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Fortification of rice improves dietary adequacy and equity of nutrient intake in Nepal: evidence from a modelling approach

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Maharjan¹, Dharma S. Manandhar⁴,
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Fortification of rice improves dietary adequacy and equity of nutrient intake in Nepal: evidence from a modelling approach

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Food Diets & Nutrition: 25 Years of Progress for Nepal
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& 25 Years of Nepal's Progress in Nutrition

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Background – Why fortify rice in Nepal?

- Diets in Nepal are deficient in multiple micronutrients
- Intra-household allocation of food is inequitable.
- Anaemia and micronutrient deficiencies persist.
- A nutritionally adequate diet is unaffordable for many
- Fortification of staple food can improve diets affordably with minimal behaviour change required.
- Rice fortification could:
 - overcome micronutrient deficiencies / improve health,
 - reach those not covered by other interventions,
 - deliver micronutrients consistently and safely,
 - build on existing technology and infrastructure.



Background – How to fortify rice in Nepal?

Rice is fortified by blending in hot-extruded fortified rice kernels with ordinary rice in ratio of 1:100 by weight

Under an MOU involving

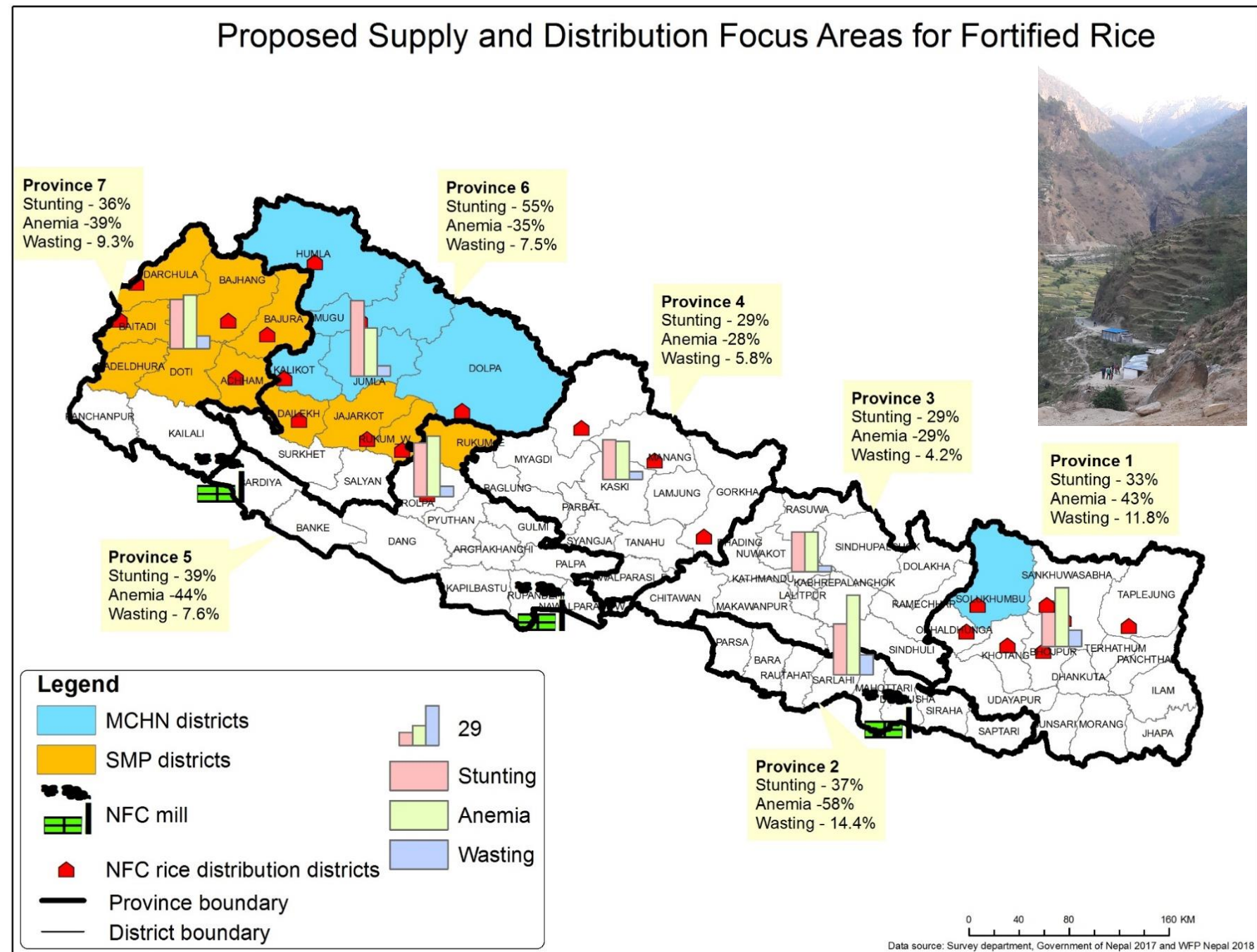
- Ministry of Industry Commerce and Supplies (MoICS),
 - Nepal Food Corporation (NFC),
 - Department of Food Technology and Quality Control (DFTQC),
 - Ministry of Health and Population (MoHP) and
 - World Food Programme (WFP), are planning to:
- **Formulate a standard** for fortified rice
 - Introduce **blending equipment** into NFC rice mills
 - **Fortify NFC social safety net rice** and **distribute** subsidised fortified rice in NFC remote areas



