



# Assessing the Nutritional Impact of Golden Rice

September 8, 2021



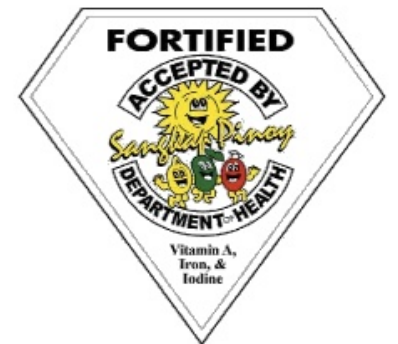
HELEN  
KELLER  
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Amanda C. Palmer, PhD  
Glaiza V. Calayo-Garvilles  
Dolly R. Reario, MPH  
Rolf D.W. Klemm, DrPH

# Background

VA deficiency remains a public health concern in the Philippines:

- 15.5% prevalence nationwide
- 13.6% urban vs. 16.9% rural
- 5.5% in wealthy vs. 22.4% in poor households



# Complementary Solutions

**Supplementation  
(Garantisadong  
Pambata)**

**Diversified diet  
(Gulayan sa  
Paaralan,  
breastfeeding)**



**Food fortification  
(Sangkap Pinoy)**

# Complementary Solutions

**Supplementation  
(Garantisadong  
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**Diversified diet  
(Gulayan sa  
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**Food fortification  
(Sangkap Pinoy)**

**50% of children do not  
consume enough  
vitamin A in their diets**

# Complementary Solutions

**Supplementation  
(Garantisadong  
Pambata)**

**Diversified diet  
(Gulayan sa  
Paaralan,  
breastfeeding)**



**Food fortification  
(Sangkap Pinoy)**

**Biofortification  
(Golden Rice)**



# Golden Rice Development

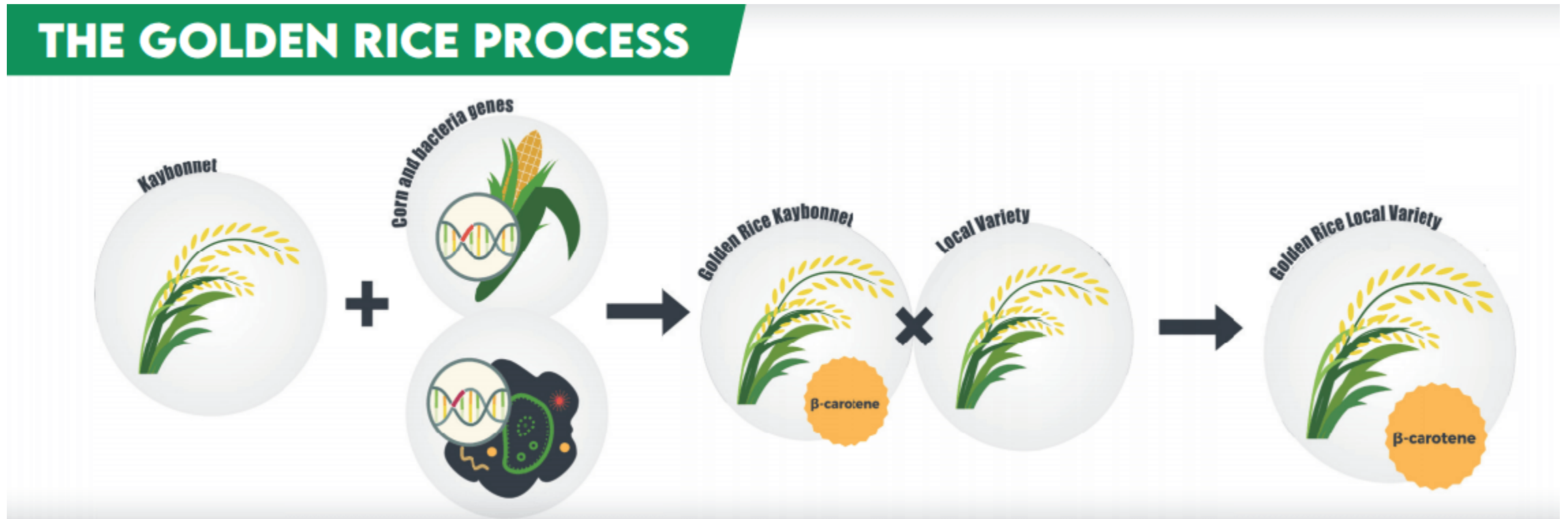
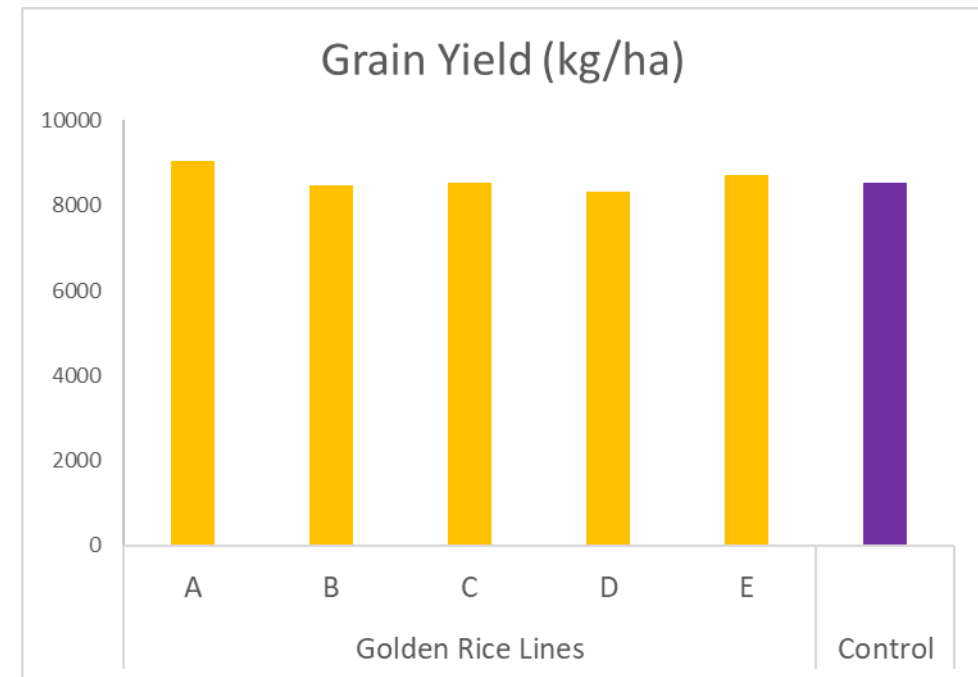
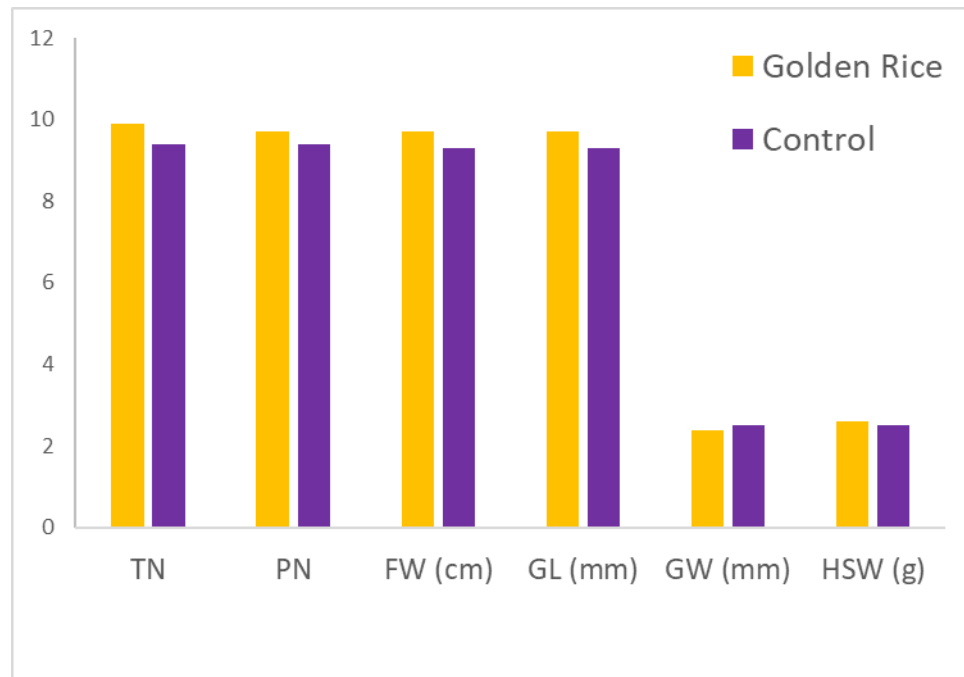


