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## **Nutrition Global Learning and Evidence Exchange:** **“How to combine interventions to reduce micronutrient deficiencies, including anemia”**

Phnom Penh, Cambodia | December 13, 2014

**Omar Dary, Ph.D.**

USAID – Washington D.C., Nutrition Division/HIDN/GH

OD-2014-33



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# Determinants of nutrition status

## Type of growth and development

### Genetic, Demographic & Environmental Factors:

Race, gender, ethnicity, altitude, sun-exposure, intestinal flora

**Physical Factors:** good nutrition, good health, disease resistance

**Social Factors (Care) :** Early stimulation, belonging to a family, attention, love

Child/mother health practices, Immunization  
**(Individual Health)**

**"Food Security"**  
**(Foods)**

Safe water and hygienic foods, healthy environments  
**(Collective Health)**

Macronutrients supply: cereals, pulses, oil and fats, animal protein

# Causes of anemia

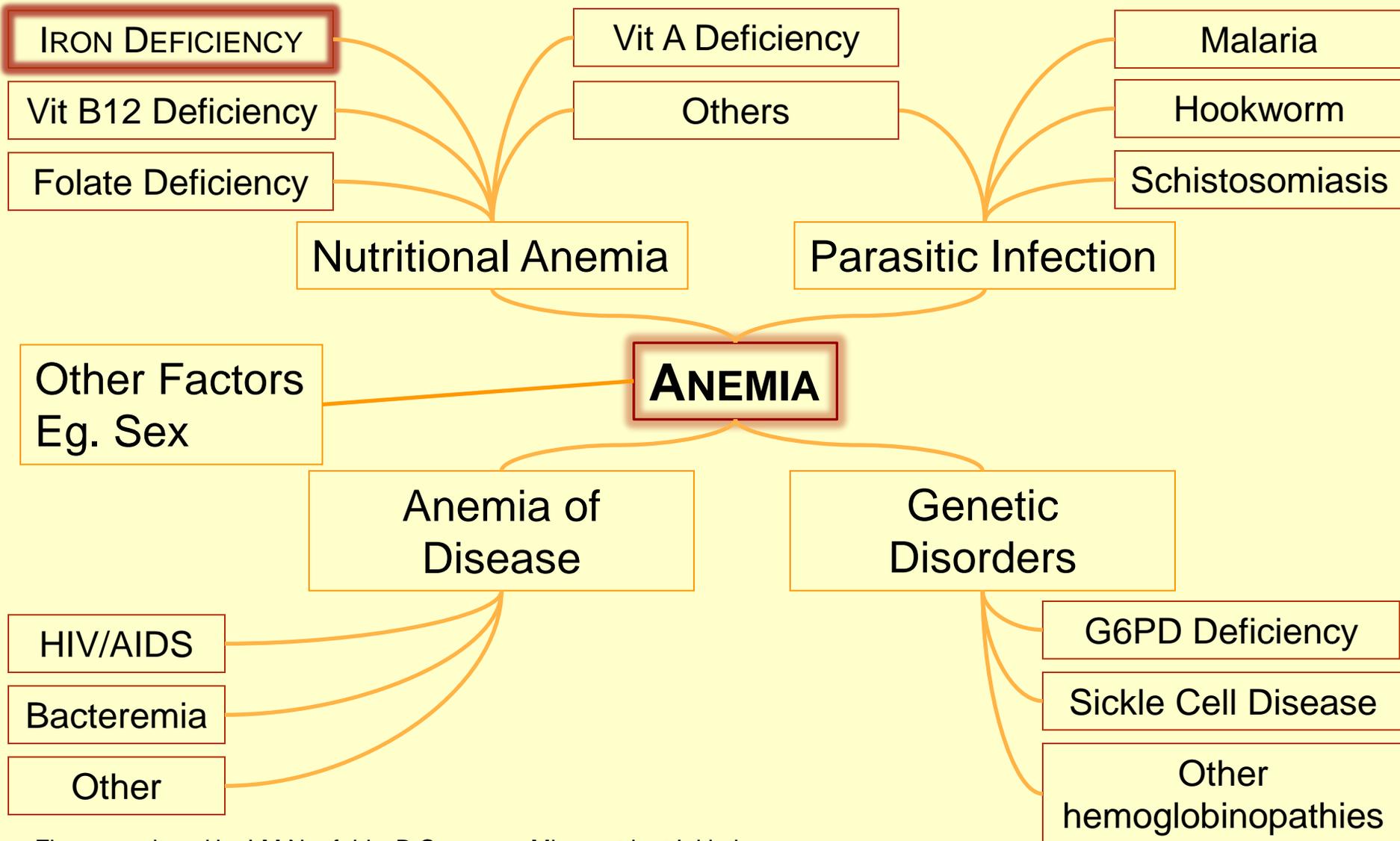


Figure produced by LM Neufeld y B Cameron, Micronutrient Initiative



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# Biomarker indicators of micronutrients status

Intelligence, growth (**height, weight**), physical endurance, educational and social performance

Vit. A	Vit. B <sub>12</sub>	Folate	Iron	Zinc	Iodine
Xerophthalmia, Anemia	NTD's Anemia	NTD's Anemia	Anemia	-	Goiter
Serum retinol	RBC-Vit. B <sub>12</sub>	RBC-folate	Serum ferritin; sTR	Serum zinc	Thyroid hormones
Breast-milk retinol	Serum Vit. B <sub>12</sub>	Serum folate	-	-	Urinary iodine

**QUATERNARY**  
(Functional signs)

**TERTIARY** (Clinical signs)

**SECONDARY** (Metabolic biomarker)

**PRIMARY**  
(Biomarkers of intake)