Where to distribute fortified rice in Nepal?

NFC target districts initially focusing upon

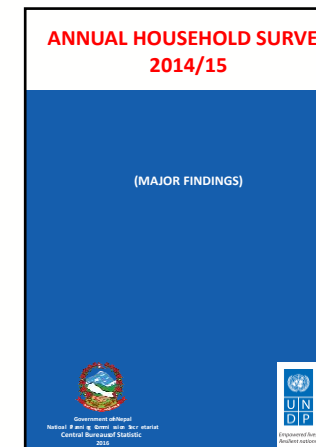
- Bajura
- Dolpa
- Humla
- Jumla
- Jajarkot
- Kalikot



Study design: modelling approach

Using 2 datasets:

- 1) **Individual-level 24-hour** dietary recall data from pregnant women, their mothers-in-law and household heads living in the plains of Nepal (Province 2), in the control arm of the **Low Birth Weight South Asia Trial**
- 2) **Household-level 7-day** consumption data from the **Nepal Household Annual Survey 2014-15** household consumption (national/province-level).



Analysis

Used nutrient composition values compiled into a **Nepal-specific food composition table**.

For different household members

pregnant women,
mothers-in-law and
male household heads

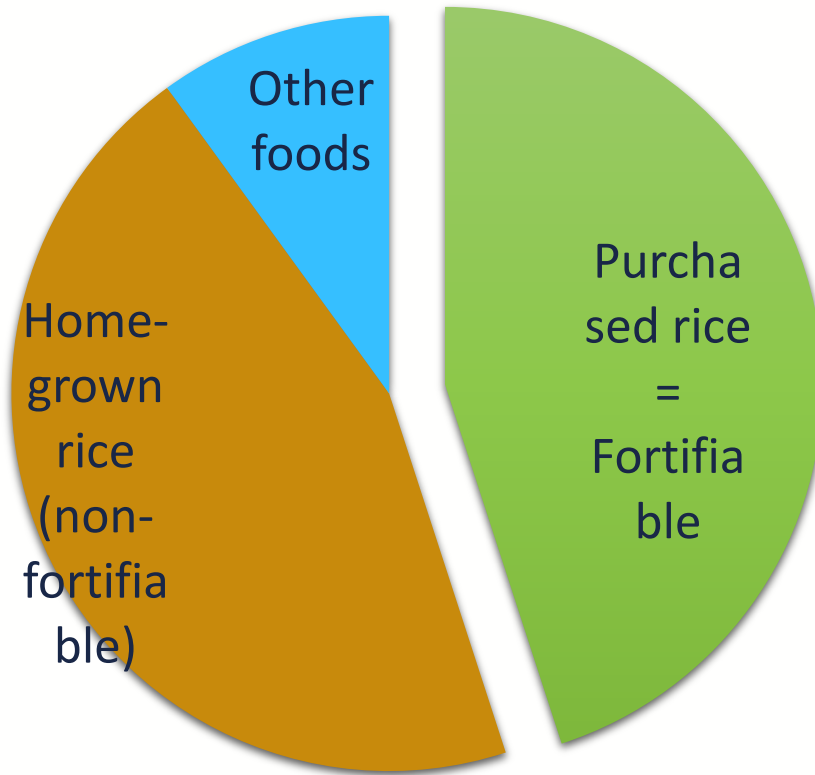
in the individual-level data

and for men and women in the household
survey data we estimated:

1. **Daily rice intakes**



Analysis

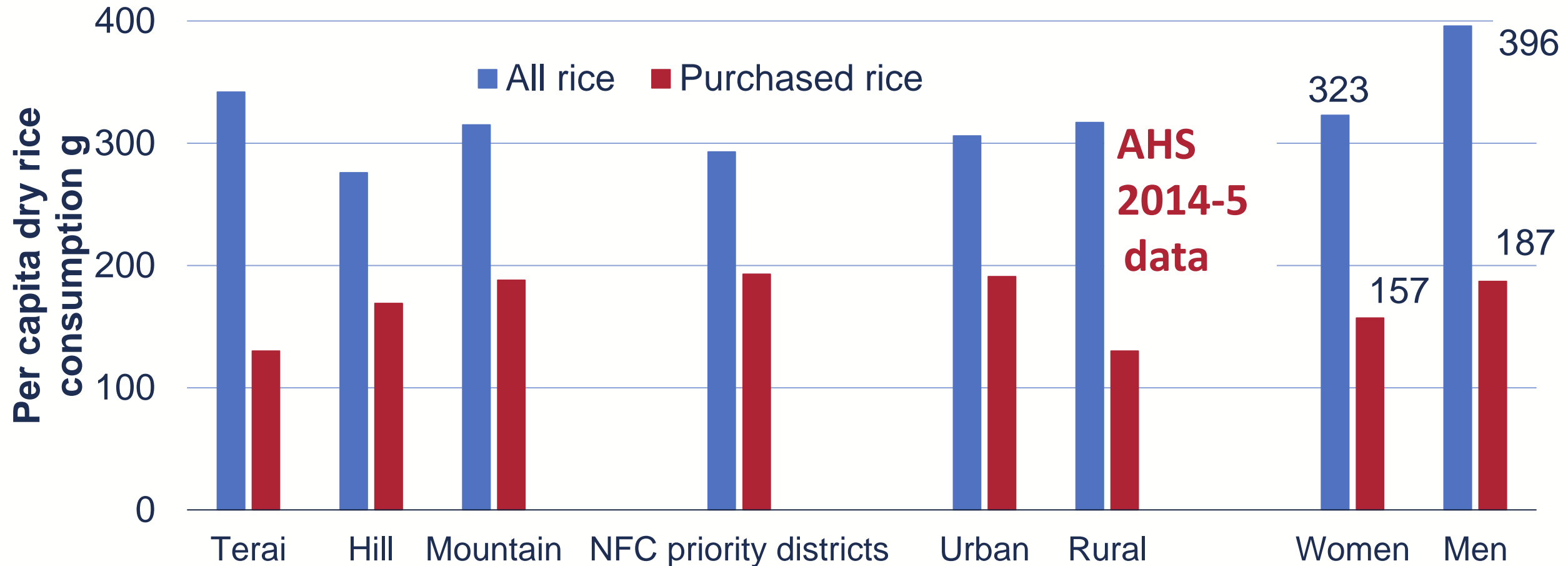


By substituting nutrient values of unfortified rice with those of fortified rice we calculated for **Nepalese diets with and without fortification:**

2. Overall nutrient intake
3. **Probability of adequacy (PA) of individual micronutrients and**
4. Mean Probability of adequacy (MPA) for the **overall diet**
5. **Difference in MPA** between pregnant women, their mothers in law and male household heads