Figure: International Rice Research Institute

# How does Golden Rice perform in field tests?



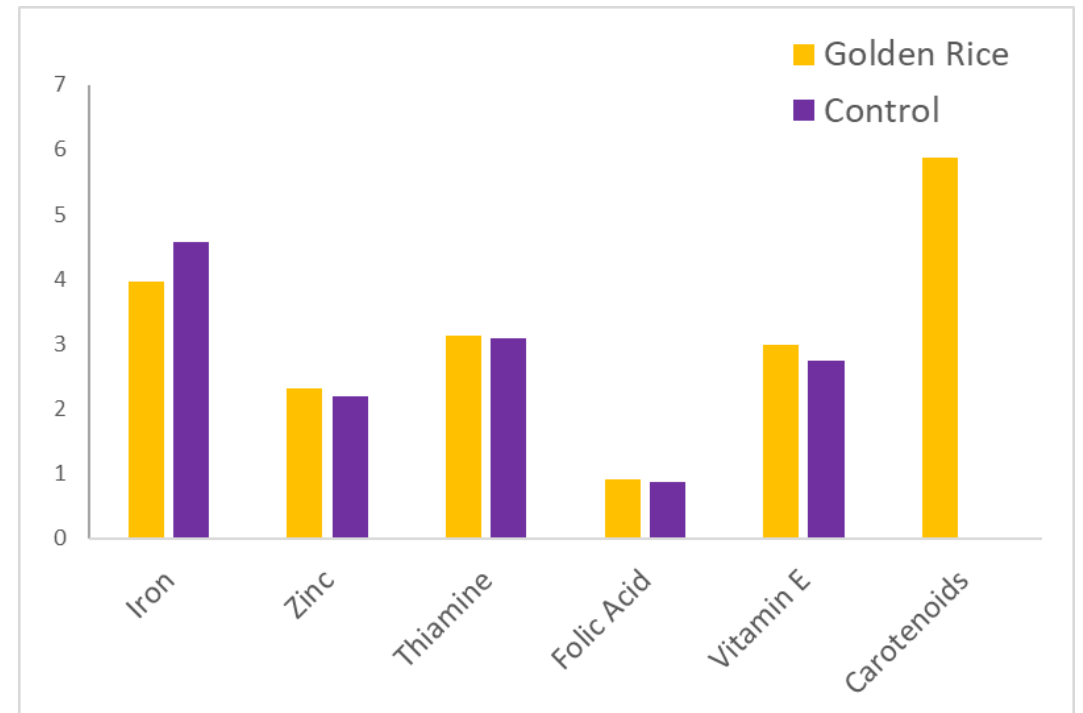
Source: Mallikarjuna Swamy *et al*, *Sci Rep* 2021

GR2E PSBRc82 vs. PSBRc82 (Dry Season); TN, tiller number; PN, panicle number; FW, flag leaf width; GL, grain length; GW, grain width; HSW, hundred seed weight