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# Nutrient Intakes: Supply of vitamins by different food groups, DDS concept

Vitamins	Milk	Eggs	FMP	Cereals, roots tubers	Pulses nuts seeds	ProVA* fruits & vgt.	Other fruits & vgt.	Ref.wf, oil, sugar
Vit. B-1	+	++	+	++	+++	+	++	-
Vit. B-2	+++	++	++	+	+	+	++	-
Niacin (B-3)	+	+	+++	+	++	+	++	-
Vit. B-6	++	++	++	++	++	++	++	-
Folate (B-9)	-	+	+	+	++++	+	++	-
Vit. B-12	++	++	+	-	-	-	-	-
Vit. C	+	-	-	-	-	+++*	+++*	-
Vit. A	+++*	+++	+	-	-	++*	(+)	-
Vit. D	++	++	+	-	-	-	-	-
Vit. E	+	+	+	++	+	++	++	+(oil)



# Nutrient Intakes: Supply of minerals by different food groups

Minerals/ Others	Milk	Eggs	FMP	Cereals, roots tubers	Pulses nuts seeds	ProVA* fruits & vgt.	Other fruits & vgt.	Ref.wf, oil, sugar
Iron	-	(+)	+++	(++)	(+++)	(++)	(++)	-
Zinc	-	-	+++	(++)	(++)	(+)	(+)	-
Copper	-	++	++	-	(++)	(+)	(+)	-
Calcium	+++	+	+	(+)	(++)	-	(+)	-
Iodine	-	-	-	-	-	-	-	-
Fiber	-	-	-	XX	XX	X	XX	-
Phytates	-	-	-	X	XX	-	-	-
Polyphenols	-	-	-	-	XX	-	-	-
Oxalates	-	-	-	-	-	-	XX	-



# Characteristics of micronutrient-delivering interventions



**Mass fortification:**  
staples, oil, sugar,  
milk, salt

**Target fortification:**  
comp. foods, RUTF,  
RUSF, LNS, others

**Supplementation:**  
including MNP for  
home “fortification”

**Dietary Diversity (“Nutrition”-Sensitive) -  
Biofortification**



# Comparison of micronutrient-delivering strategies

Characteristic	Biofortification	Food Fortification	Supplementation
<b>Principle</b>	Increase nutrient content through selection and breeding of basic vegetable crops	Incorporation of micronutrients to the edible vehicles during the manufacturing process	Syrups/tablets/powders, of micronutrients consumed with/without foods (home-“fortification”)
<b>Impact</b>	Additional quantity and quality of the supplied micronutrients (very little to do with the carrying vehicle).		

