

The Triple burden of disease: Intestinal parasites, undernutrition & overweight/obesity

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THE TRIPLE BURDEN OF DISEASE: INTESTINAL PARASITES, UNDERNUTRITION & OVERWEIGHT/OBESITY



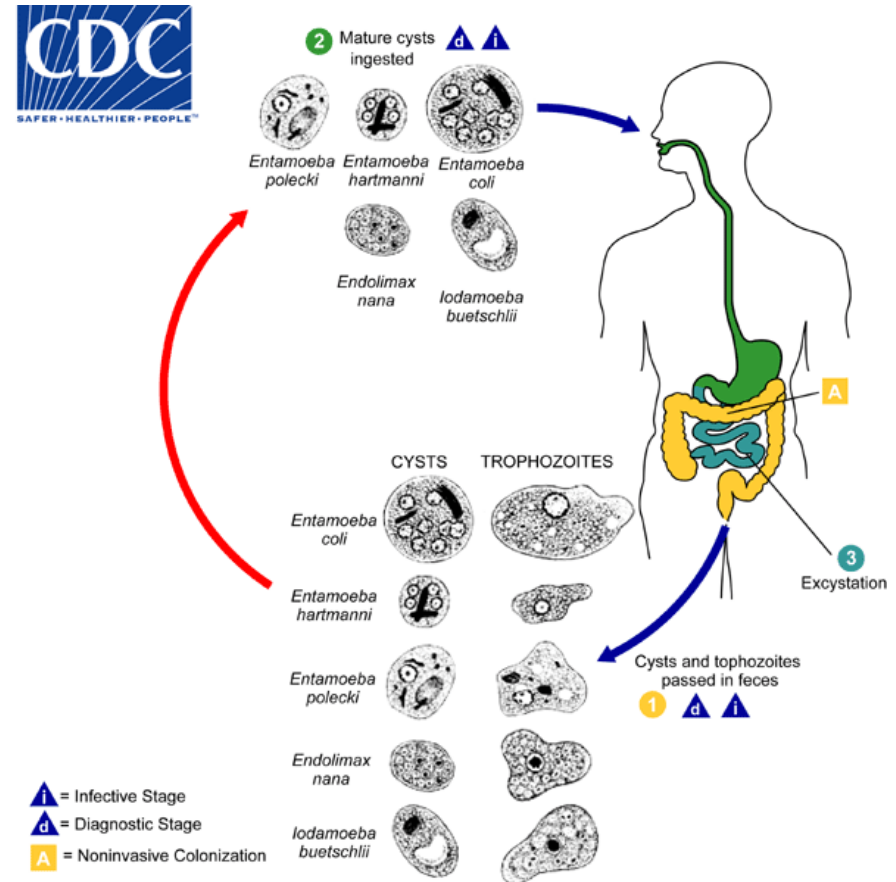
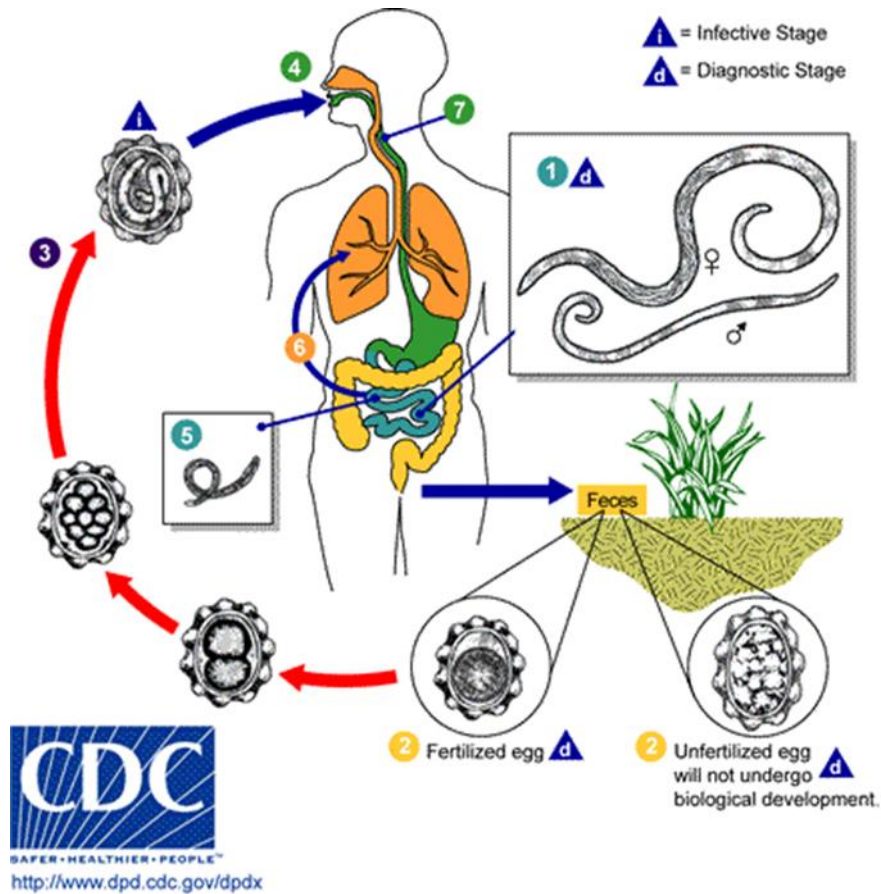
stunting