# How does the nutritional composition differ?



**Proximates**

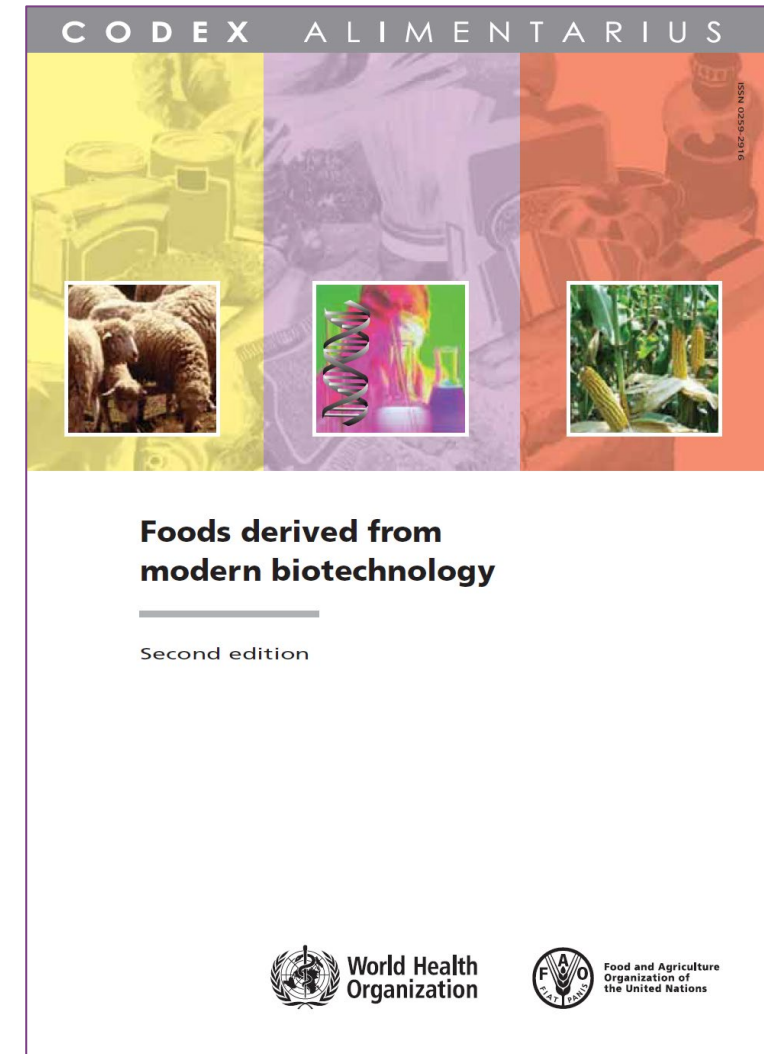


**Micronutrients**



# Is Golden Rice safe?

- Department of Agriculture's Bureau of Plant Industry (DA-BPI)
  - December 18, 2019 – Approval for food and feed or processing
  - July 22, 2021 – Commercial propagation approval
- Approved in 2018 by regulatory bodies in Australia, New Zealand, Canada and the United States



# What is the carotenoid content of Golden Rice?



Carotenoids are  
highest at time  
of harvest

Losses primarily  
during storage, but  
stabilizes by 2 months

~4-6  $\mu\text{g/g}$ ;  
similar to other  
biofortified crops

# What do we know about Golden Rice?



Photo: Adrian Dubock

## Golden Rice

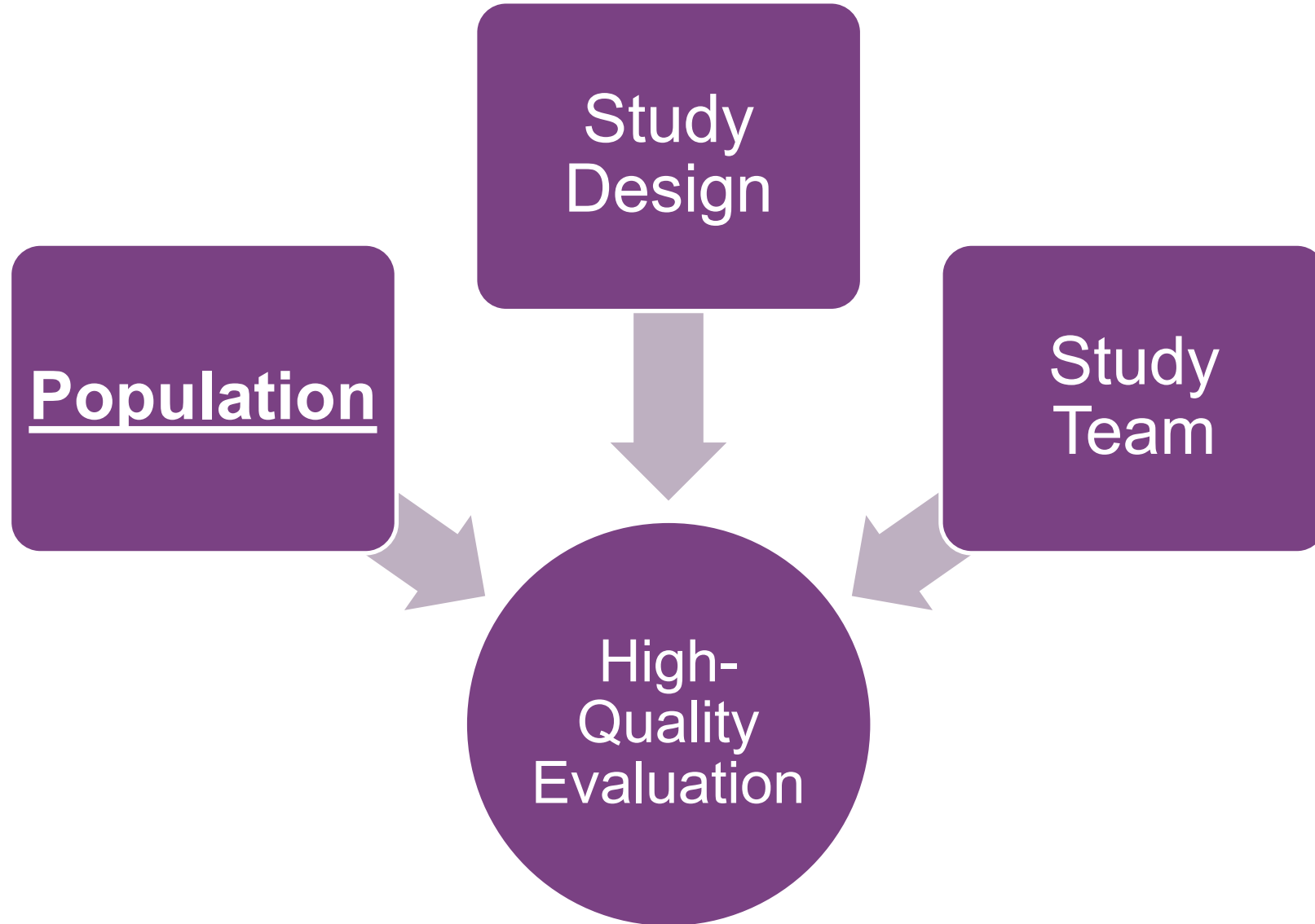
~4-6  $\mu\text{g/g}$ ; 4:1 VA equivalency  
200 g/day = 300  $\mu\text{g}$  VA/day



