

# Concerns, myths and misconceptions of rice fortification

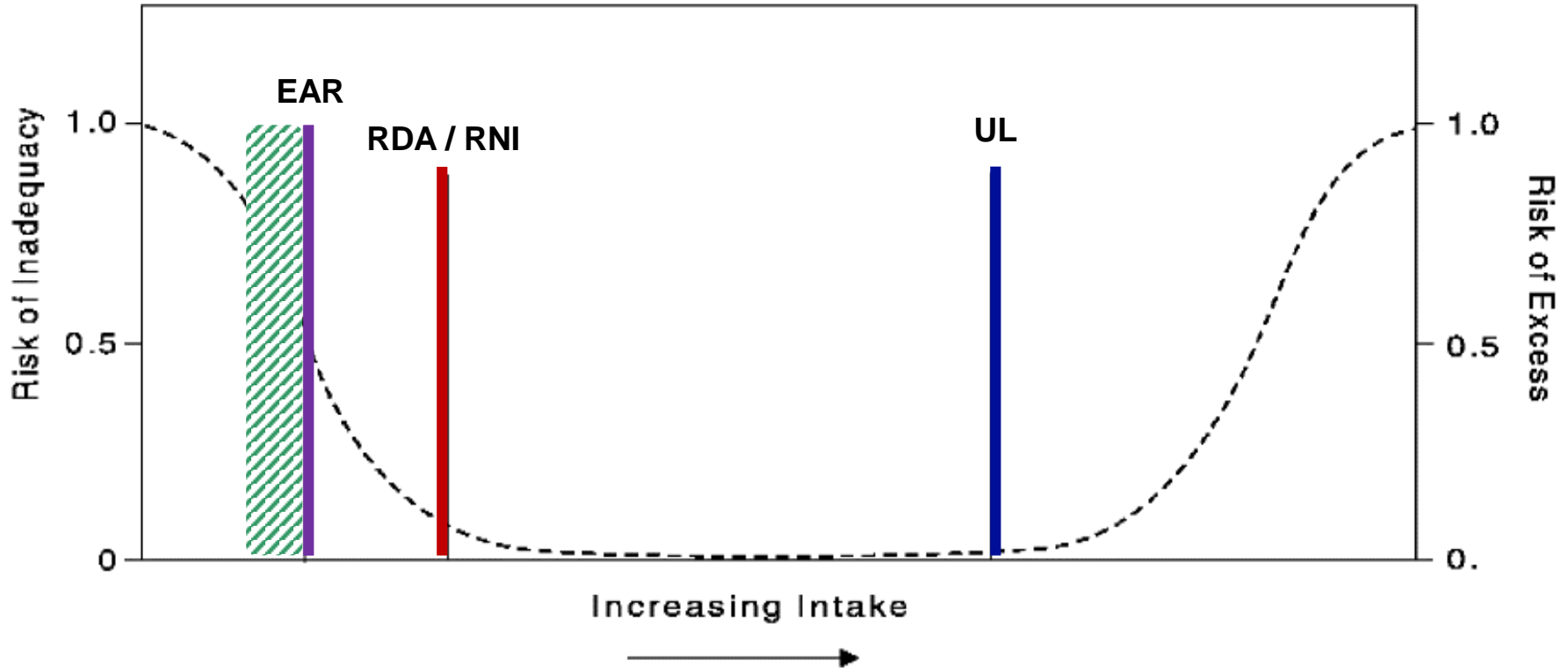
**Helena Pachón**

**Senior Nutrition Scientist**

**Food Fortification Initiative**

**[helena.pachon@emory.edu](mailto:helena.pachon@emory.edu)**

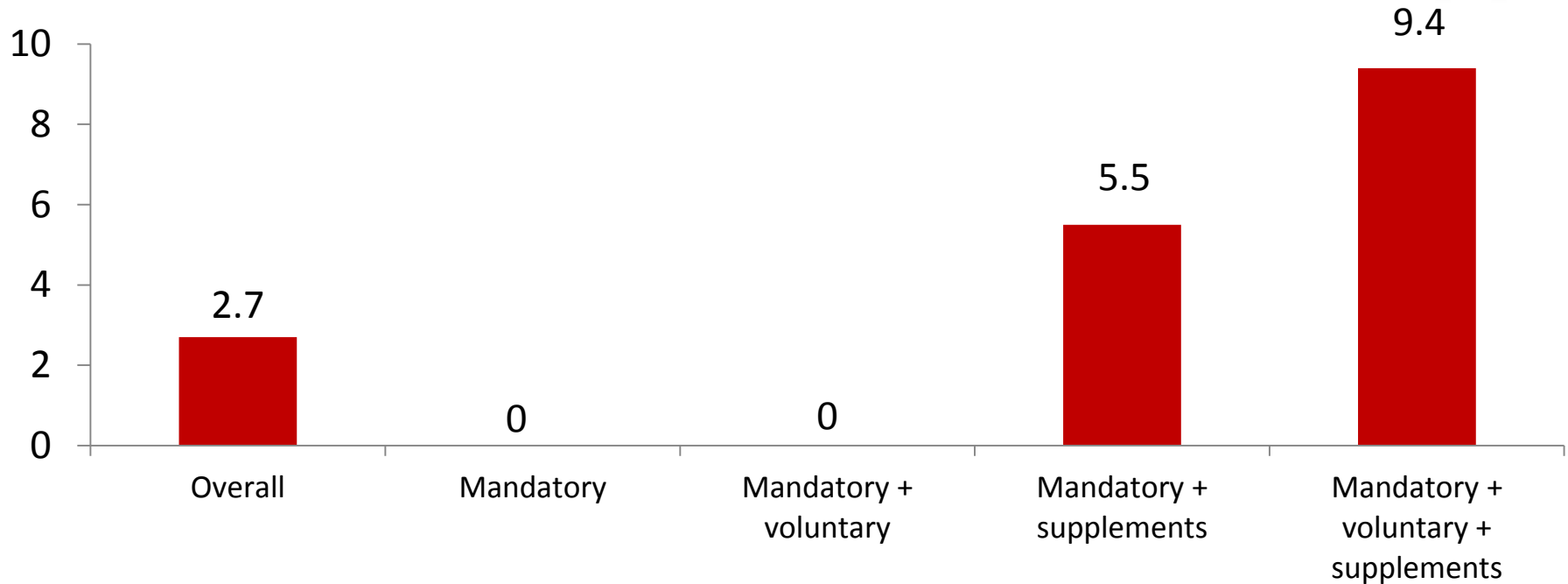
# Is rice fortification safe?



**EAR:** Estimated Average Requirement; **RDA:** Recommended Dietary Allowance / **RNI:** Recommended Nutrient Intakes; **UL:** Tolerable Upper Intake Level

# Is rice fortification safe?

Percent of Non-pregnant Adults ( $\geq 19$  Years) in USA with Folic Acid Intake above Tolerable Upper Intake Level (UL)



Mandatory folic-acid fortification of cereal grains (including rice) is safe  
Only people consuming supplements had intake levels above the UL

# Is rice fortification safe?

- Fortification with iron is safe for people with blood disorders
- Fortification with folic acid does not mask vitamin B12 deficiency



cc licence by flickr. Picture by Alpha

**Fortification is safe**

# Can rice fortification eliminate all micronutrient deficiencies?

Percentage of Mexican Women with Iron Deficiency after Six Months of Consuming Fortified Rice or Milled (unfortified) Rice



Rice fortification will help reduce micronutrient deficiencies  
Rice fortification will not eliminate micronutrient deficiencies in their totality  
Population should strive to eat a healthy diet  
Some population groups will need additional interventions

