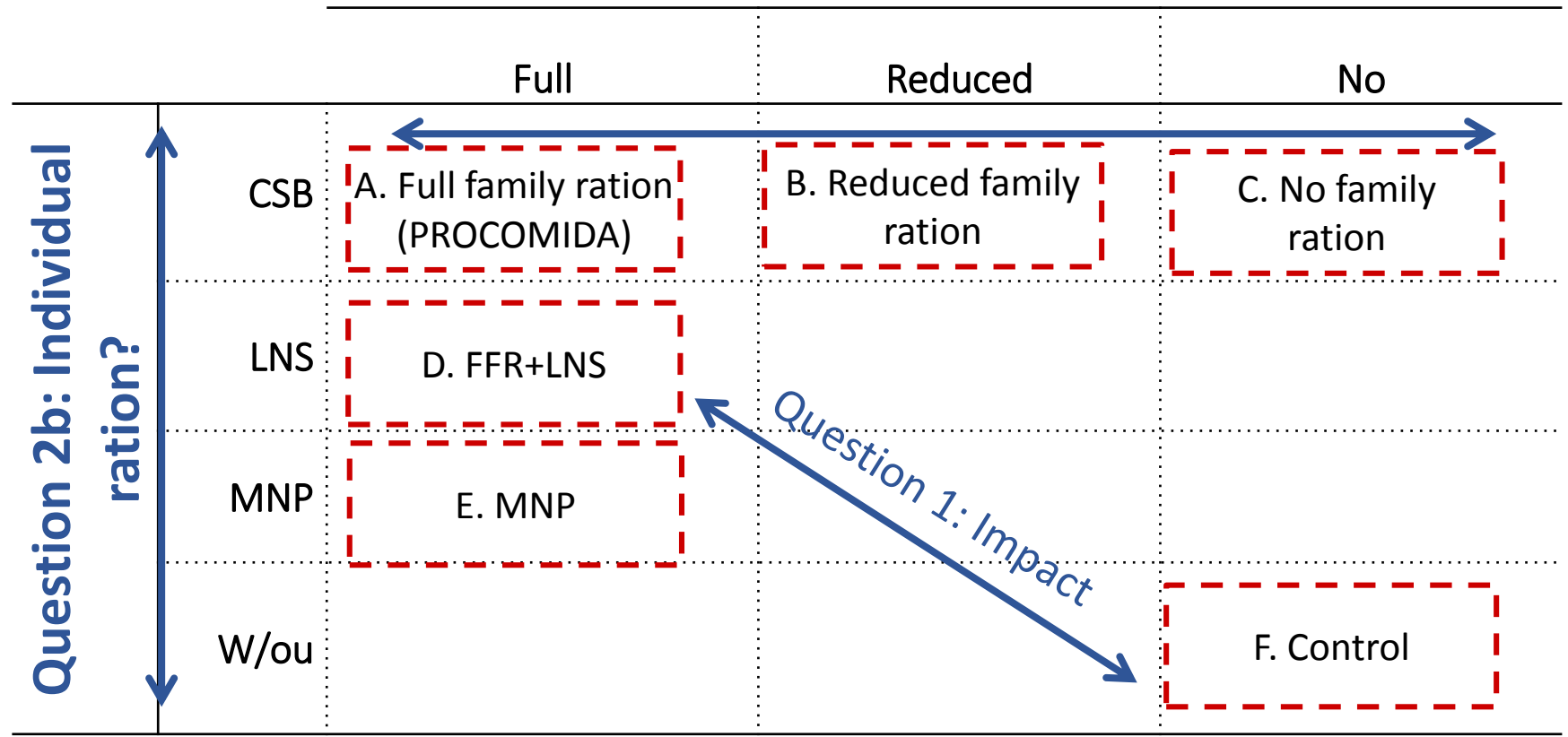
Concept taken from UNICEF, Strategies for improving nutrition in developing countries, 1990.

Although nutrients (foods) are insufficient to assure “good nutrition”, they are still essential.