## Kangkong

~28  $\mu\text{g/g}$ ; 21:1 VA equivalency

# Can Golden Rice improve vitamin A status?



# Who should we study?



Infants & children 6-59 months of age receive high-dose capsules twice annually

Age Group	Vitamin A (mcg RE)		%<EAR
	EAR	Median (25 <sup>th</sup> , 75 <sup>th</sup> )	
6-11 months	190	84 (18, 234)	69.3
1-2 years	187	200 (79, 431)	47.8
3-5 years	220	242 (147, 401)	44.8
6-9 years	270	218 (150, 358)	63.1
Source: 2018 ENNS; Estimated Average Requirement (EAR) from 2015 Philippines Dietary Reference Intakes			

# Where should the trial be carried out?



District Meeting

PTA Meeting

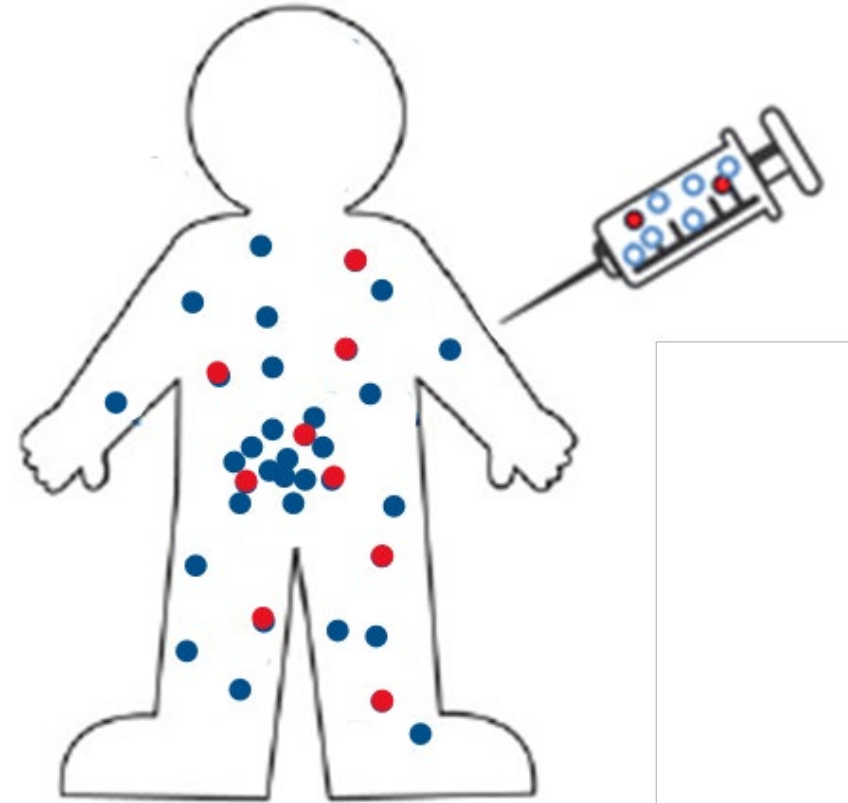
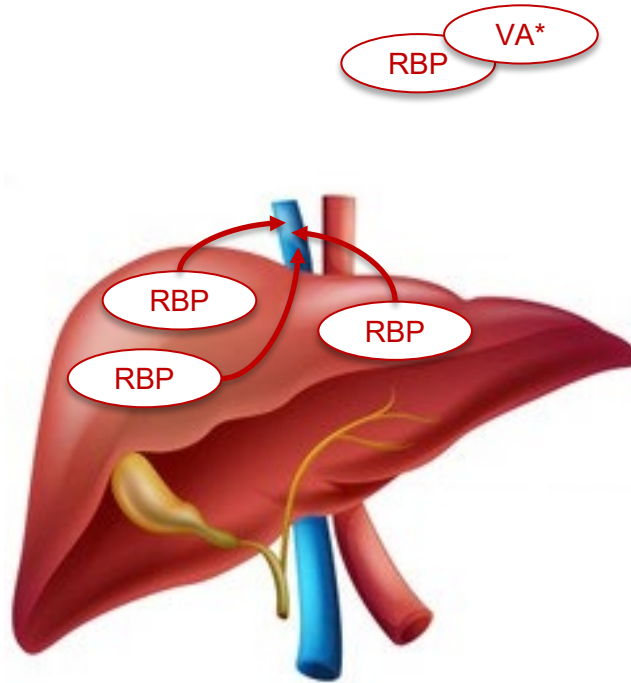
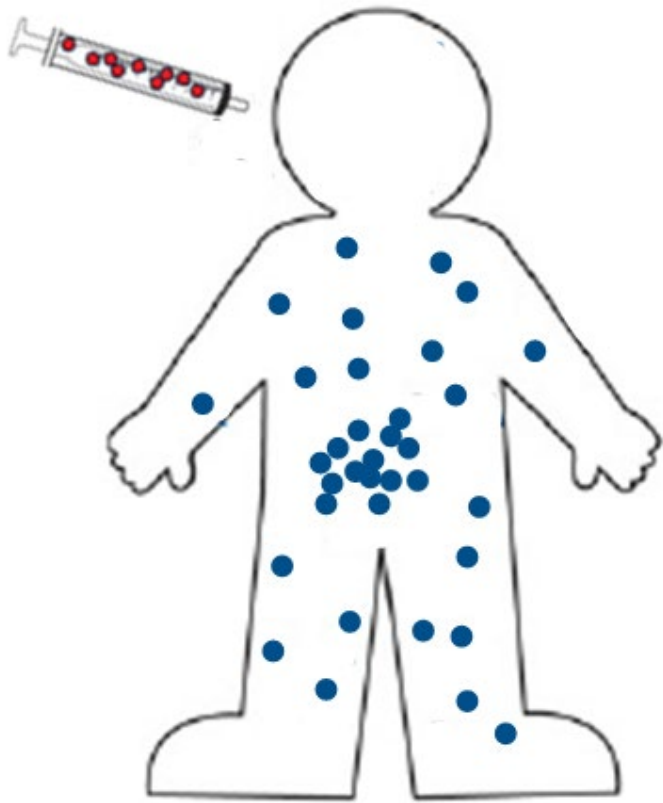
Planned  
Screening Study  
Protocol