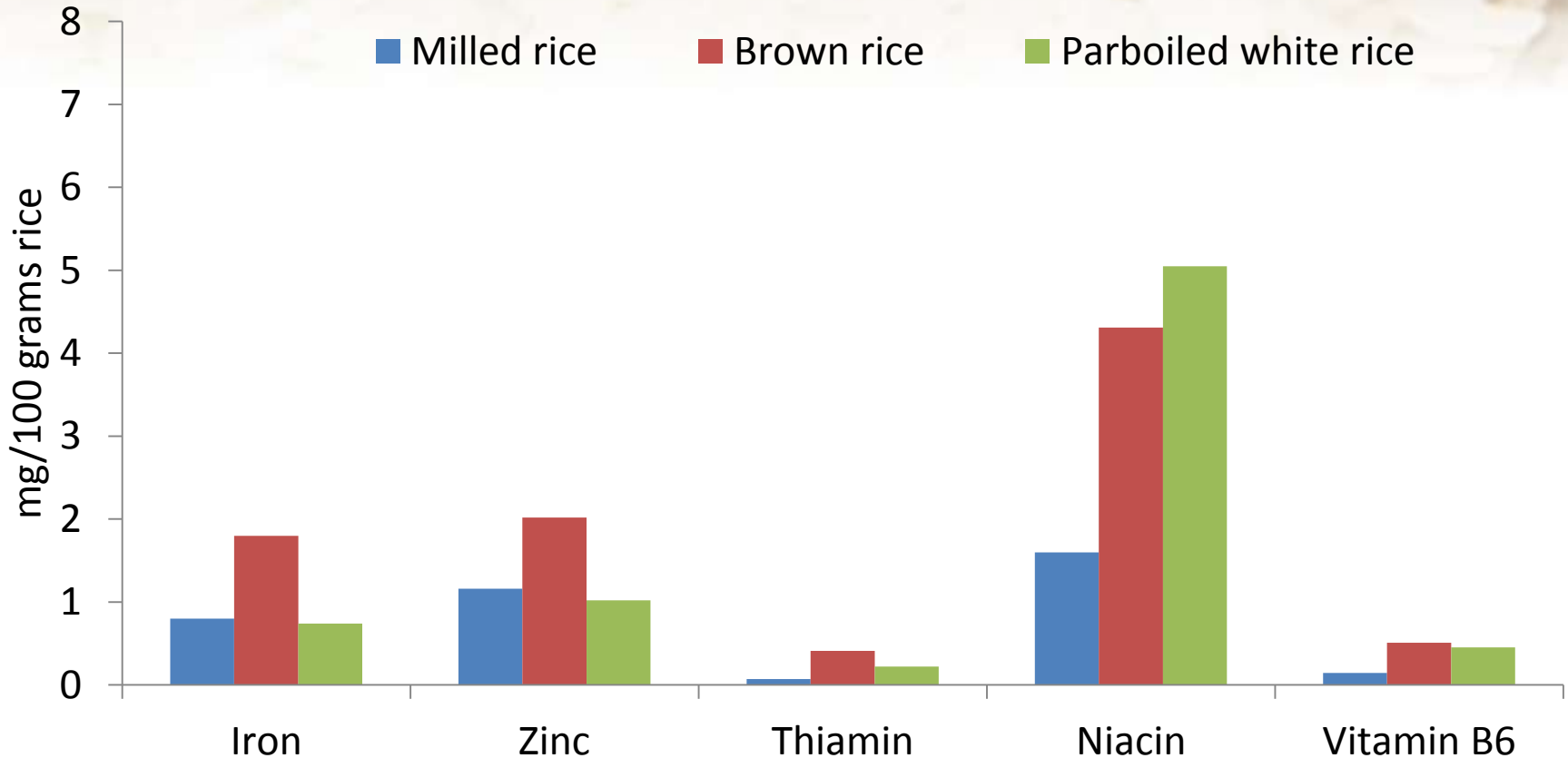
# What is the difference between fortified and bio-fortified rice?