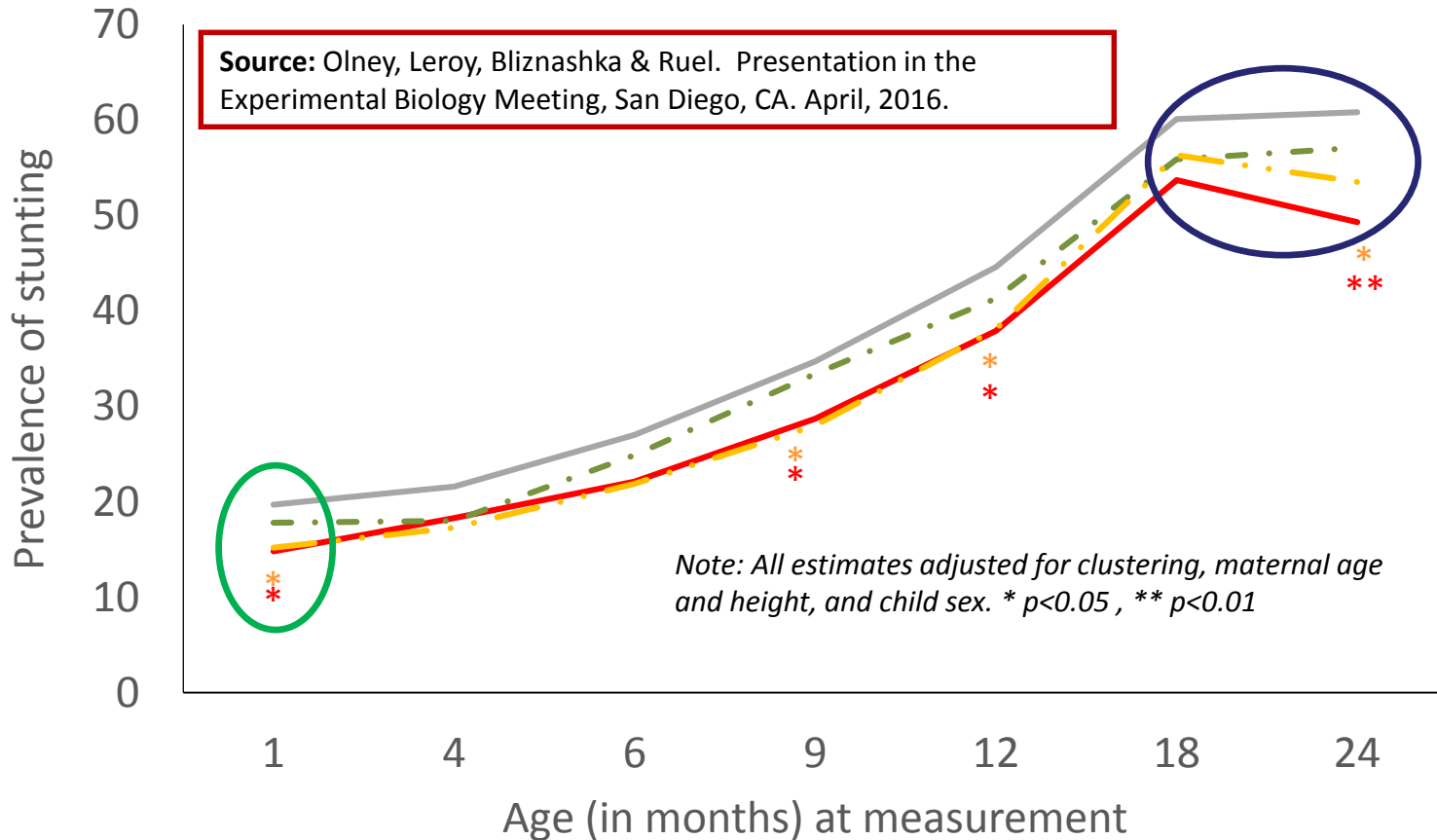
Study design PM2A (IFPRI/FANTA/USAID-FFP) in Guatemala: Research questions

Question 2a: Family ration?



Source: Olney, Leroy, Bliznashka & Ruel. Presentation in the Experimental Biology Meeting, San Diego, CA. April, 2016.