Household  
Visit

Child  
Assessment

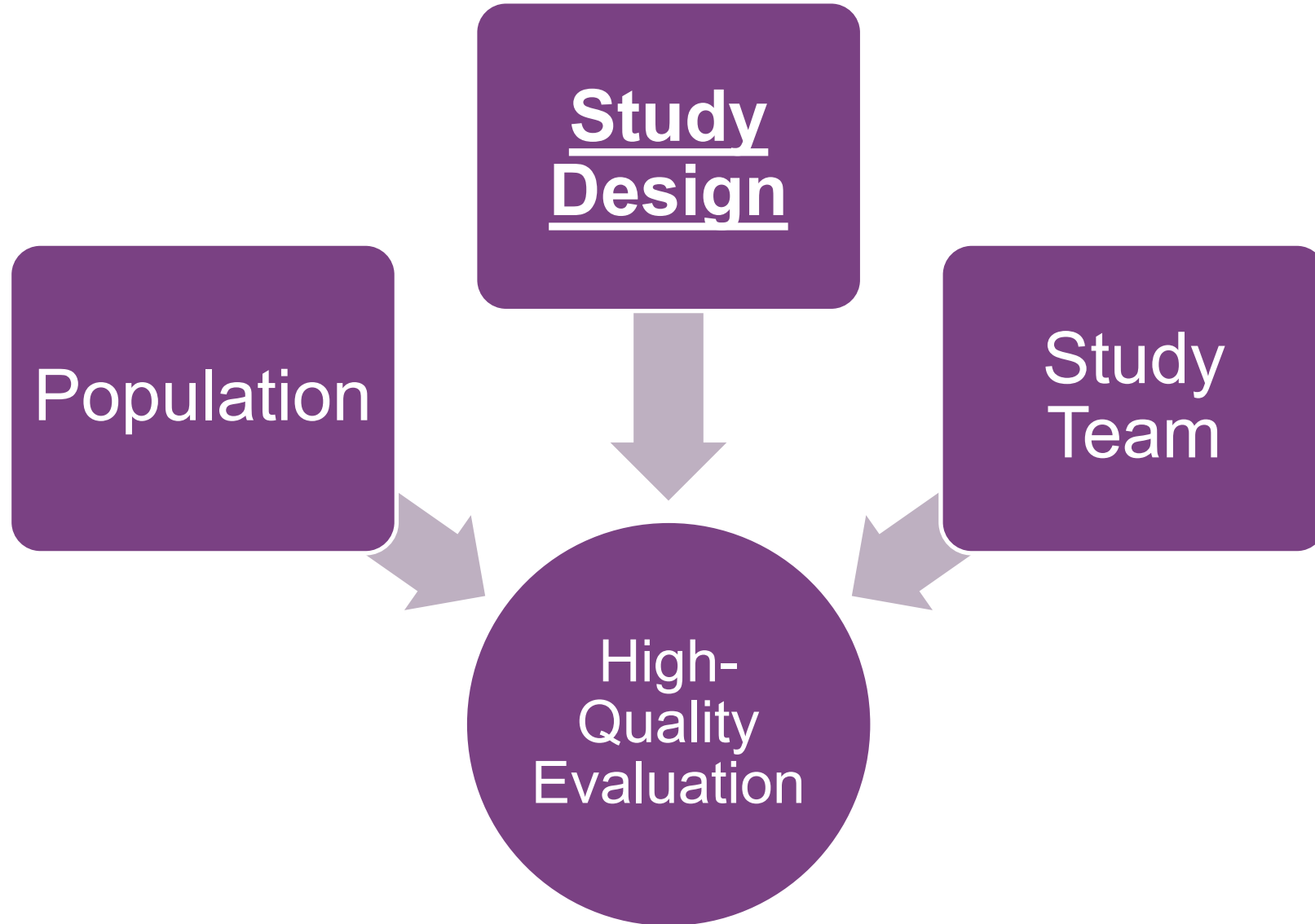


# Modified Relative Dose Response



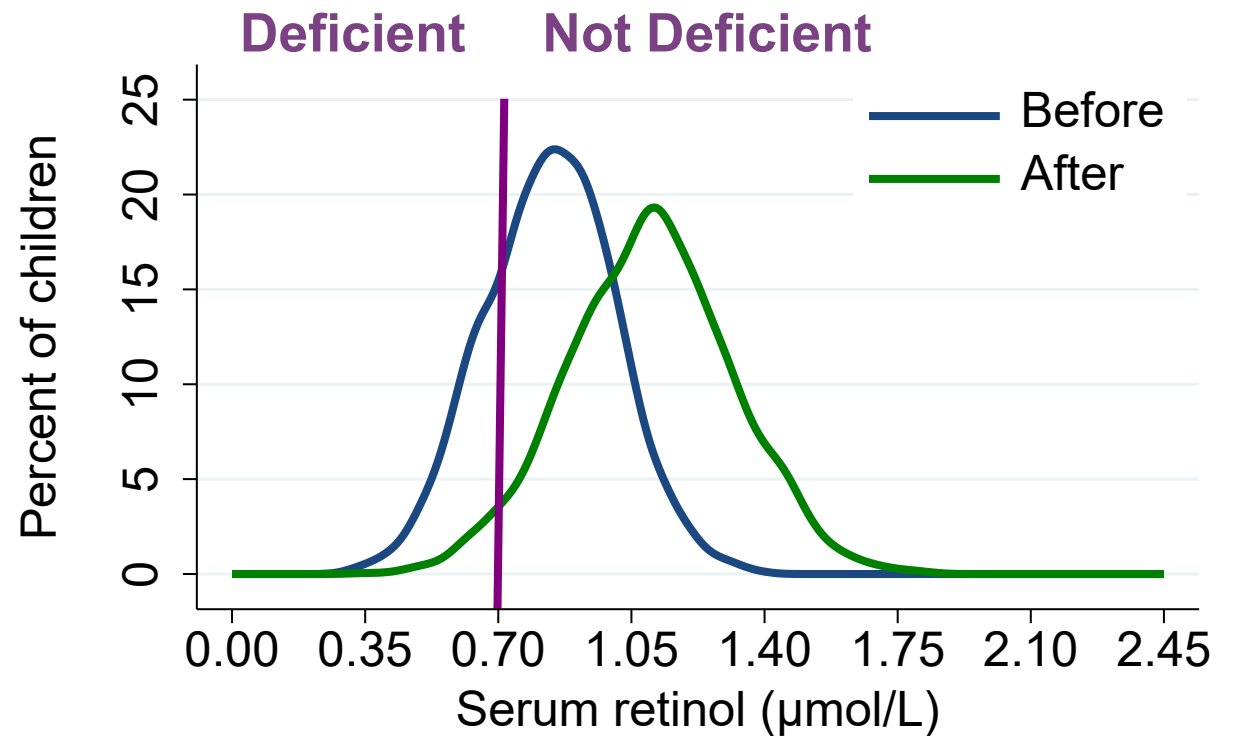


# Can Golden Rice improve vitamin A status?