Added nutrients	Fortified	Bio-fortified
When	During industrial processing	During its development via plant breeding or genetic modification (GM)
Time frame	Now	After breeding/GM (years-decades)
Which	Virtually any can be added	Iron <sup>1</sup> , zinc <sup>1</sup> , beta-carotene <sup>2</sup> (mainly)
Levels	Higher	Lower

These are complementary strategies to reduce micronutrient deficiencies

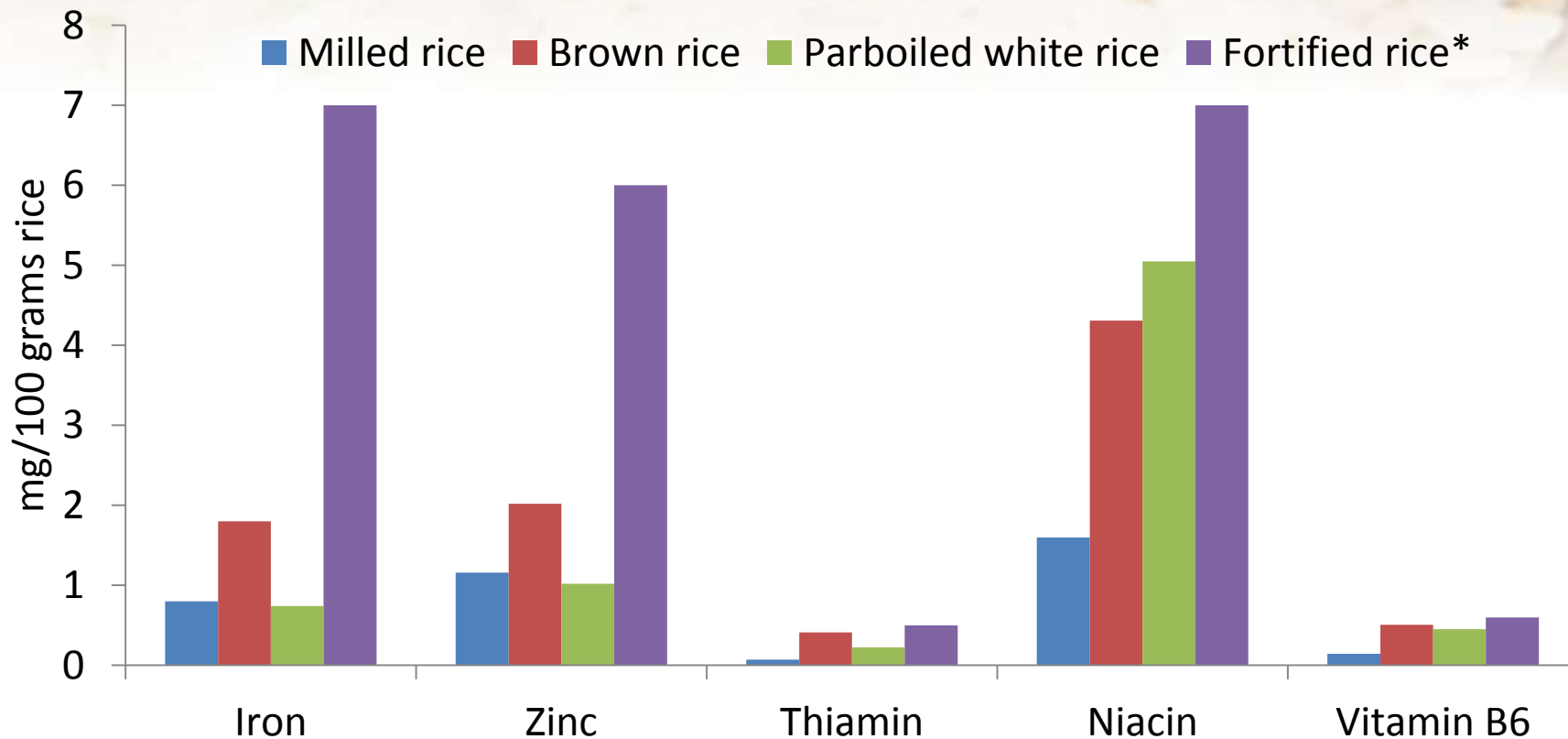


# Why not eat parboiled rice or brown rice instead of fortified rice?