Micronutrient deficiency



THE TRIPLE BURDEN OF DISEASE: INTESTINAL PARASITES



THE TRIPLE BURDEN OF DISEASE: INTESTINAL PARASITES, UNDERNUTRITION & OVERWEIGHT/OBESITY



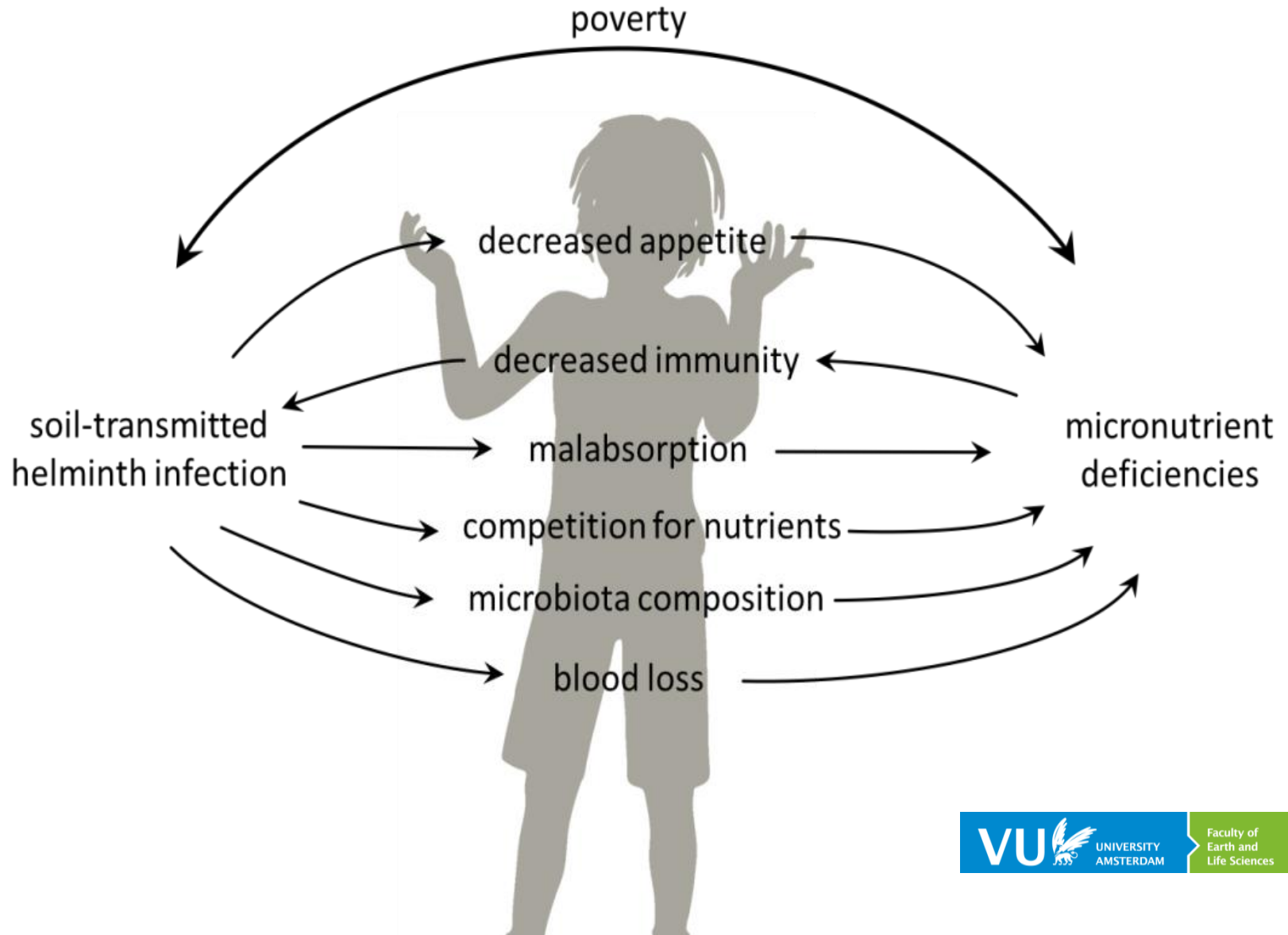
stunting



Micronutrient deficiency



INTESTINAL PARASITES & UNDERNUTRITION



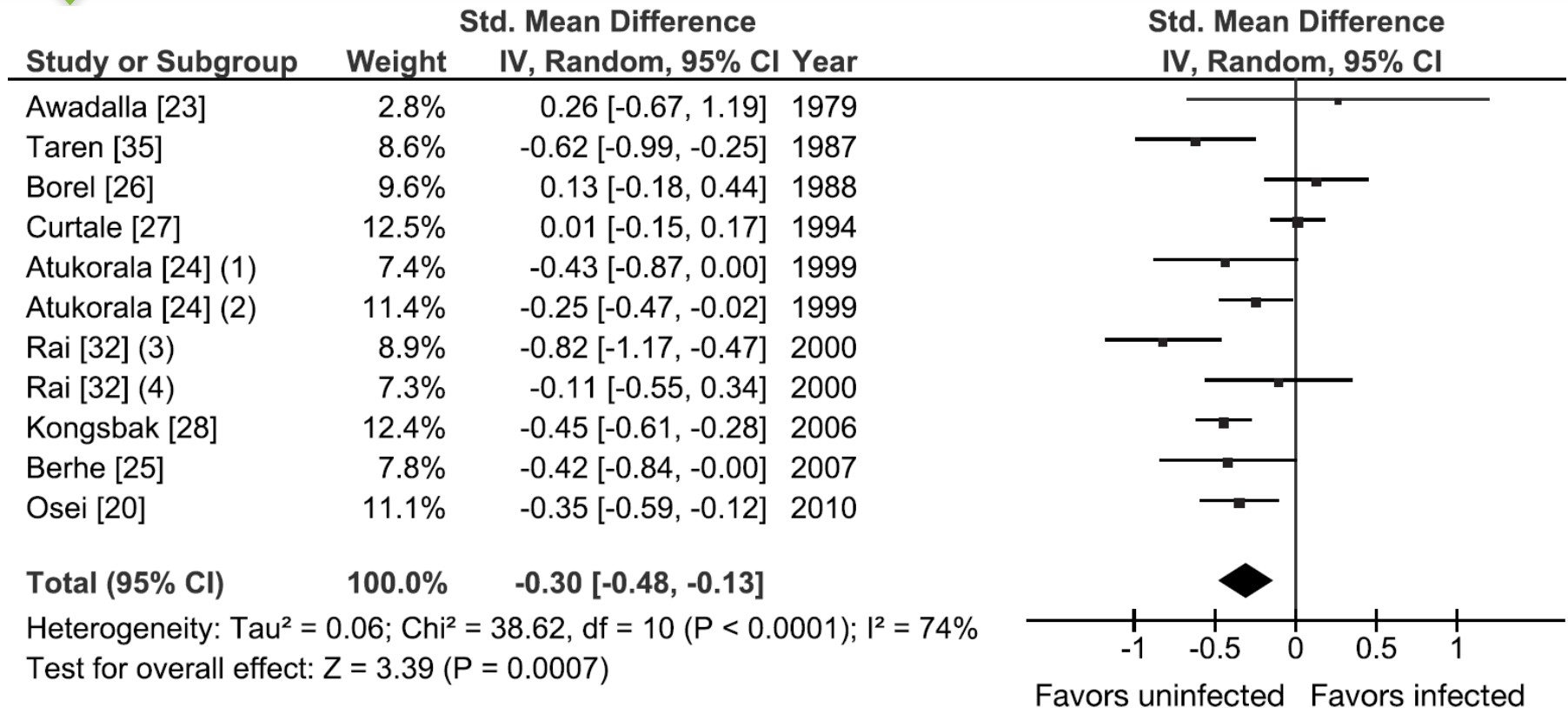
HELMINTH INFECTIONS AND MICRONUTRIENTS IN SCHOOL-AGE CHILDREN: A SYSTEMATIC REVIEW AND META-ANALYSIS

Objective: To systematically review current evidence on possible associations between helminth infections and micronutrient status in school-age children.