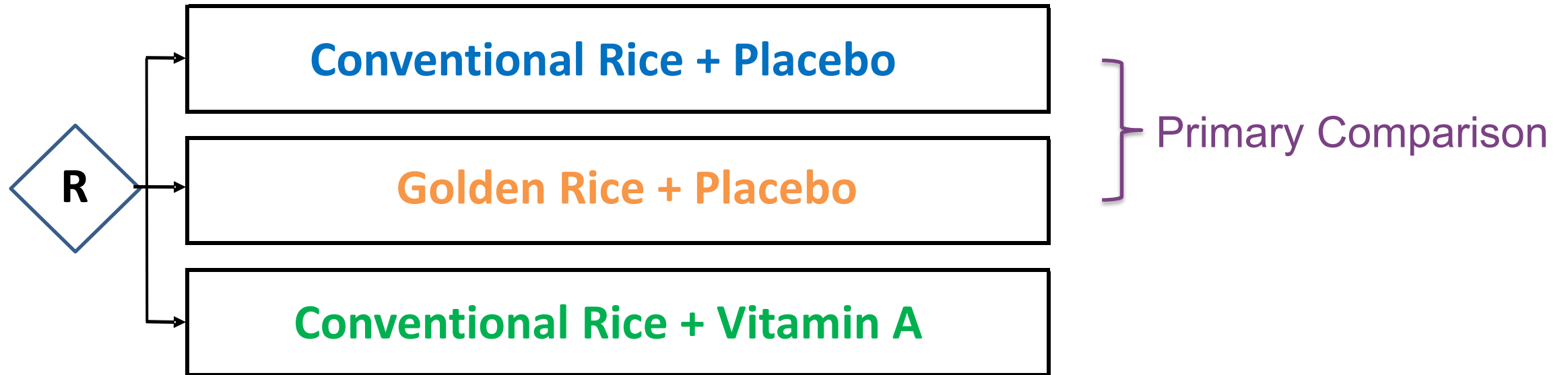


# What should we measure?

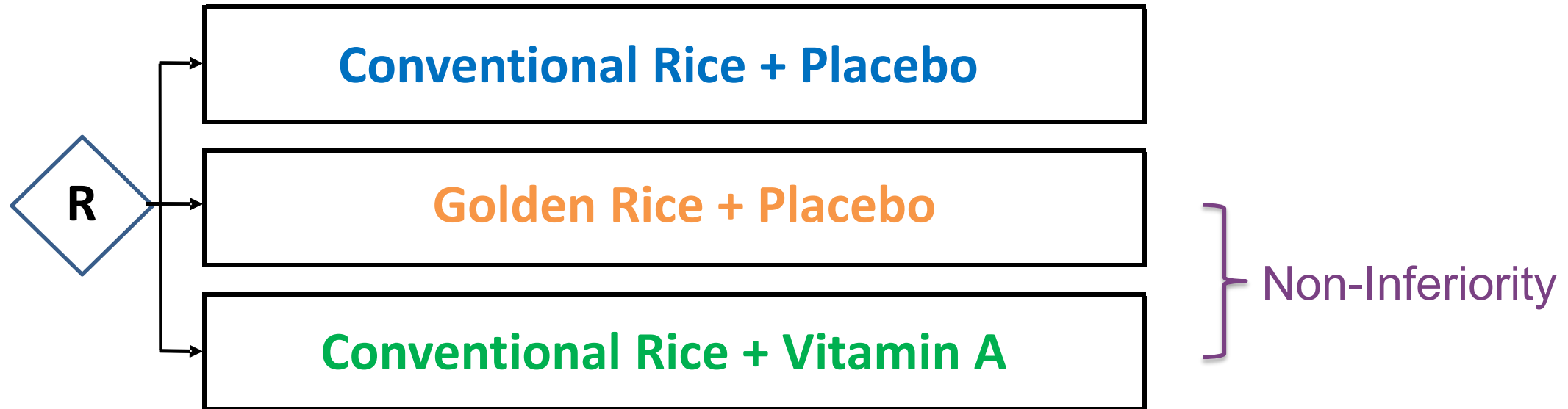
- Serum beta-carotene
- Serum retinol
- Total body stores
- Eye function
- Inflammation