**Brown rice and parboiled rice are more micronutrient-rich than milled rice**

# Why not eat parboiled rice or brown rice instead of fortified rice?



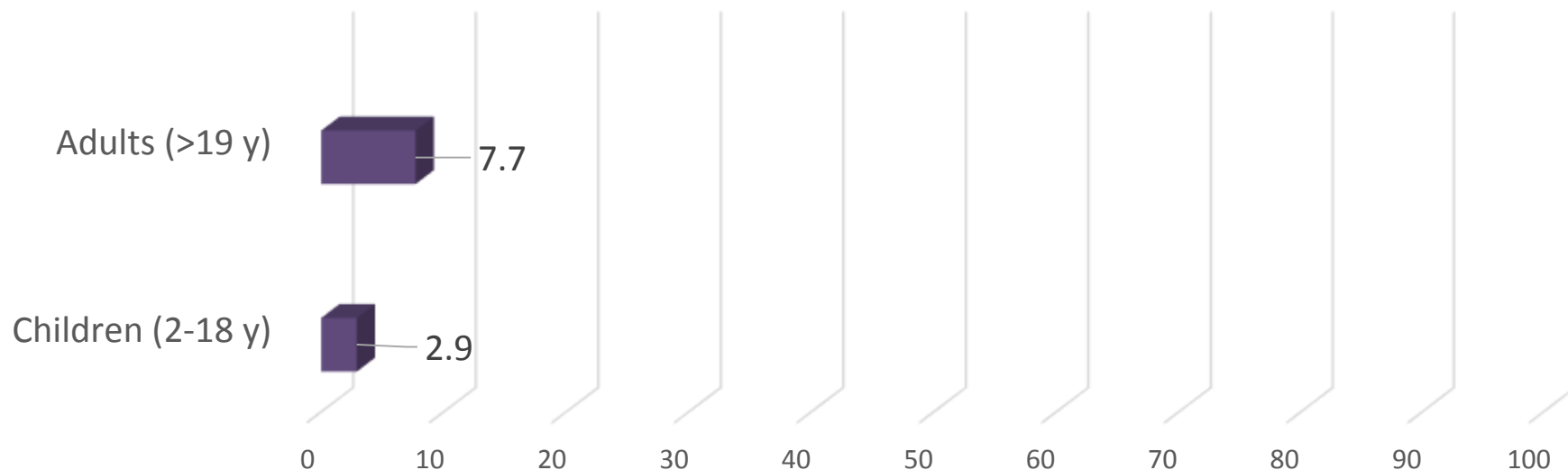
Fortified rice is more micronutrient-dense than milled rice, brown rice and parboiled rice

USDA Nutrient Data Bank; \* Fortified rice per USDA (2014) requirements for international food assistance programs; Vitamin A, folate, vitamin B12 content is negligible in milled, brown or parboiled rice; can be significant in fortified rice