Non-Cochrane approach: include both experimental and observational studies

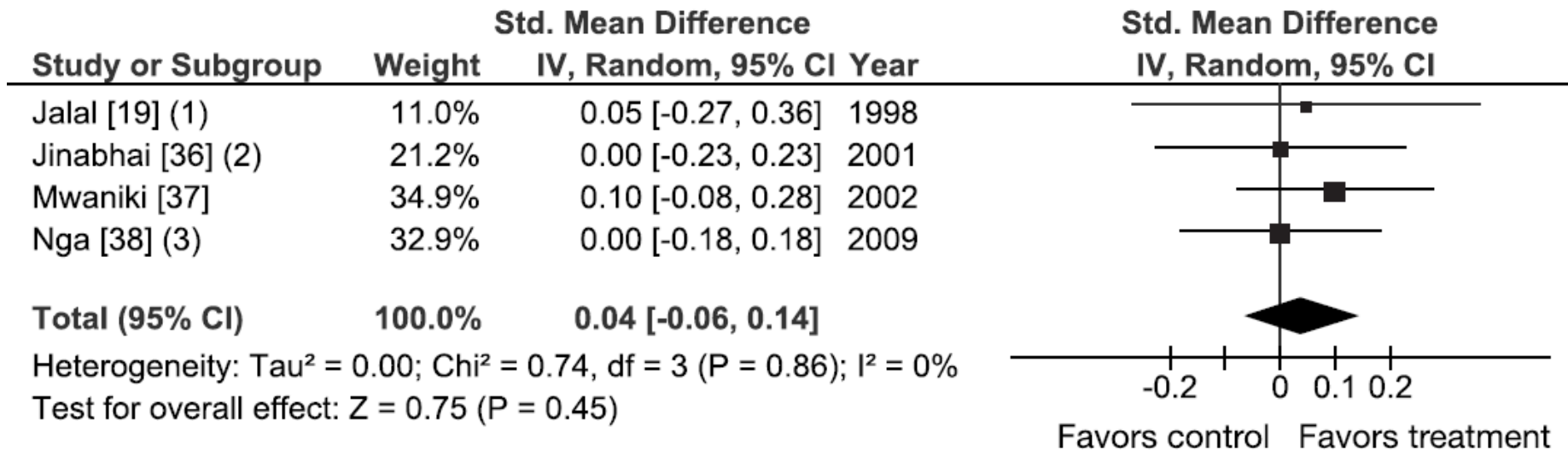
1. Observational (cross-sectional) data
2. RCT deworming → micronutrients
3. RCT supplementation → helminth (re)infection

RESULTS: HELMINTH INFECTIONS AND MICRONUTRIENTS IN SCHOOL-AGE CHILDREN: A SYSTEMATIC REVIEW AND META-ANALYSIS



Retinol in helminth infected and uninfected children (n=3005): →
Retinol concentration is negatively associated with helminth infections

RESULTS: HELMINTH INFECTIONS AND MICRONUTRIENTS IN SCHOOL-AGE CHILDREN: A SYSTEMATIC REVIEW AND META-ANALYSIS



Effects of deworming on serum retinol (n=1421):
→ Deworming does not significantly increase retinol concentrations

CONCLUSION : HELMINTH INFECTIONS AND MICRONUTRIENTS IN SCHOOL-AGE CHILDREN: A SYSTEMATIC REVIEW AND META-ANALYSIS

- **Helminth infection:**

Associated with lower serum retinol but not ferritin status

- **Deworming:**

Increases ferritin concentration but not serum retinol

- **Multi-micronutrient supplementation:**

Decreases the risk of helminth (re-)infection.

SPECIES-SPECIFIC ASSOCIATIONS BETWEEN SOIL-TRANSMITTED HELMINTHS AND MICRONUTRIENTS IN VIETNAMESE SCHOOLCHILDREN

- 590 school children (6-9 years of age)
- Children were randomly selected from two primary schools in Northern Vietnam.
- STH infections were determined in stool.
- Hemoglobin, ferritin, CRP, retinol and zinc were measured in blood.

Definition of deficiency:

Vitamin A deficiency : $<0.70 \mu\text{mol/L}$

marginal vitamin A status: $<1.05 \mu\text{mol/L}$,

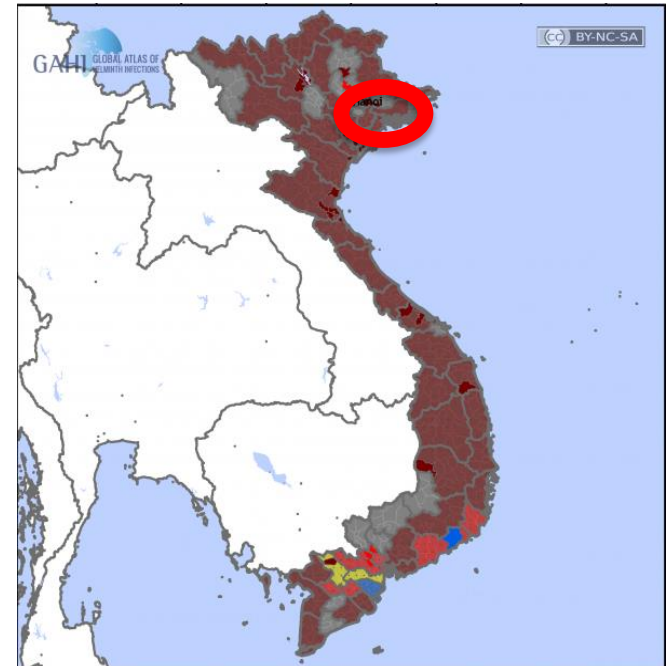
zinc deficiency: plasma zinc $<9.9 \mu\text{mol/L}$,