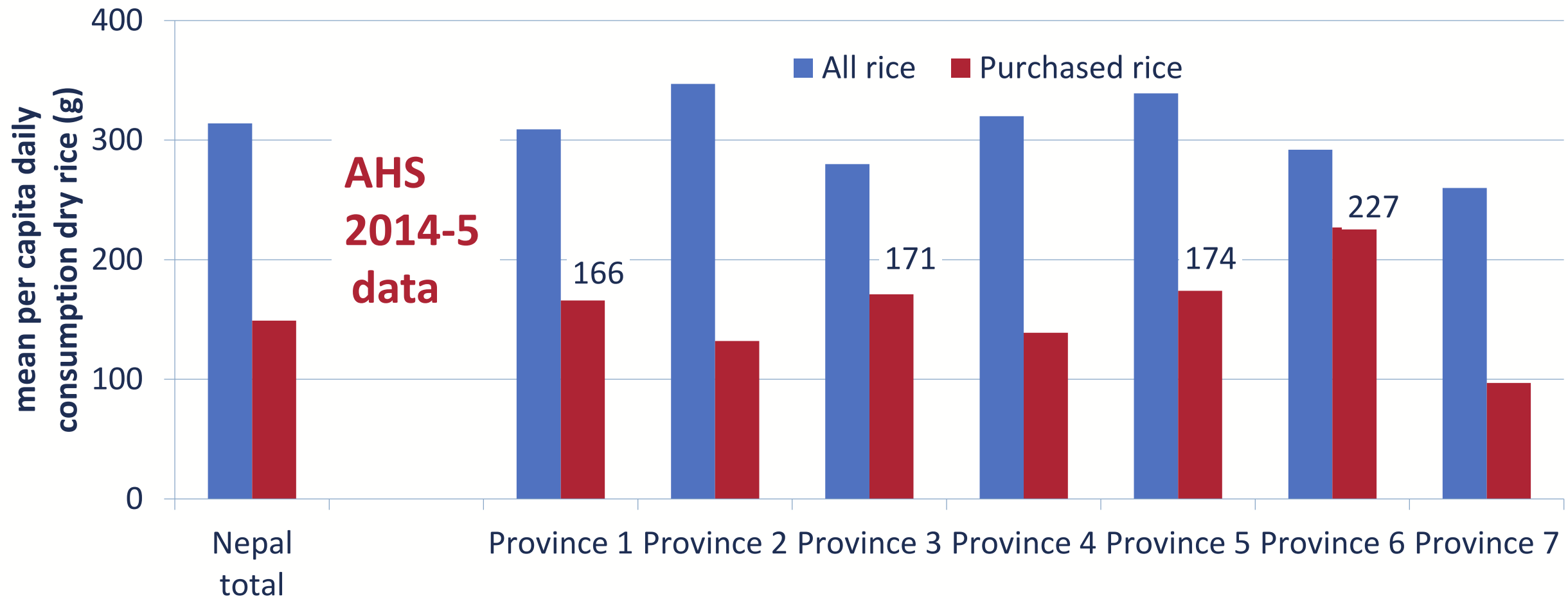
Fortification has most potential where consumption of purchased rice is high

Rice consumption: 314 g day all rice; 149 g purchased rice in the last 7 days 98% consumed any rice, 53% purchased rice