# Why not eat parboiled rice or brown rice instead of fortified rice?

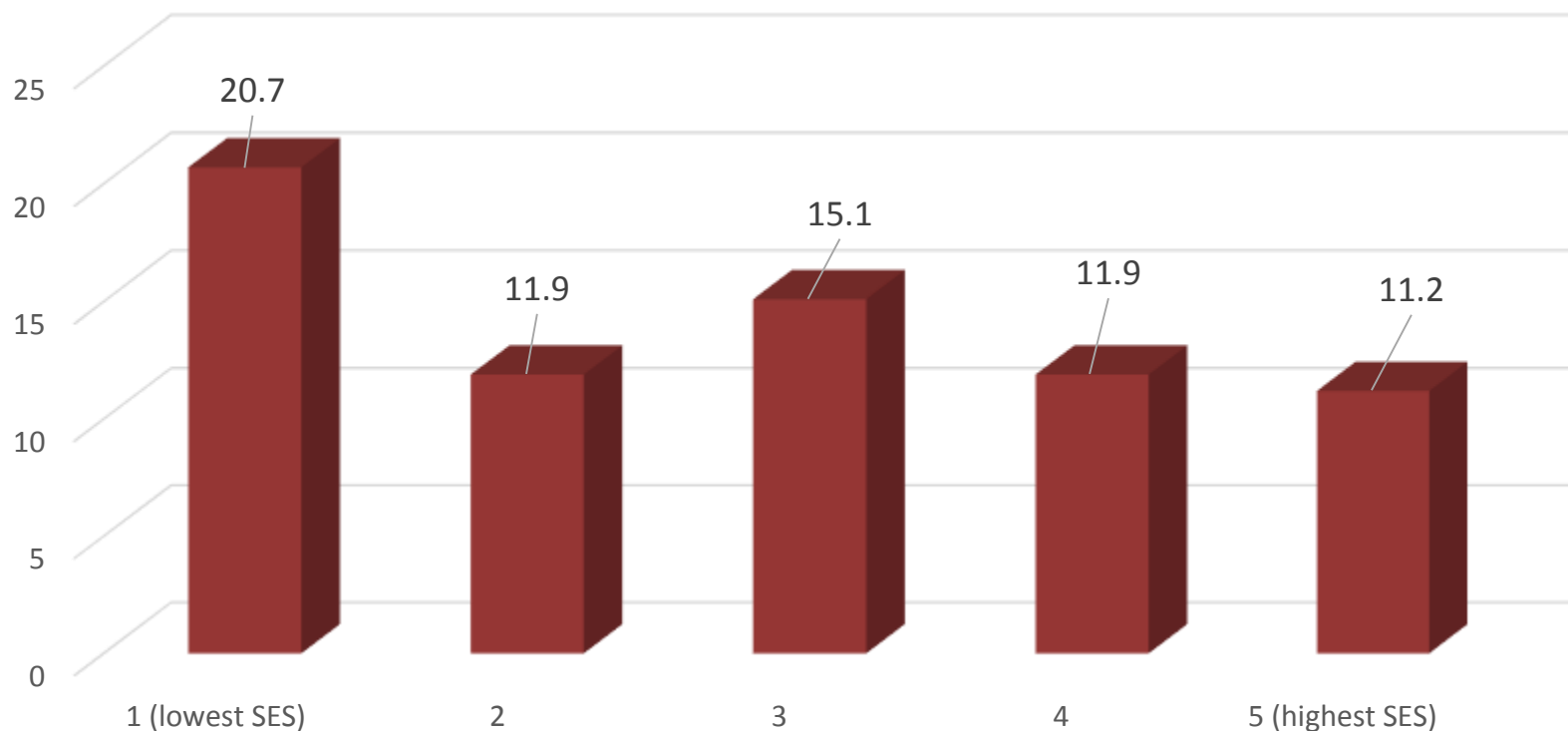
Percent of USA Population Consuming at least 3 Whole Grain Ounce Equivalents per Day



Despite recommendations, consumption of whole grains is low

# Is fortified rice only needed by low-income groups?

Percent of Non-pregnant Vietnamese Women (15-49 Years) with Iron Deficiency, by Socioeconomic Status (SES)