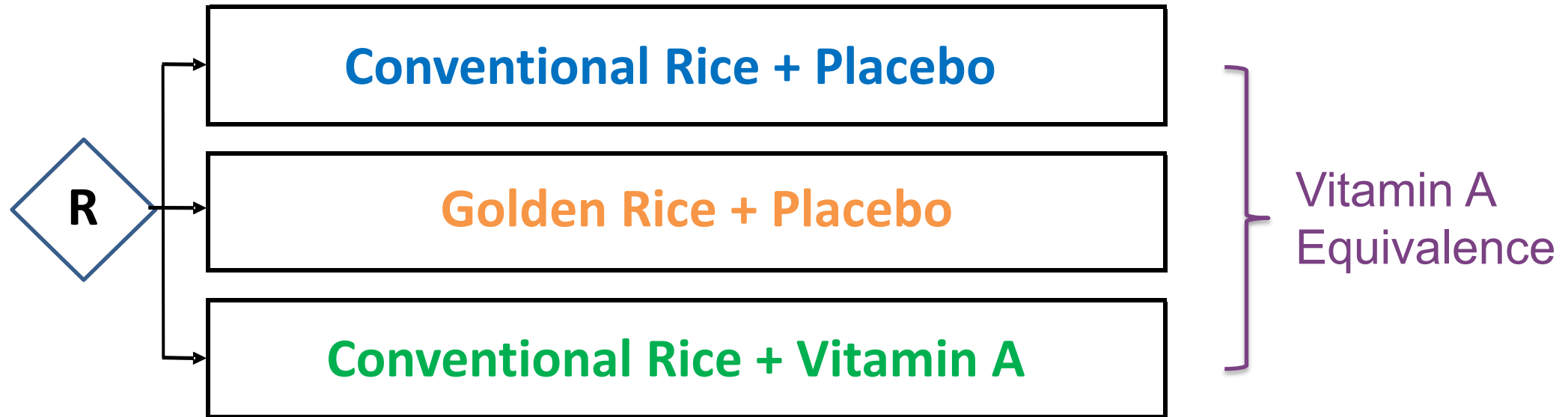
# How should the trial be designed?