Iron deficiency: plasma ferritin $15 \mu\text{g/L}$,

anemia: hemoglobin $< 115 \text{ g/L}$,



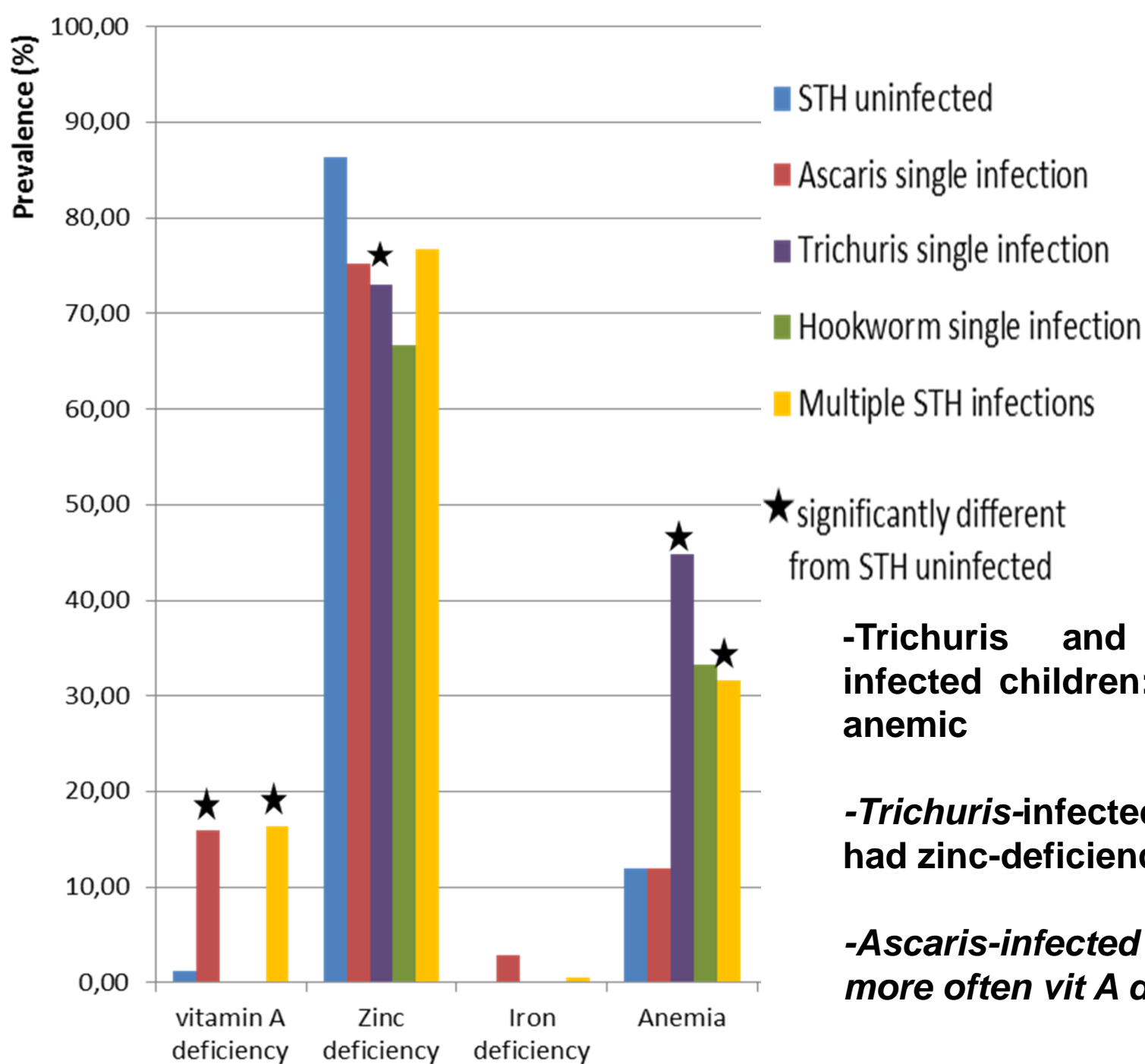
Institut de recherche
pour le développement