Nutrient deficiencies affect all socioeconomic strata

All could benefit from fortified rice

# Can any variety of rice be fortified?

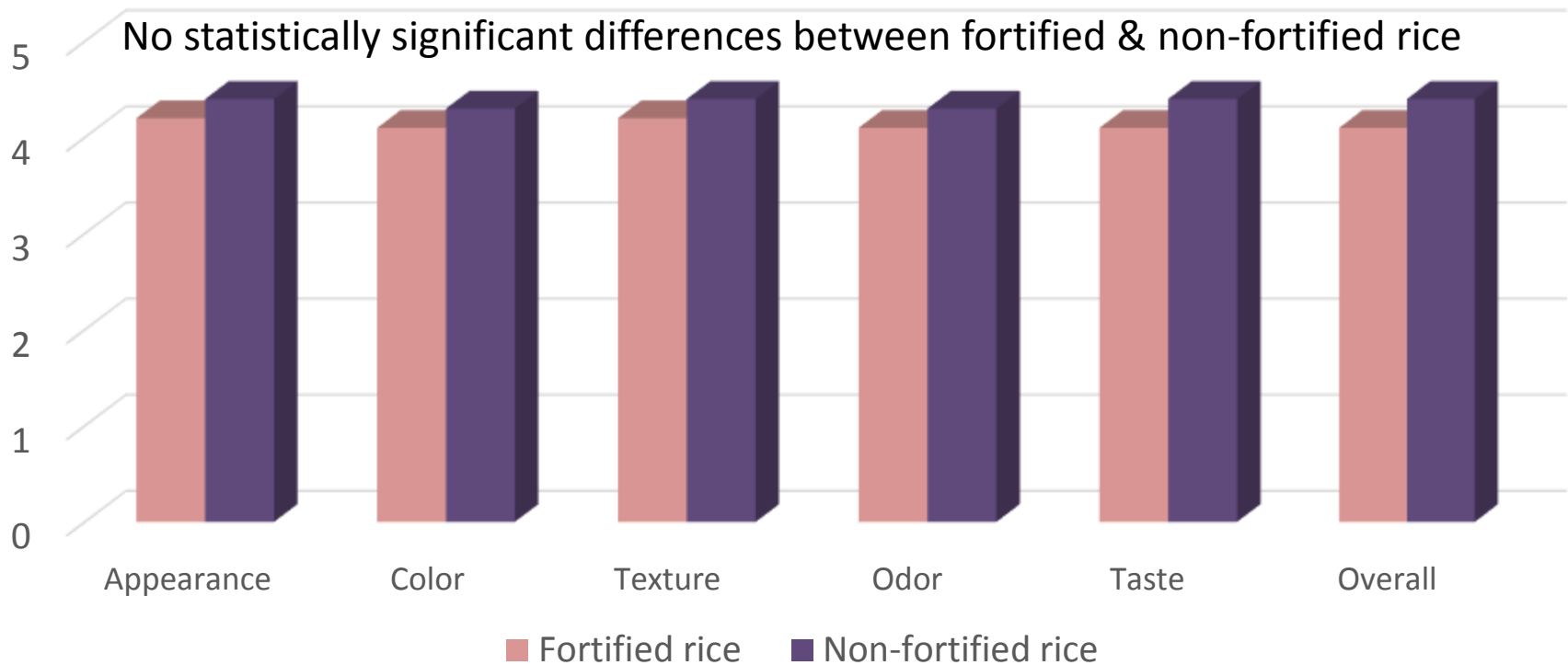


Image: dreamstime.com

Any variety of rice can be fortified—Requires tailoring of fortified kernel

# Is fortified rice acceptable to consumers?

Acceptability Scores for Fortified and Non-fortified Rice:  
Sensory Evaluation by Indian Children 8-11 Years



Fortified rice tastes, looks and smells like non-fortified rice

# Are the nutrients in fortified rice retained after preparation and cooking?

## Percent Retention of Nutrients Exposed to Different Preparation and Cooking Methods: Average for Coating, Cold Extrusion & Hot Extrusion

30 min soaking before boiling in excess water and discarding water	■ Excess + soaking
Boiling in excess water and discarding water	■ Excess
Boiling and letting rice absorb water	■ Boiling
Washing before boiling and letting rice absorb water	■ Boiling + washing
Frying before boiling and letting rice absorb water	■ Frying

# Conclusions (1)

- Rice fortification is safe
- Rice fortification will increase nutrient intake but cannot eliminate all micronutrient deficiencies
- Rice fortification & bio-fortification are different and complementary interventions
- Fortified rice is designed to be more micronutrient-rich than brown, parboiled or milled rice