## PROGRAMMATIC EFFICIENCY (Sustainability)

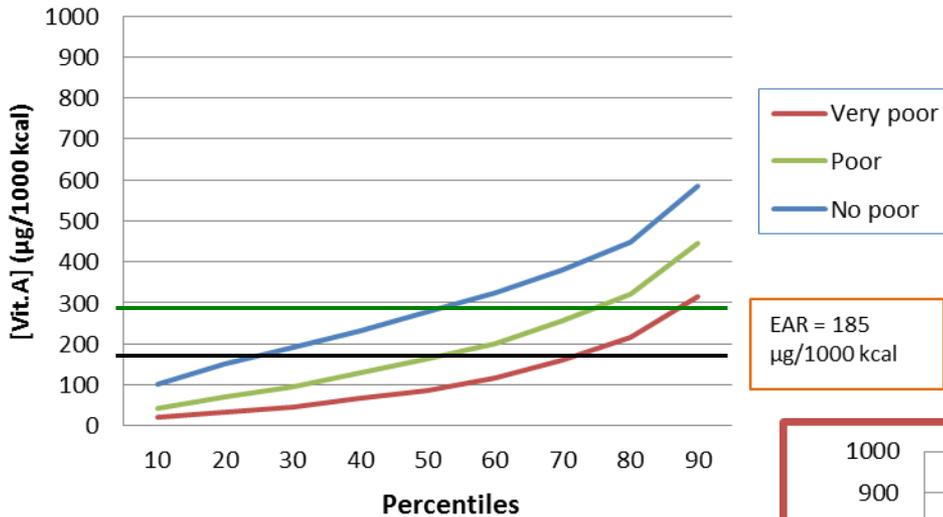
Feasible to produce	√	√√	√√√
Easy to deliver	√√	√√√	√
Accessed by consumers	√√	√√√	√
Practical to monitor	√	√√*	√√√
Viable <u>total</u> cost.	√√	√√√*	√

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



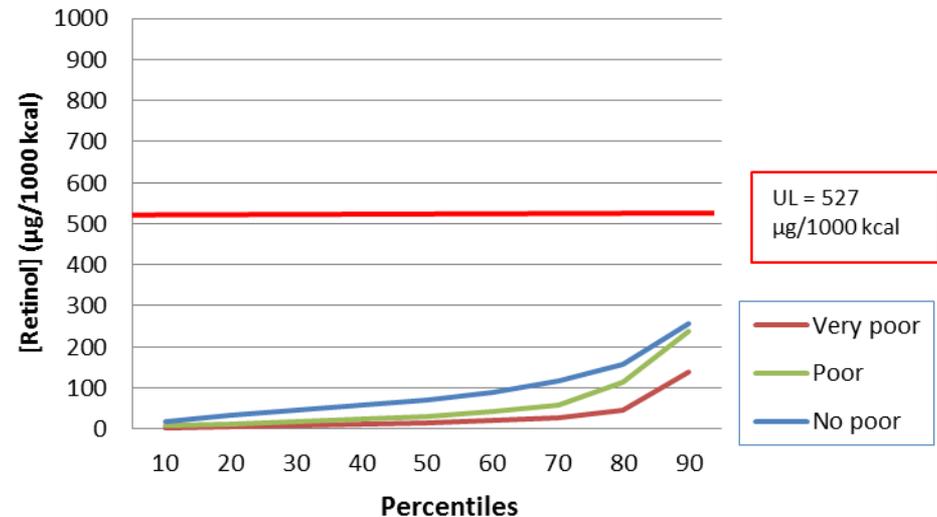
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# “Adequacy” and “safety” of vitamin A in the absence of fortification for children 2-4 y, Guatemala-2006