Child stunting (LAZ < -2)



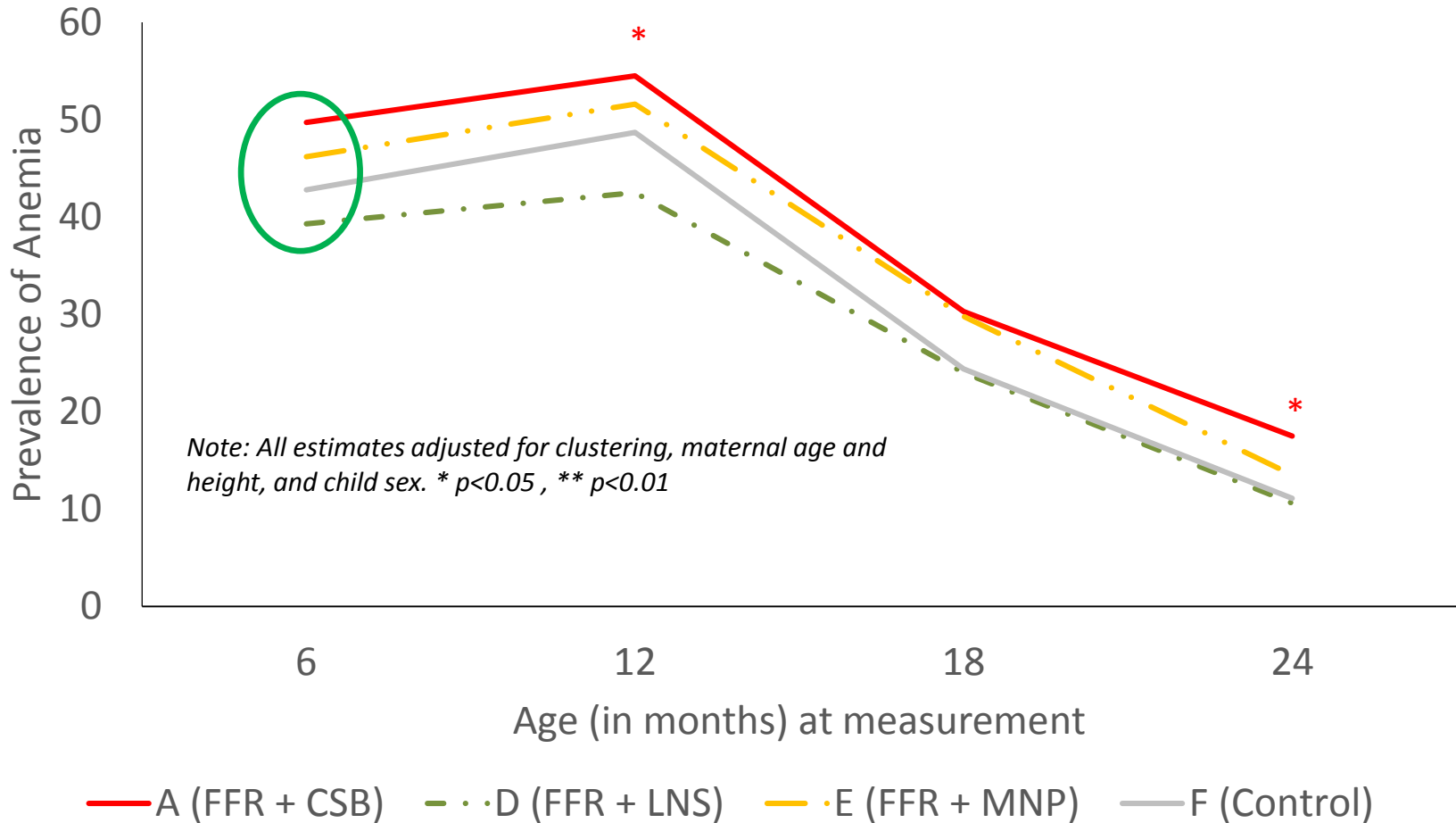
— A (FFR + CSB) - · - · D (FFR + LNS) - · - · E (FFR + MNP) — F (Control)