Per capita rice consumption by Province

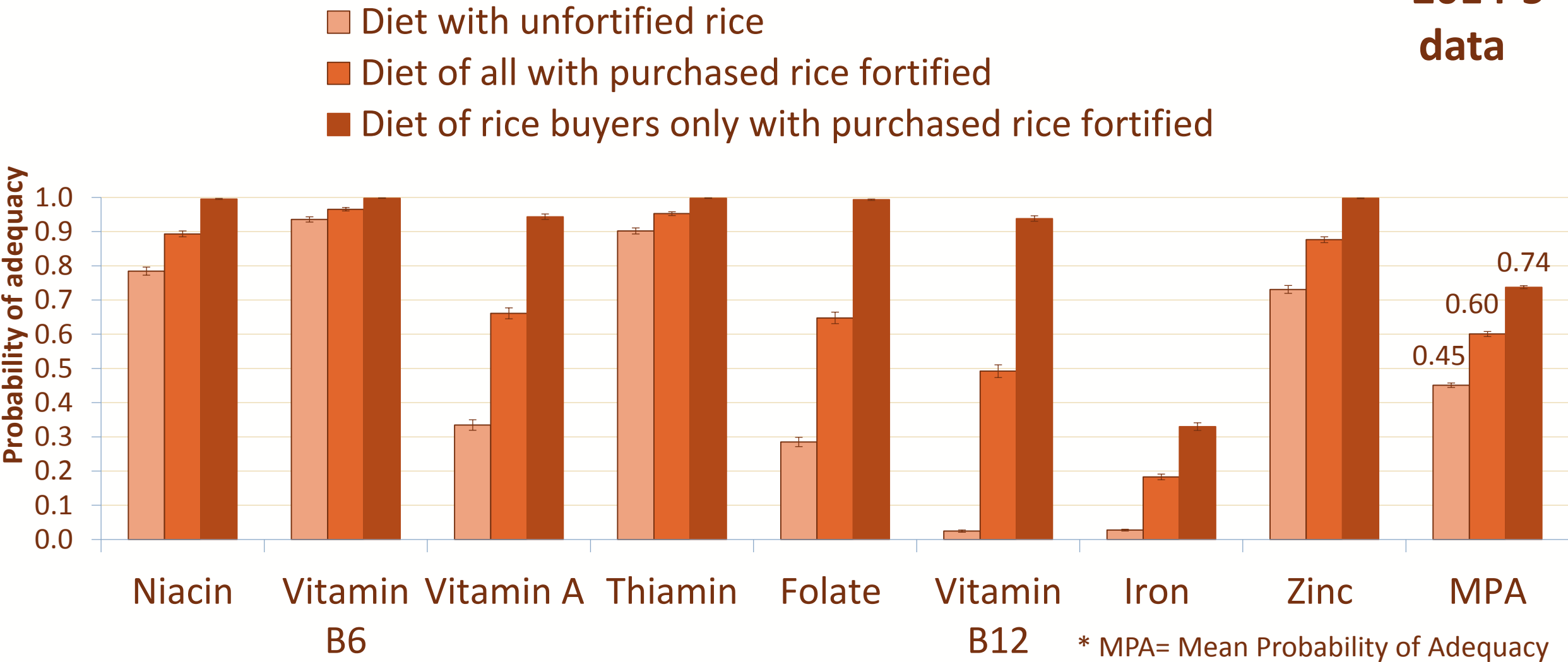
Starting fortification in Province 6 (NFC priority areas) makes sense due to highest consumption of purchased rice and social safety net coverage. Provinces 5, 3 & 1 also have potential subsequently.



Fortification improves adequacy (PA) of all fortified nutrients.
PA lowest for Iron. Rice buying households benefit most.