de Gier et al., accepted, Am J Trop Med. Hyg



Faculty of
Earth and
Life Sciences



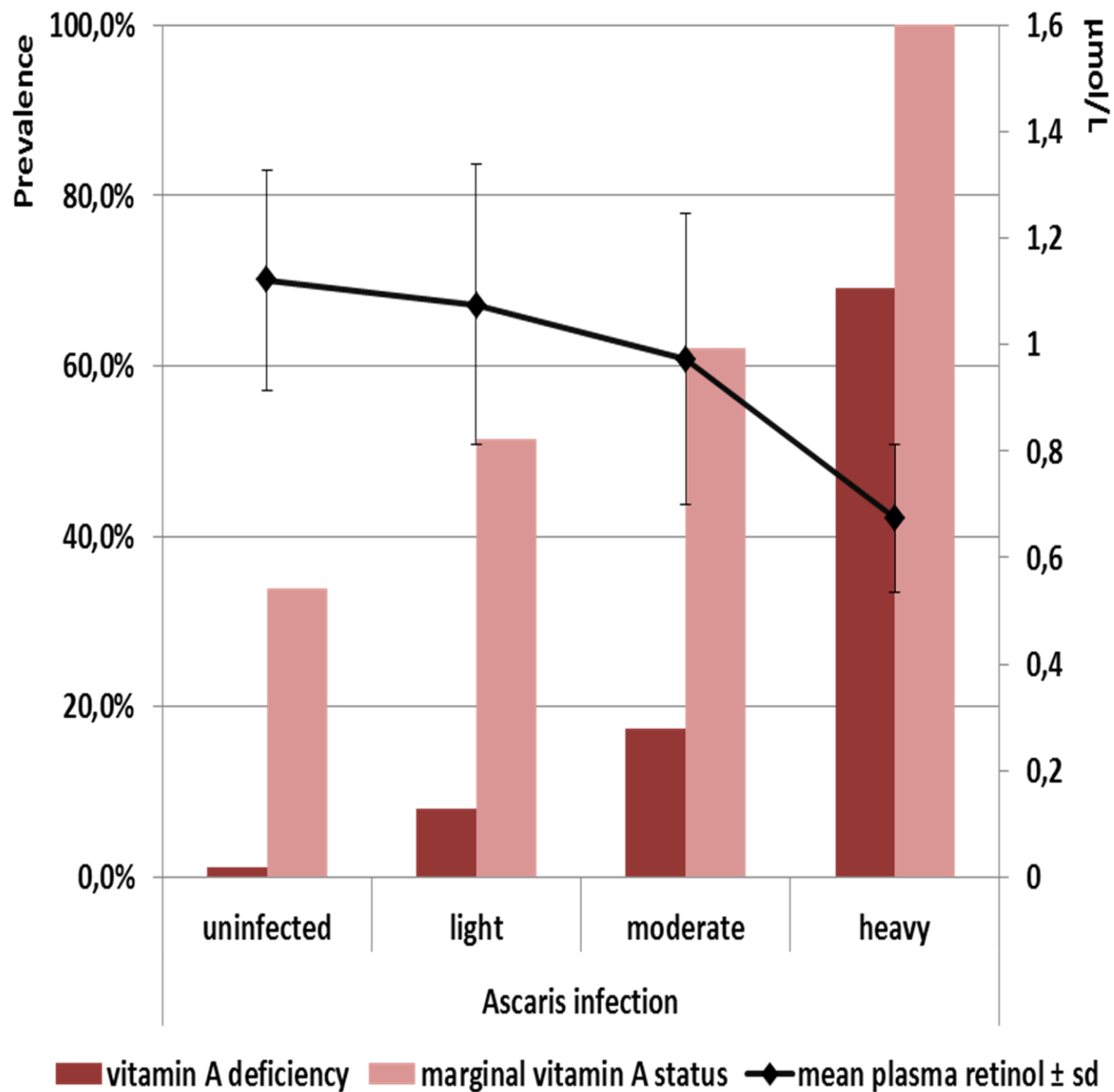
-Trichuris and hookworm infected children: more often anemic

-Trichuris-infected children: had zinc-deficiency less often

-Ascaris-infected children: more often vit A deficient

RESULTS

Ascaris specific
and intensity-
dependent
association with
retinol



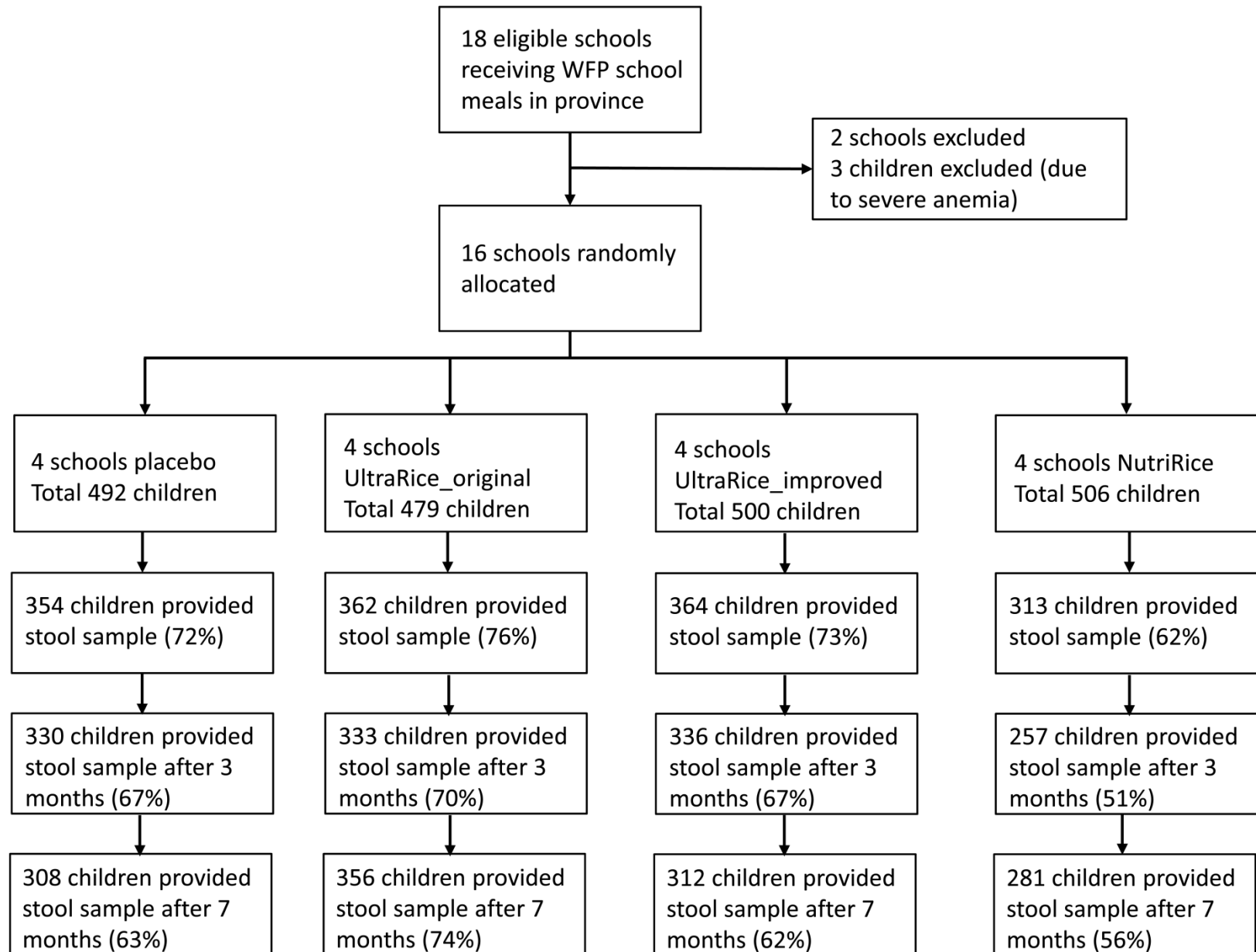
MICRONUTRIENT-FORTIFIED RICE CAN INCREASE HOOKWORM INFECTION RISK : A CLUSTER RANDOMIZED TRIAL

- A cluster randomized, placebo-controlled, double-blinded trial in Cambodian schoolchildren (6-15 y), 4x4 schools
- 3 different types of micronutrient- fortified rice or placebo World Food Program (WFP)
- Stool samples were analyzed by Kato Katz at baseline, 3 months and 7 months.