A (FFR + CSB) = *

D (FFR + LNS) =

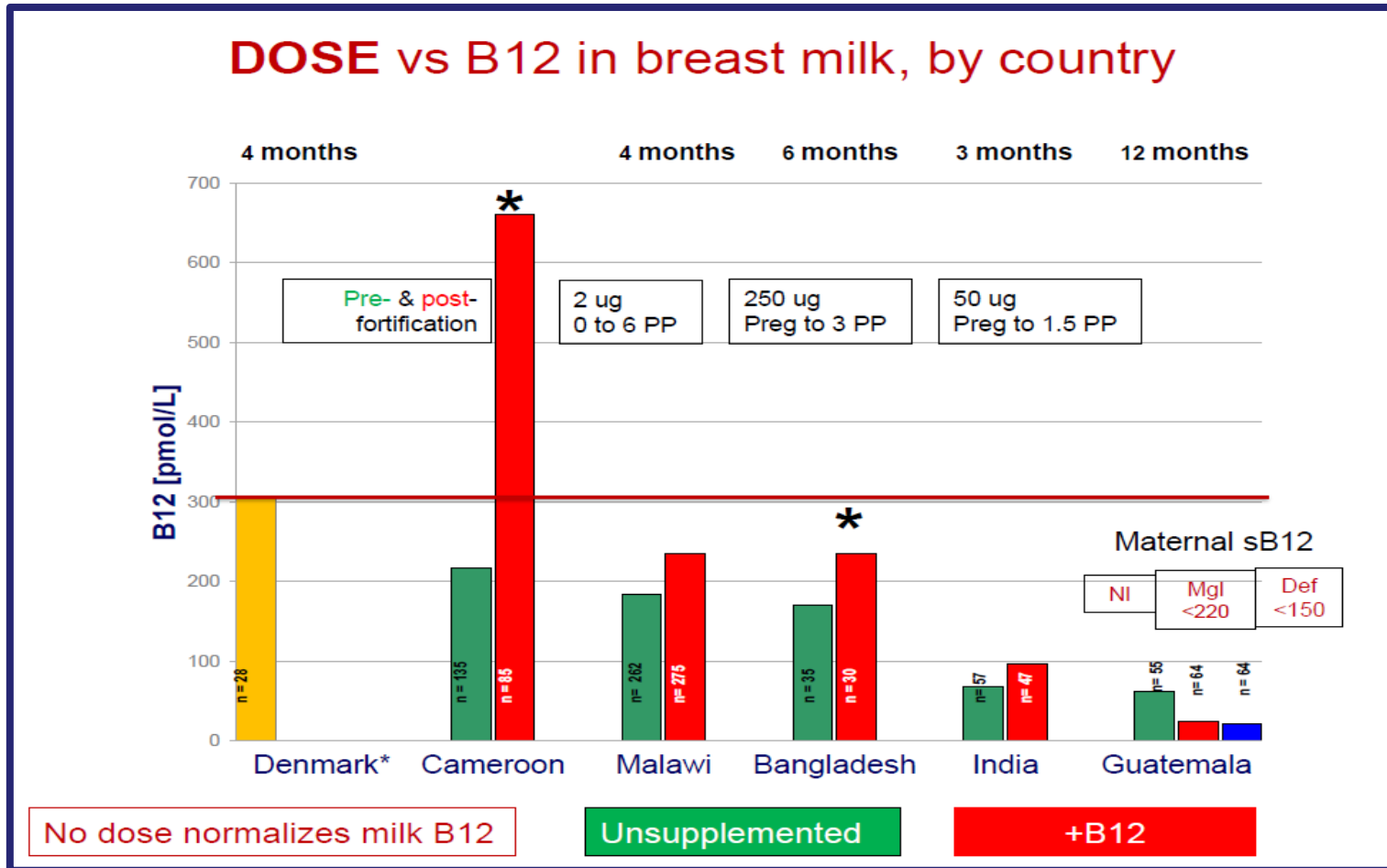
E (FFR + MNP) = *

Child anemia (Hb < 11 g/dL)



Source: Olney, Leroy, Bliznashka & Ruel. Presentation in the Experimental Biology Meeting, San Diego, CA. April, 2016.

Content of vitamin B12 in breast milk from several countries



Source: Allen L. , Vitamin B₁₂ deficiency in Guatemala. USDA-ARS, WHNRC, Davis, CA, 2016.