Probability of adequacy for women's diets

AHS
2014-5
data

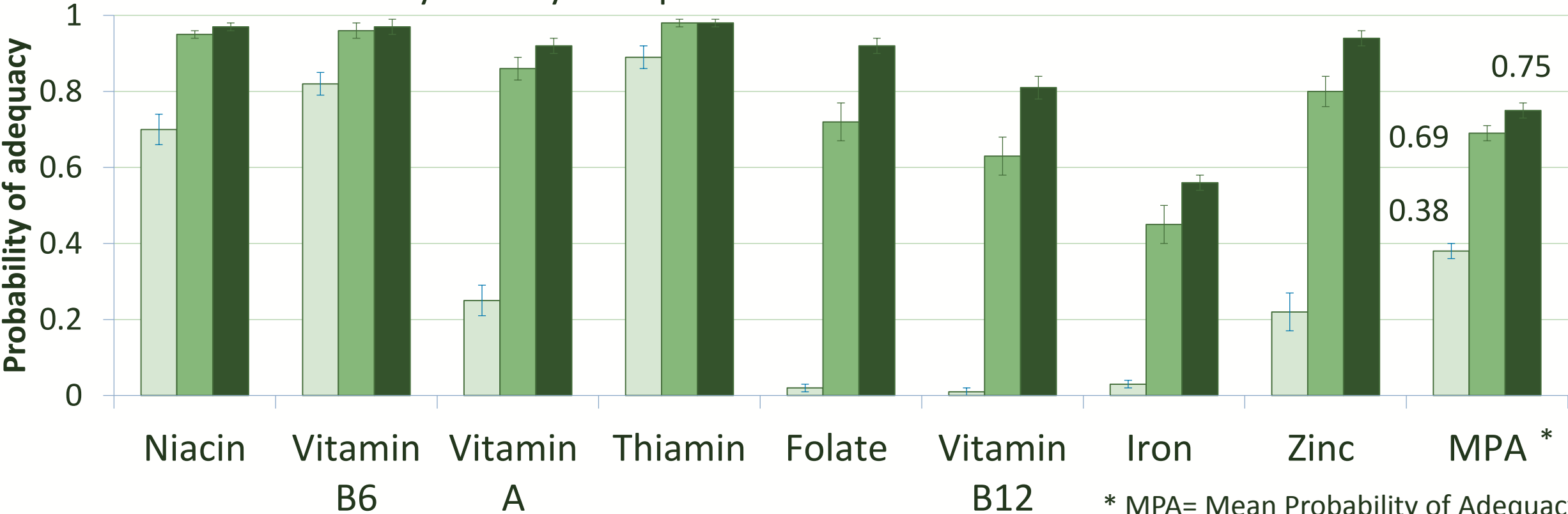


Fortification improves adequacy (PA) for pregnant women of all fortified nutrients.

Probability of adequacy for pregnant women's diets

LBWSAT
2015
data

- Diet with unfortified rice
- Diet of all with purchased rice fortified
- Diet of rice buyers only with purchased rice fortified

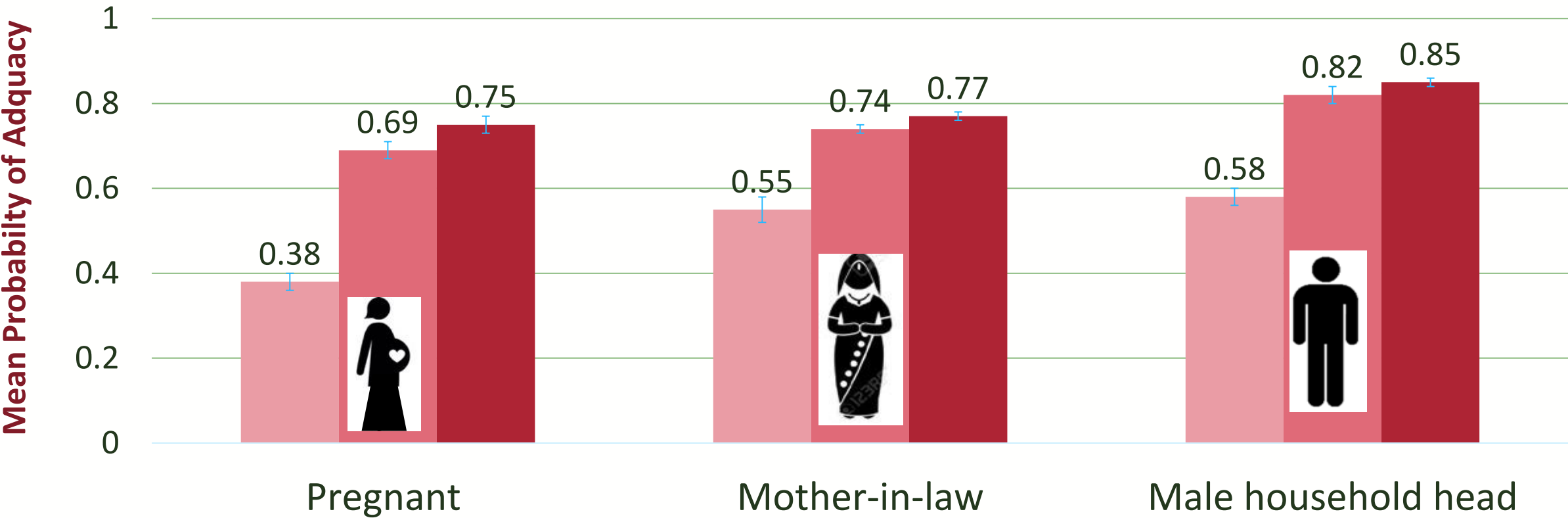


Inequitable intra-household food allocation means that adequacy improves for household members differently with fortification