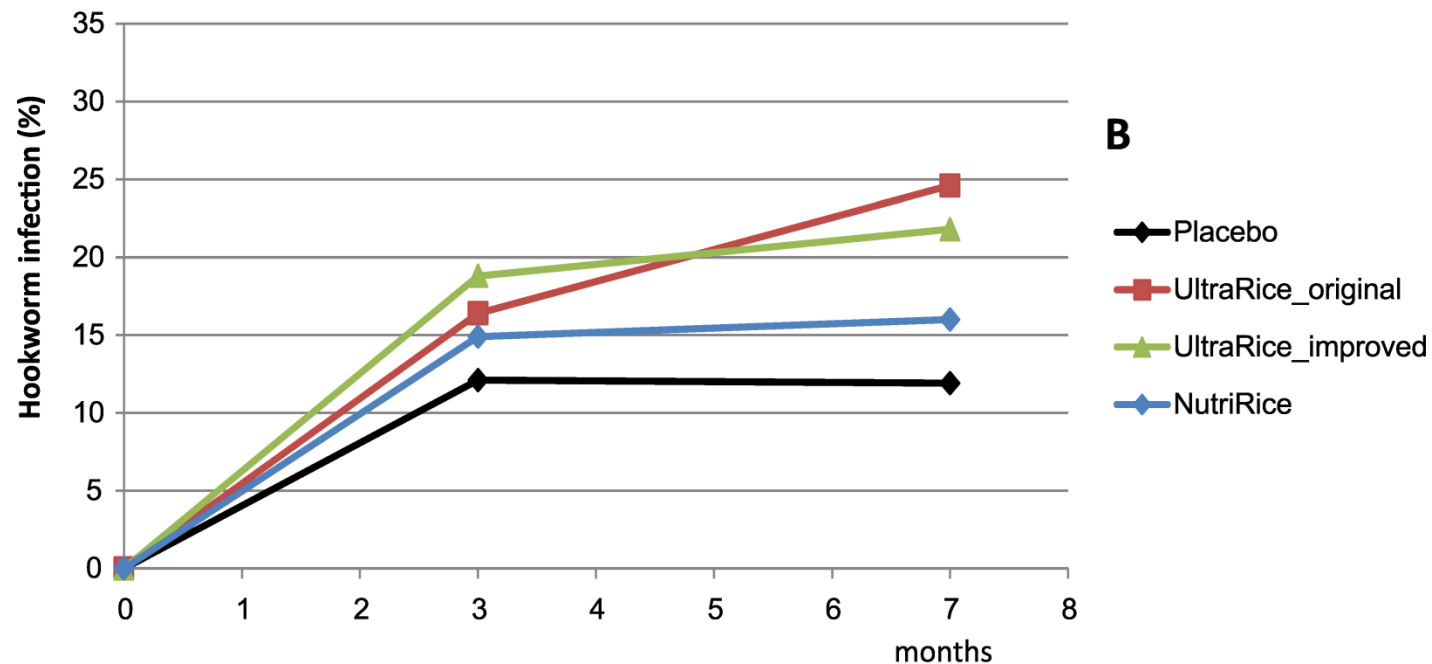


de Gier et al., provisionally accepted, Plos one





RESULTS MICRONUTRIENT-FORTIFIED RICE INCREASES HOOKWORM INFECTION RISK IN HIGH PREVALENCE SETTINGS: A CLUSTER RANDOMIZED TRIAL



Only baseline uninfected children (N=1134)

RESULTS MICRONUTRIENT-FORTIFIED RICE INCREASES HOOKWORM INFECTION RISK IN HIGH PREVALENCE SETTINGS: A CLUSTER RANDOMIZED TRIAL

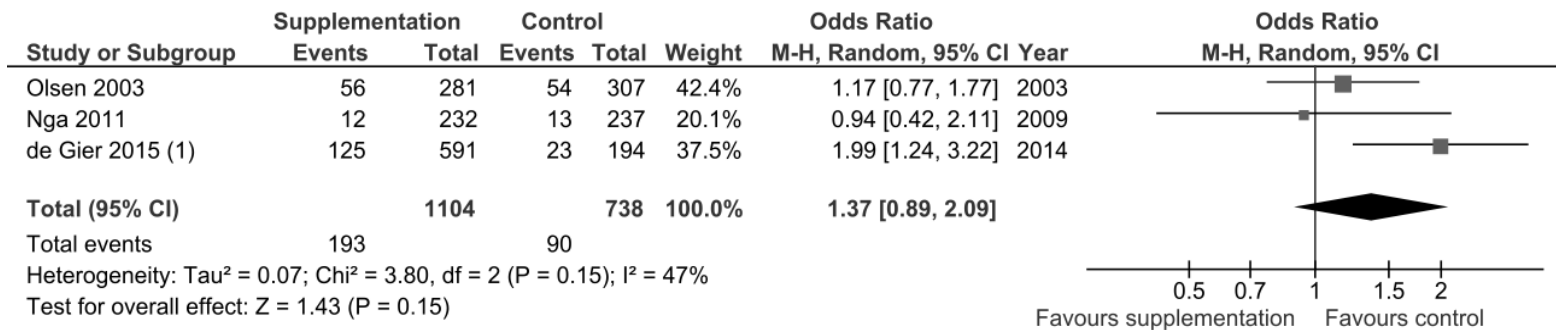
Longitudinal effects of micronutrient fortified rice on hookworm infection risk of baseline uninfected (N=941) children.

Hookworm infection: baseline uninfected children (N=941)							
	Baseline	3 months	7 months	crude % point risk difference with placebo (95% CI)	aOR ¹ (N=982)	95% CI	P value
Placebo	0.0	26 (12.1%)	23 (11.9%)		1 (ref)		
UltraRice original	0.0	34 (16.4%)	56 (24.6%)	+ 12.7% (5.3 to 19.8)	1.89	1.06 to 3.37	0.032
UltraRice improved	0.0	39 (18.8%)	41 (21.8%)	+ 10.0% (2.5 to 17.4)	1.91	1.12 to 3.26	0.018
NutriRice	0.0	24 (14.9%)	28 (16.0%)	+ 4.1% (-2.9 to 11.4)	1.75	0.63 to 4.81	0.284

¹From mixed model analysis, adjusted for sex, age (in quartiles) and baseline prevalence of hookworm at the school.