The nutritional value of human milk reflects the current diet of the mother

Nutrients Type I (dependents)				Nutrients Type II (independents; stored?)	
Vit. B ₁	Vit. B ₂	Vit. B ₆	Vit. B ₁₂	Sufficient	Insufficient?
Vitamin A & E		Vitamin D*		Folate, (Niacin)**	Iron, Zinc
Iodine		Selenium		Calcium	Copper

Notes:

* Can be synthesized from cholesterol and exposure to direct sunlight

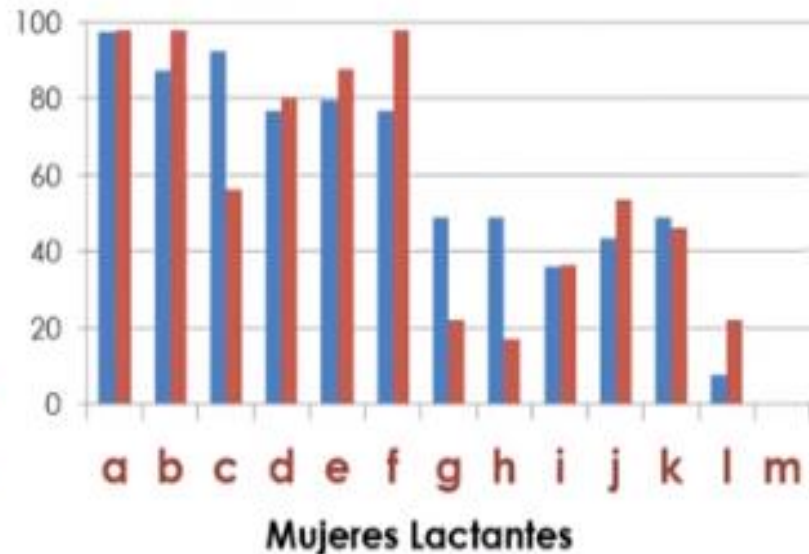
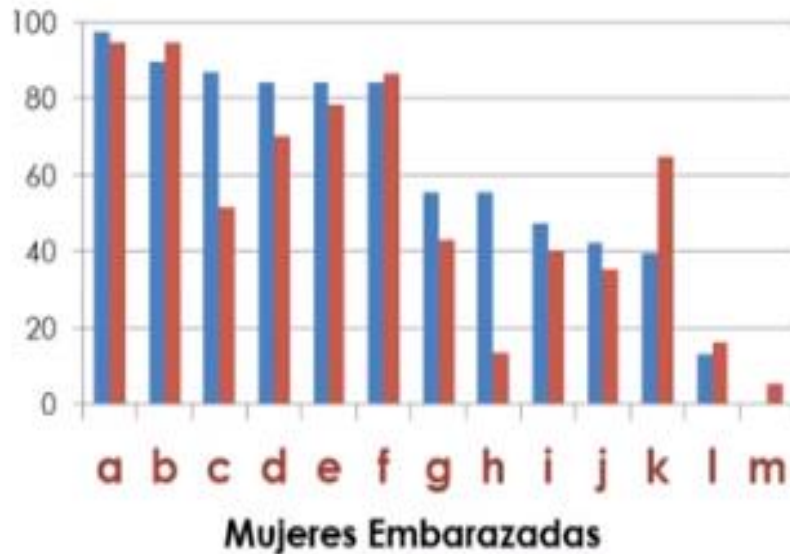
** Can be synthesized from amino acids in protein (tryptophan)

References: Allen LH, *Adv Nutr* 2012; **3**:362-369; and Allen LHGJ, en: Dealange FM WKJ (Ed). *Micronutrient deficiencies in the first months of life*. Basel: Karger Ag; 2003. pp 55-88.

Guatemala HL: More frequent consumed foods by PLW in Guatemala - Optifoods

Alimentos más frecuentemente consumidos por mujeres embarazadas y lactantes por departamento