Dietary “adequacy” (density)

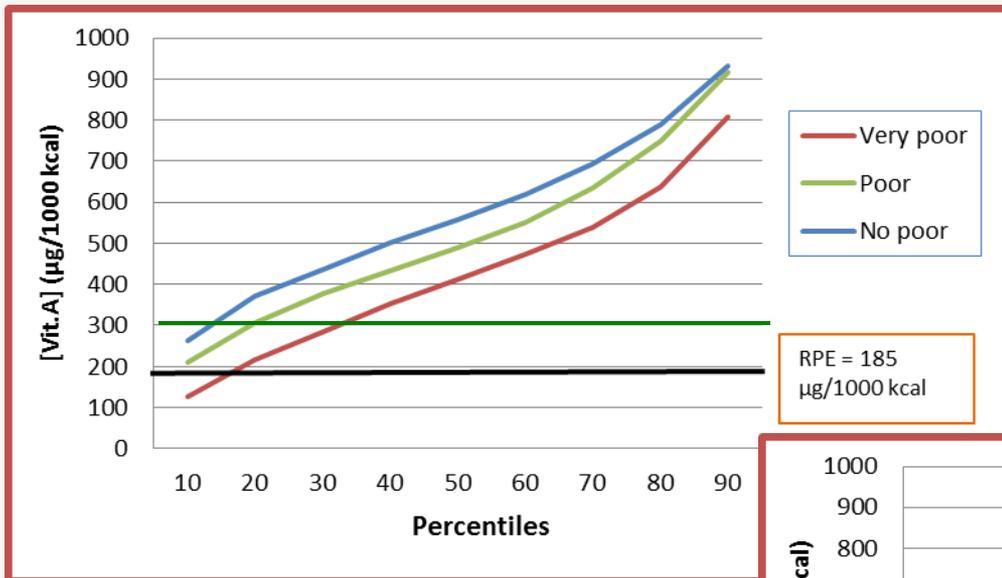
“Safety” of retinol (density)



**Source :** Menchú *et al.* (INCAP). Estudio complementario la ENCOVI-2006 de Guatemala; 2013.

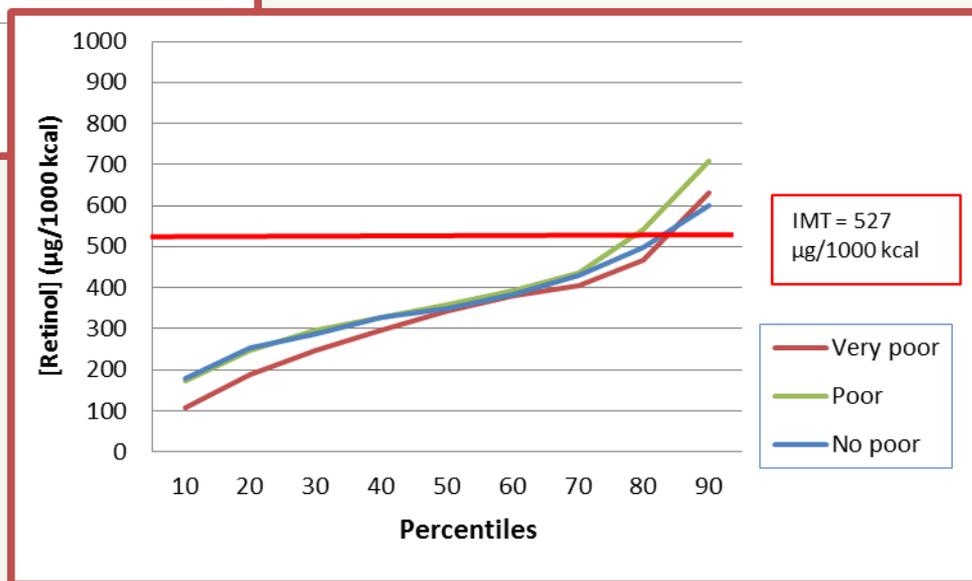


# “Adequacy” and “safety” of vitamin A in the presence of sugar fortified with vit. A (9 mg/kg) for children 2-4 y



Dietary “adequacy” (density)