# Conclusions (2)

- Rice fortification can benefit all strata of society who have nutrient deficiencies (or are at risk)
- Any variety of rice can be fortified
- When properly produced, fortified rice tastes, smells and looks the same as non-fortified rice
- Most nutrients (except Vitamin A) in fortified rice (coating, extrusion) are retained after preparation and cooking



ಧನ್ಯವಾದ



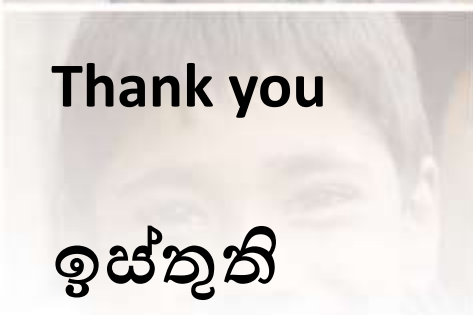
धन्यवाद



धन्यवाद



ຂໍຂອບໃຈທ່ານ



Thank you

ඉස්තුවාදි



Terima kasih

Salamat Po



ଧନ୍ୟବାଦ

ကျေးဇူးတင်ပါတယ်။

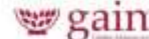


អរគុណ



SCALING UP  
RICE FORTIFICATION  
IN ASIA

Bangkok, September 16-19, 2014





# References

- Grant A. Evidence for the safety of fortifying flour with iron in the presence of thalassemia and other blood disorders (presentation). 2012. <http://ffinetwork.org/about/calendar/2012/Documents%202012/TurkeySummary.pdf>
- Hotz C et al. Efficacy of iron-fortified Ultra Rice in improving the iron status of women in Mexico. *Food Nutr Bull.* 2008;29:140-9.
- Institute of Medicine. Dietary reference intakes: Applications in dietary assessments. Washington DC, National Academy Press, 2000. [[http://www.nap.edu/catalog.php?record\\_id=9956](http://www.nap.edu/catalog.php?record_id=9956)].
- Lailou A et al. Micronutrient deficits are still public health issues among women and young children in Vietnam. *PLoS ONE* 7(4): e34906. doi:10.1371/journal.pone.0034906 2012.
- Mills JL et al. Low vitamin B-12 concentrations in patients without anemia: the effect of folic acid fortification of grain. *Am J Clin Nutr* 2003;77:1474-7.
- Ministry for Primary Industries (MPI). Voluntary folic acid fortification monitoring and evaluation report. MPI Technical Paper No: 2012/01. MPI: Wellington, MPI, 2012.
- Nestel P et al. Biofortification of staple food crops. *J Nutr* 2006;136:1067-7.
- Radhika MS et al. Micronized ferric pyrophosphate supplied through extruded rice kernels improves body iron stores in children: a double-blind, randomized, placebo-controlled midday meal feeding trial in Indian schoolchildren. *Am J Clin Nutr.* 2011;94:1202-10.
- Reicks et al. Total dietary fibre intakes in the US population are related to whole grain consumption: results from the National Health and Nutrition Examination Survey 2009-2010. *Nutrition Research* 2014.
- USDA. USDA commodity requirements: MR24 milled rice and fortified milled rice for use in international food assistance programs. USDA, 2014. [www.fsa.usda.gov/Internet/FSA\\_File/mr23.pdf](http://www.fsa.usda.gov/Internet/FSA_File/mr23.pdf)
- USDA Nutrient Data Bank. <http://ndb.nal.usda.gov/ndb/search/list>
- Wieringa FT et al. Stability and retention of micronutrients in fortified rice prepared using different cooking methods. *Ann NY Acad Sci* 204;1-8.
- Yang Q et al. Folic acid source, usual intake, and folate and vitamin B-12 status in US adults: National Health and Nutrition Examination Survey (NHANES) 2003–2006. *Am J Clin Nutr* 2010;91:64-72.
- Ye X et al. Engineering the provitamin A (b-carotene) biosynthetic pathway into (carotenoid-free) rice endosperm. *Science* 2000;287:303-5.