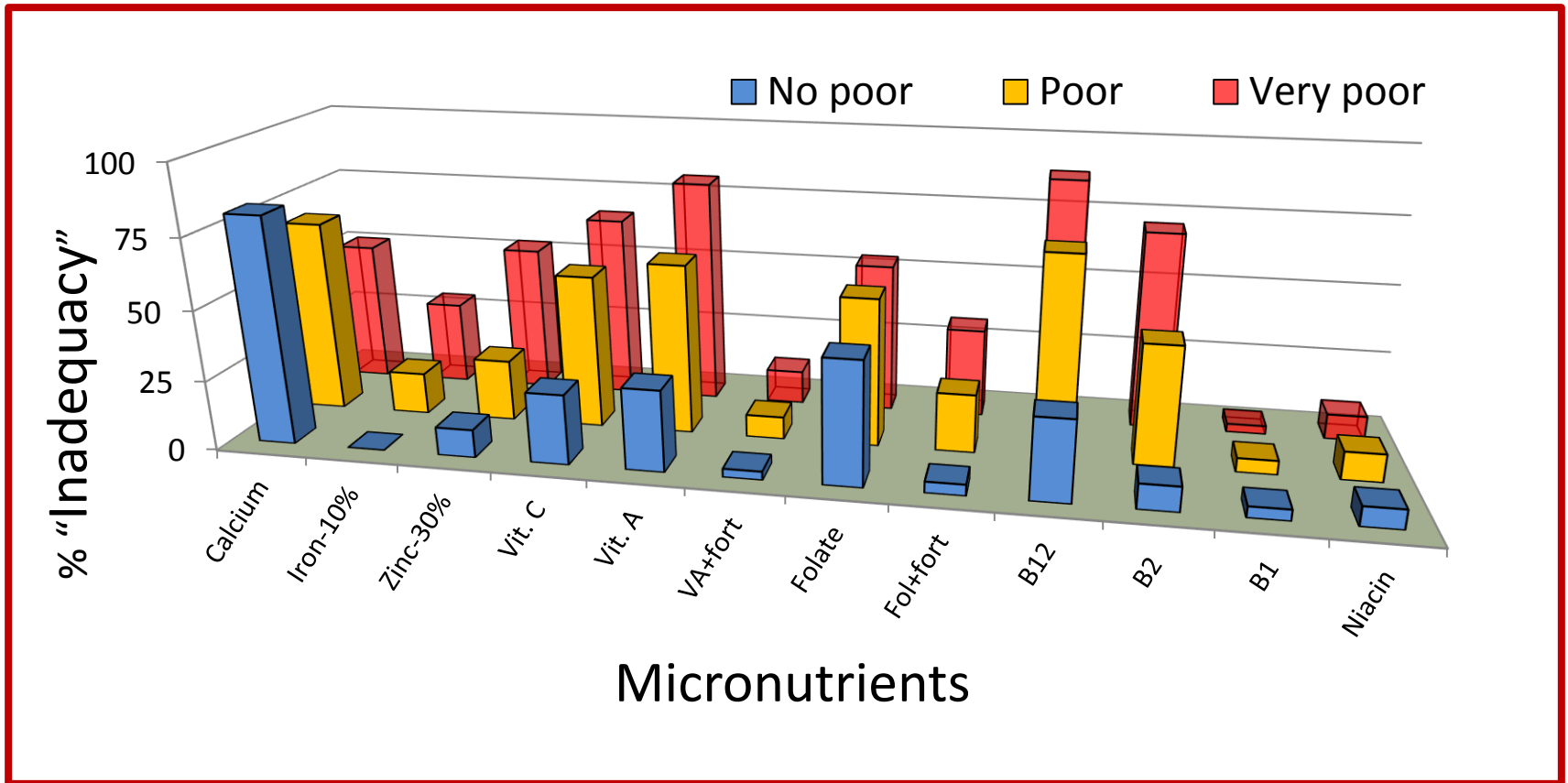
■ Huehuetenango ■ Quiché



- a. Sal de mesa
- b. Azúcar, fortificada con Vitamina A y hierro
- c. Tortilla, maíz nixtamalizado 1
- d. Cebolla 2
- e. Tomate
- f. Café
- g. Papas
- h. Sopa de pollo, instantánea, polvo
- i. Aceite vegetal 3
- j. Huevos 4
- k. Frijol negro
- l. Incaparina
- m. Avena instantánea fortificada 5?

Source: M. Mazariegos, Webinar FANTA/USAID – INCAP. June 28th, 2016. <http://www.incap.int/index.php/es/registro>

Population “Inadequacy” through nutrient density (< EAR/1000 kcal), applied to women– Guatemala 2006



Source : Menchú *et al.* (INCAP). ENCOVI-2006 Household survey, Guatemala; 2013.

Guatemala HL: Micronutrients that are difficult to satisfy through the common diet

Source: M. Woldt. FANTA/USAID. August 29th, 2013.