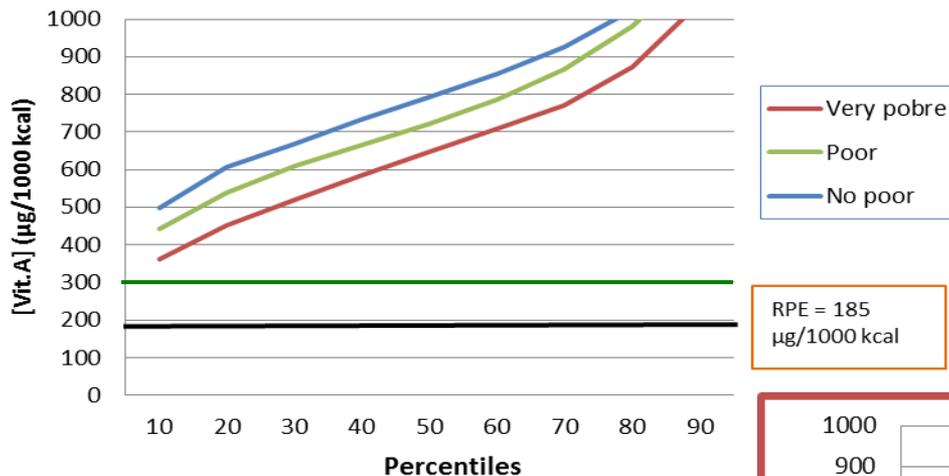
“Safety” of retinol (density)



**Source :** Menchú *et al.* (INCAP). Estudio complementario la ENCOVI-2006 de Guatemala; 2013.

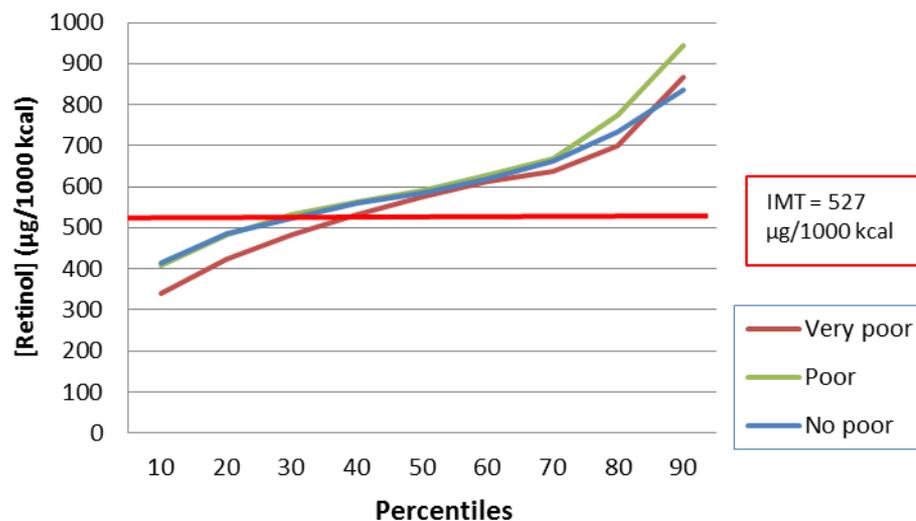


# Modeling adding vit. A supplements: an unnecessary intervention in Guatemala



Dietary adequacy (density)

Safety of retinol (density)



Source : Menchú *et al.* (INCAP). Estudio complementario la ENCOVI-2006 de Guatemala; 2013.



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# From product efficacy to program effectiveness