DISCUSSION: MICRONUTRIENT-FORTIFIED RICE INCREASES HOOKWORM INFECTION RISK IN HIGH PREVALENCE SETTINGS: A CLUSTER RANDOMIZED TRIAL

- Significantly increased hookworm infection risk in children receiving MMN fortified rice
- Meta-analysis of MMN fortification or supplementation measuring hookworm as outcome:



(1) baseline uninfected children

A stylized illustration on the left side of the slide. It features a black silhouette of a child standing on a dark, uneven ground, reaching up with their right arm towards a single, dark, oval-shaped fruit hanging from a tree. The tree's branches are highly decorative, with many loops and swirls. The background is a gradient of colors, starting with a bright yellow sun in the upper right, transitioning through light green and blue to a dark blue at the bottom. The overall style is simple and artistic.

Helminth Infections and Micronutrients in children

PhD defense **Brechje de Gier**

Dec 9: 13:45 Aula
Vrije Universiteit Amsterdam

THE TRIPLE BURDEN OF DISEASE: INTESTINAL PARASITES, UNDERNUTRITION & OVERWEIGHT/OBESITY



stunting



Micronutrient deficiency



MORE INTESTINAL PARASITES IN HOUSEHOLDS WITH STUNTED CHILDREN & OVERWEIGHT/OBESE ADULTS

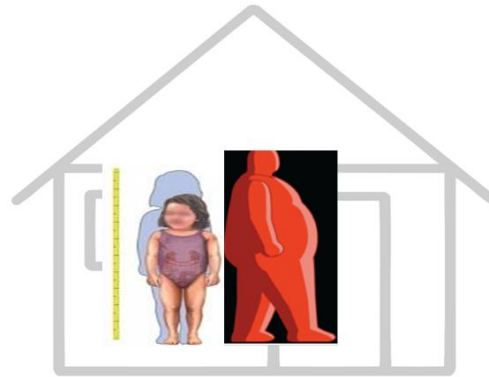


Table 4. Association between geohelminth and *Giardia lamblia* infection with being a member of a dual burden household stratified by poverty level

Model adjusted for age and gender, stratified by poverty	Relative poverty			Critical poverty		
	OR	95% CI	p	OR	95% CI	p
No infection	1.00			1.00		
Only geohelminth infection	0.57	0.14–2.34	NS	3.02	1.11–8.22	0.03
Only <i>G. lamblia</i> infection	2.67	0.39–18.07	NS	2.25	0.46–10.91	NS
Geohelminth and <i>G. lamblia</i> infection	NR			6.06	1.18–31.15	0.03

n = 188 in these models; NR: No regression possible due to low number of individuals, NS: non significant.

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stunting



Micronutrient deficiency



PhD: Gerardo Zavala Gomez
**Parasites, obesity, micronutrients,
gutflora and immune response in
mexican schoolchildren**



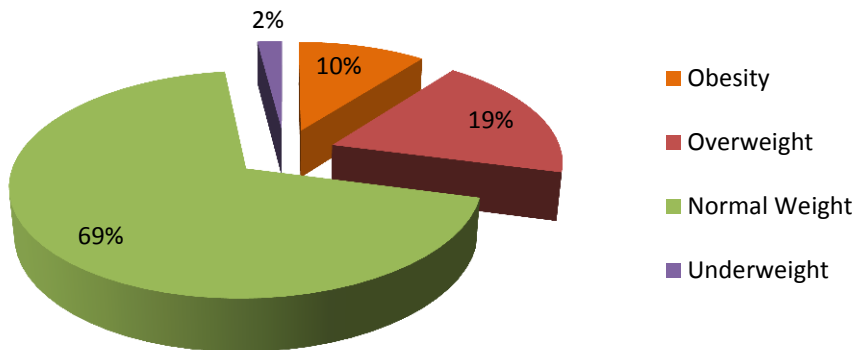
THE TRIPLE BURDEN OF DISEASE: INTESTINAL PARASITES, UNDERNUTRITION & OVERWEIGHT/OBESITY