	Breastfed children			Non-breastfed children	Women	
	6–8 m	9–11 m	12–23 m	12–23 m	Pregnant	Lactating
Iron	△	●	●	●	△	■
Zinc	△	●	●	■	●	●
Vit. B-12	■	■	■	●	◇	◇
Folate	■	■	■	■	●	●
Calcium ?						

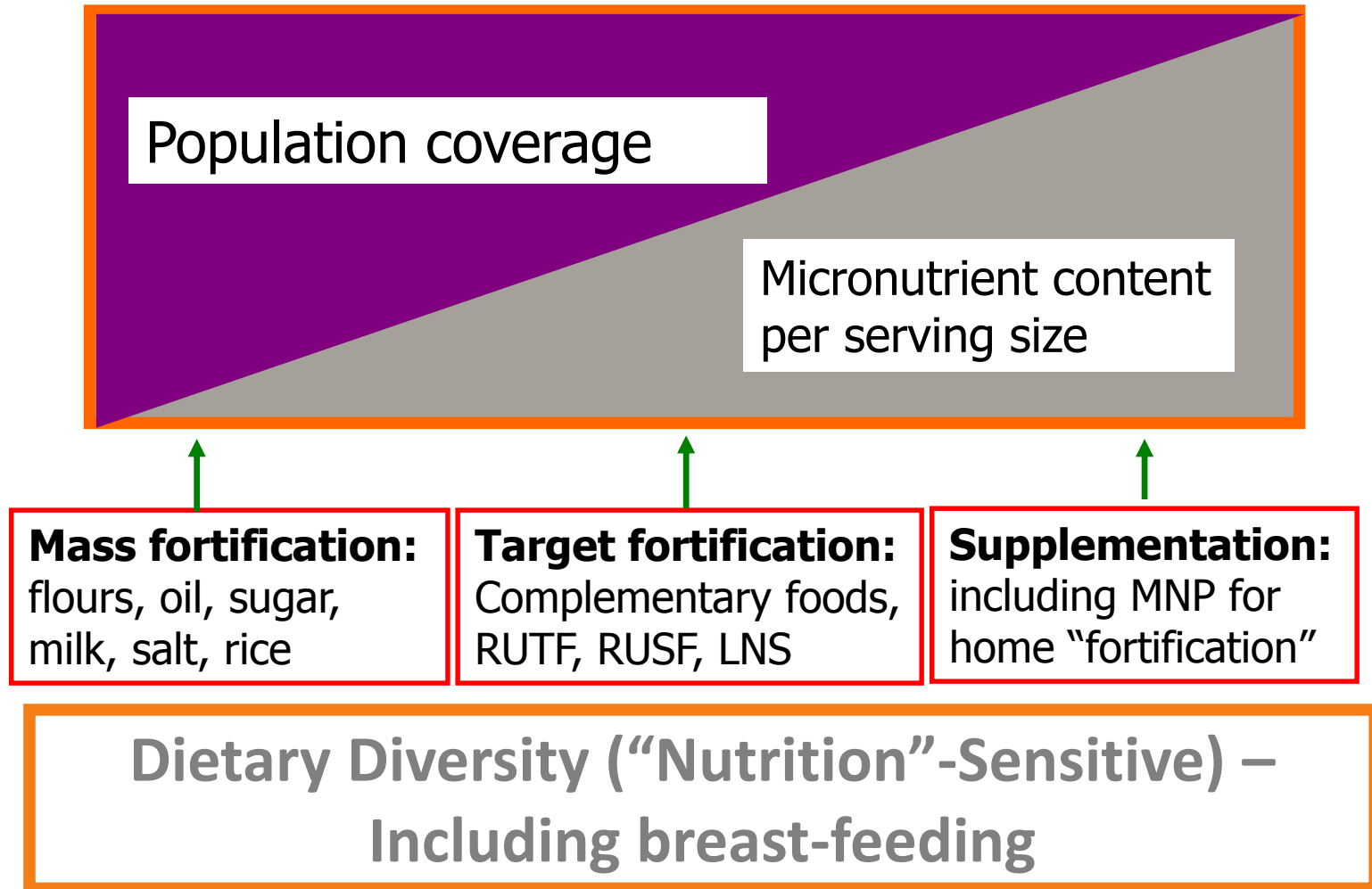
- △ Not possible to meet nutrient requirement with local foods, including fortified foods
- Not possible to meet nutrient requirement unless consume fortified cereals
- ◇ Not possible to meet nutrient requirement unless consume liver
- Possible to meet nutrient requirements with local foods