Mean Probability of Adequacy (MPA) for pregnant women, mothers-in-law and male household head's diets

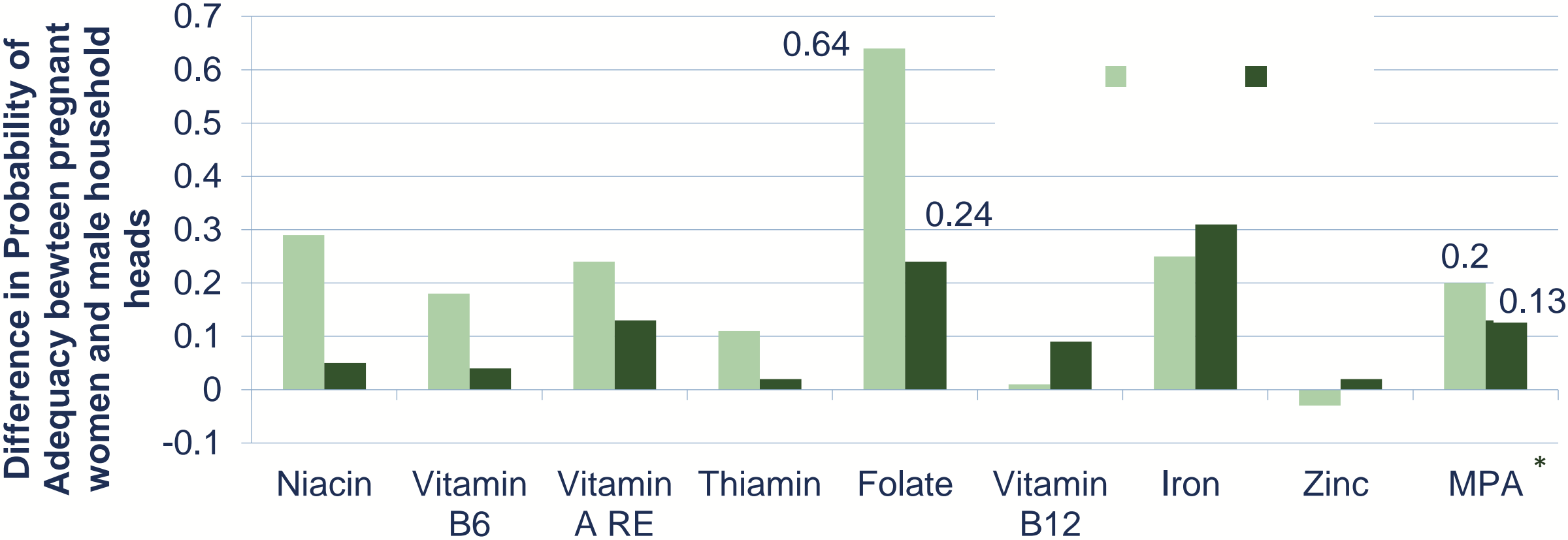
LBWSAT
2015
data

- Diet with unfortified rice
- Diet of all with purchased rice fortified
- Diet of rice buyers only with purchased rice fortified



Inequality between probability of adequacy for pregnant women and men decreases for niacin, Vitamins B6 and A, Thiamin and folate and for Mean Probability of Adequacy when rice is fortified.

Difference in Probability of Adequacy between men and pregnant women with and without fortification of rice



* MPA= Mean Probability of Adequacy

Nutrients fortified in WFP premix

Implications to the agriculture-nutrition-health pathway

- Rice is consumed widely in large volumes in Nepal so is a good vehicle for fortification
 - esp for consumers of *purchased* rice in social safety nets
- Fortification of rice improves dietary adequacy markedly for all fortified nutrients
- Fortification improves gender equity of nutrient access within households but
 - fairer sharing of micronutrient-rich foods is still needed!



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