- 296 school-age children (8 ± 1.5 years)
- Rural area in Querétaro, Mexico

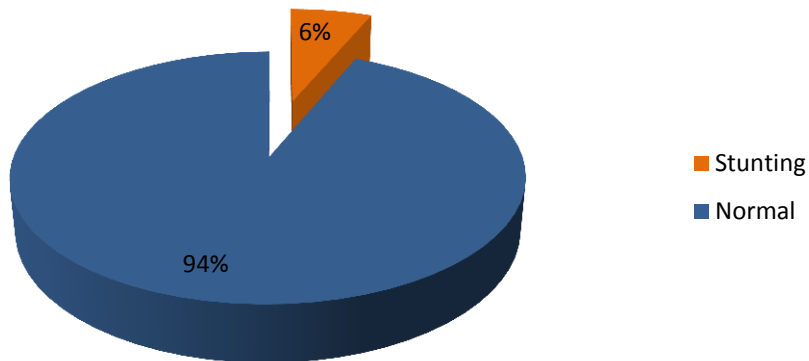


NUTRITIONAL STATUS & INTESTINAL PARASITES

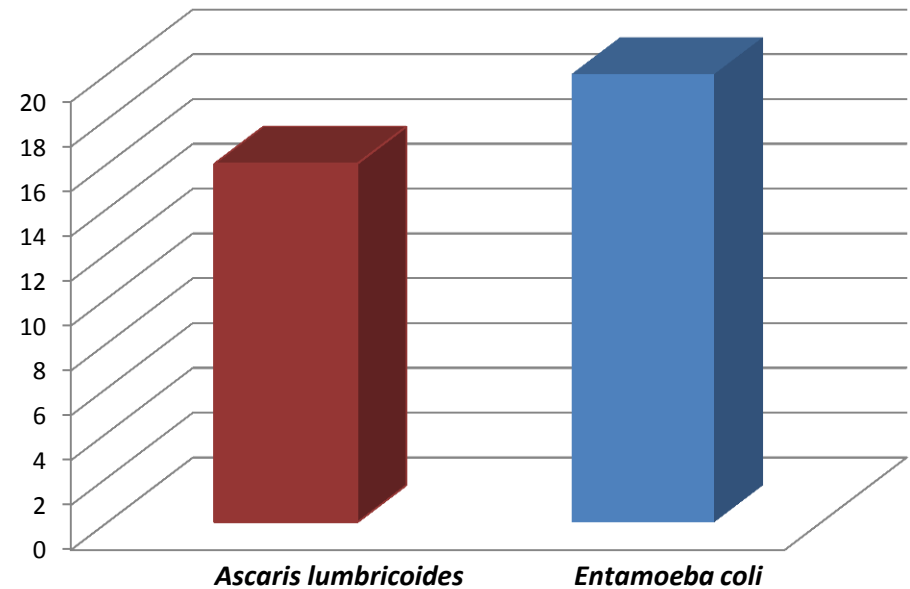
BMI for Age z-score



Stunting HAZ

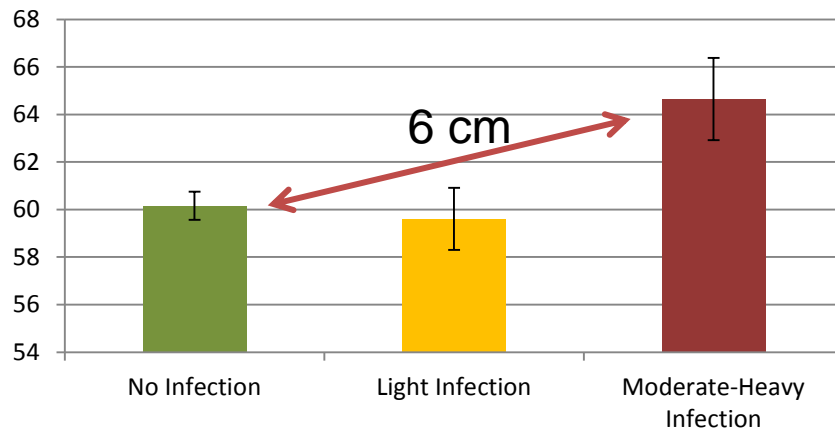


Prevalence of Infection

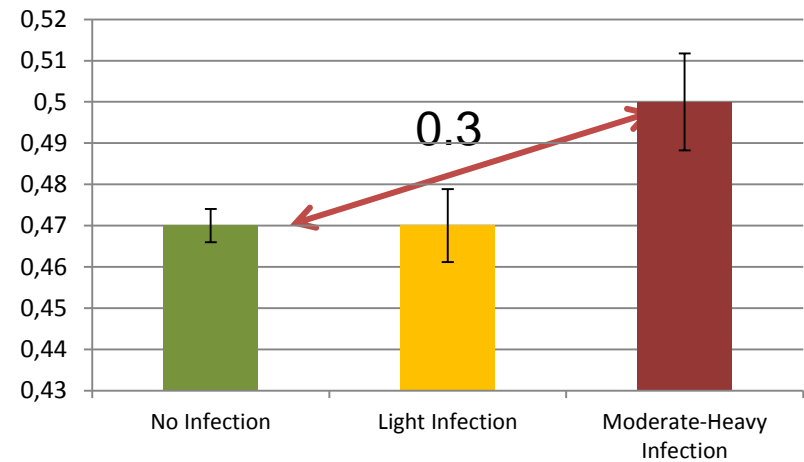


RESULTS: *ENTAMOEB*A COLI IS ASSOCIATED WITH HIGHER PERCENTAGE OF BODY FAT IN CHILDREN OF RURAL MEXICO

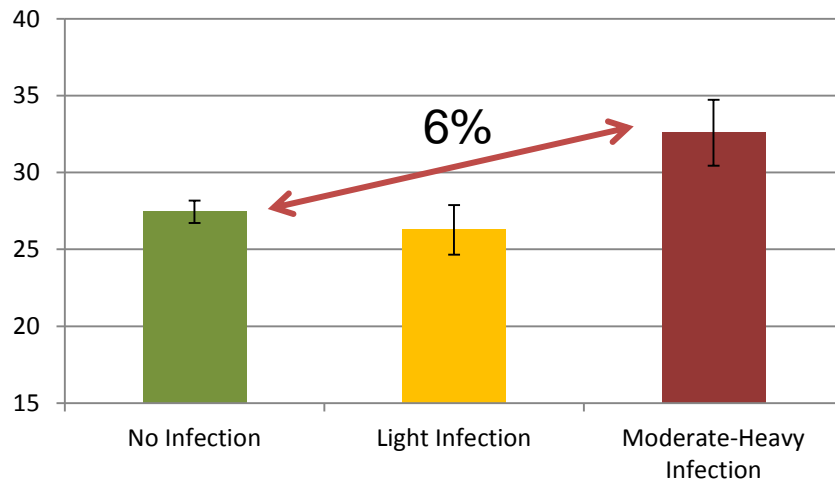
Waist Circumference (cm) $P=0.04$



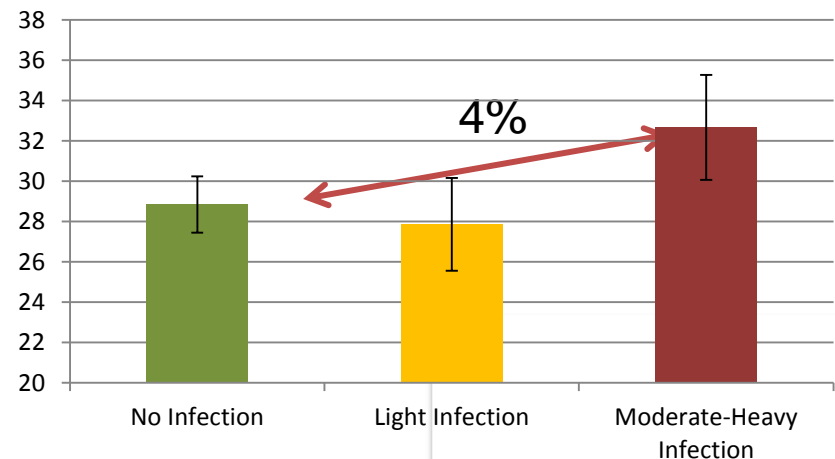
Waist-Height Ratio $P=0.03$



Abdominal Fat (%) $P=0.03$



Body Fat (%) $P=0.04$



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