Supply of iron, zinc, vitamin B₁₂ and folate by different food groups

Minerals/ Others	Milk	Eggs	FMP ¹	Cereals, roots tubers	Pulses nuts seeds	ProVA fruits & vgt.	Other fruits & vgt.	Oil, ref. flours, sugar
Iron	-	(+)	+++	(++)	(+++)	(++)	(++)	-
Zinc	-	-	+++	(+)	(++)	(+)	(+)	-
Vit. B-12	++	++	+	-	-	-	-	-
Folate (B-9)	-	+	+	+	++++	+	++	-
Fiber	-	-	-	XX	XX	X	XX	-
Phytates	-	-	-	X	XX	-	-	-
Polyphenols	-	-	-	-	XX	-	-	-
Oxalates	-	-	-				XX	-

Notes: ¹FMP = Fish, meat, poultry; X = relative density, non-nutrient; + = Relative density of the micronutrient.; () low absorption in humans

Strategies for increasing micronutrient intakes



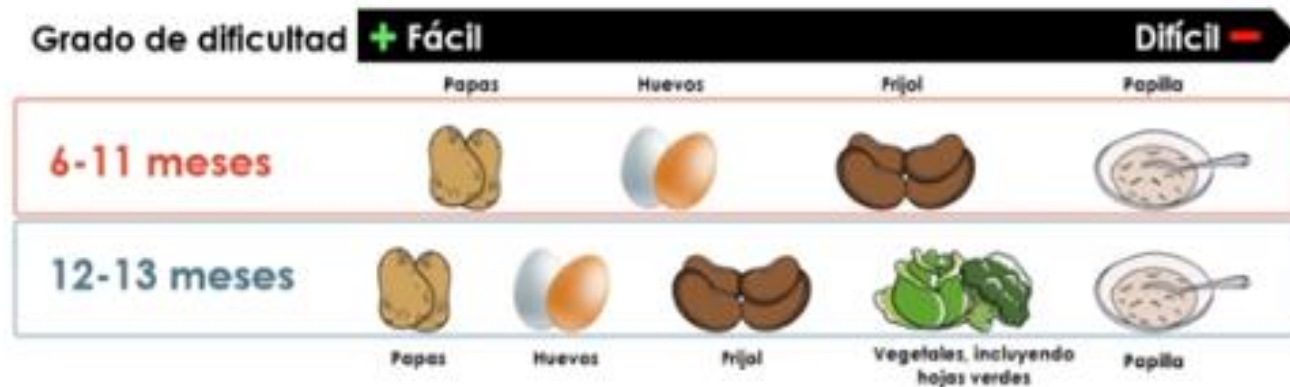
Comparison of micronutrient-delivering strategies

Characteristic	Diet	Food Fortification	Supplementation
Principle	Increase nutrient content through selection and appropriate combination of foods	Incorporation of micronutrients to the edible vehicles during the manufacturing process	Syrups/tablets/powders of micronutrients consumed with/without foods (home-“fortification”)
Impact	Additional quantity and quality of the supplied micronutrients (very little to do with the mechanism of delivery)		
PROGRAMMATIC EFFICIENCY (Sustainability)			
Feasible	√	√√	√√√
Easy to deliver	√√	√√*	√
Accessed by consumers	√√	√√√*	√
Practical to monitor	√	√√*	√√√
Viable <u>total</u> cost.	√√	√√*	√

* If centralized and reasonable-developed food industries are involved.

Guatemala HL: Degree of acceptability of Optifood recommendations

¿Qué RBAs fueron más aceptadas por los niños?



- **Retos de costo**, particularmente para papilla de Incaparina, pero también era problema para frijoles, huevos y papas (en Quiché).
- **Preferencia para servir solamente el caldo** de vegetales de hojas verdes y de frijol, y atol líquido en vez de papilla –lo cual disminuía el éxito de las RBAs de vegetales de hojas verdes, frijoles y de papilla.

Source: P. Dominguez, Webinar FANTA/USAID – INCAP. June 28th, 2016. <http://www.incap.int/index.php/es/registro>