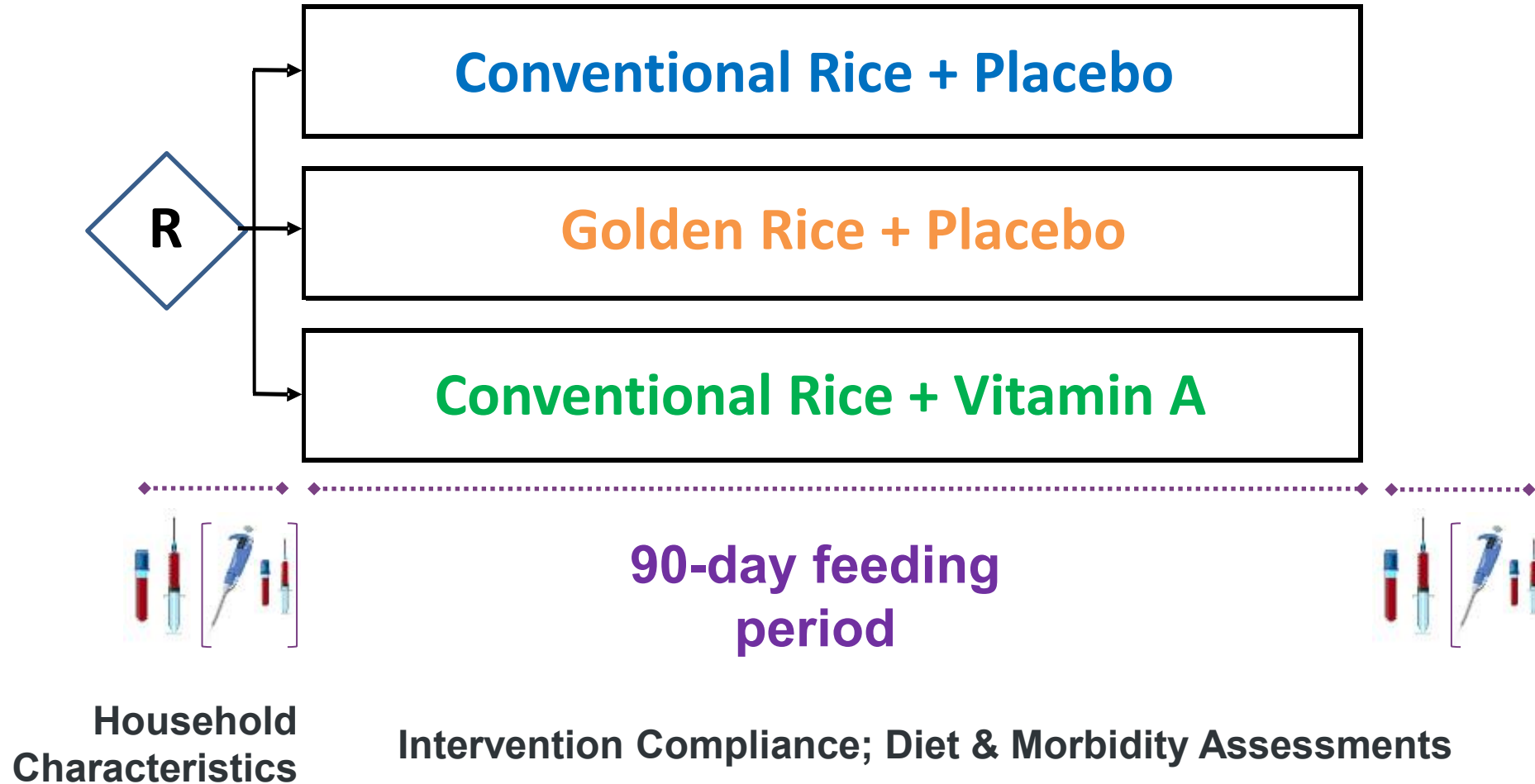
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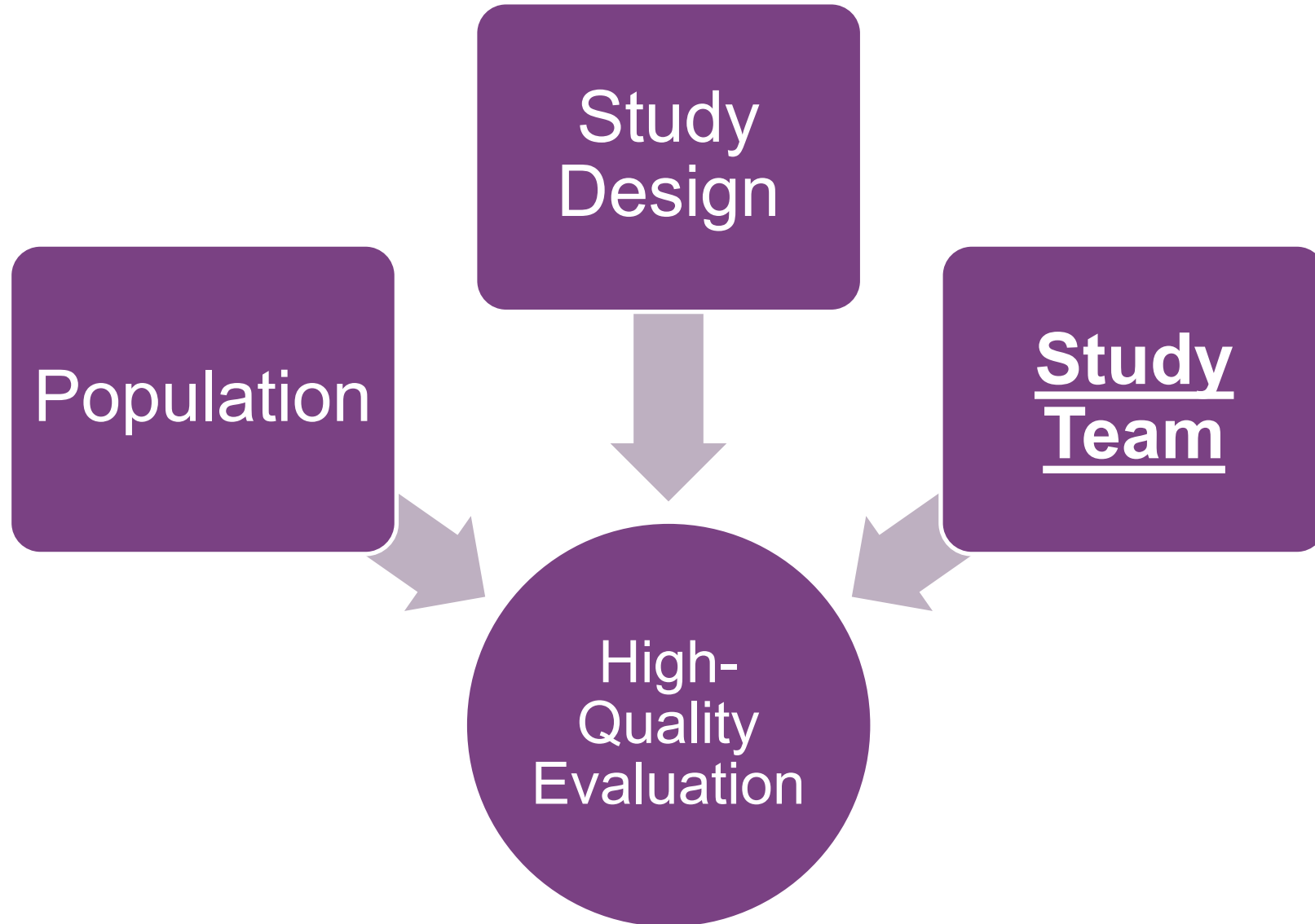
# How should the trial be designed?



# How should the trial be designed?



# Can Golden Rice improve vitamin A status?





# Who should be involved in the trial?

## Independent Evaluators

- Helen Keller International
- Johns Hopkins School of Public Health
- Food & Nutrition Research Institute
- Newcastle University

## Oversight

- Technical Advisory Group
- Single Joint Ethics Review Board
- Ethics Review Board applicable to the selected region
- Johns Hopkins Institutional Review Board
- Department of Education
- Local Government Units

# Conclusion

- Vitamin A deficiency remains a nutritional concern.
- A diverse package of interventions is required.
- Golden Rice is safe and offers potential nutritional benefits.
- Evaluating the impact of Golden Rice consumption will be key to informing nutrition policy in the Philippines.



Photo: International Rice Research Institute

Vinaka  
Choukran Merci  
Grazie Salamat Mahalo  
Takk Dhanyavad Danke  
Toda Mauruuru Nouari  
Thank You  
Chokrane Rahmat Arigatô  
Dakujem Obrigado  
Dziękuję Tak Spasibo  
Gracias Kiitos  
Nandri