METHODOLOGY OVERVIEW: WOMEN'S DIETARY DIVERSITY PROJECT I (WDDP-I)

Reaching Consensus on a Global Dietary Diversity Indicator for Women
Washington, DC, July 15–16, 2014

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July 15, 2014

EUROPEAN UNION
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FANTA III FOOD AND NUTRITION TECHNICAL ASSISTANCE
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Outline

- Criteria for data sets
- Exclusions from the sample
- Food group indicators
- Selected nutrients
- Estimated Average Requirements (EARs)
- Mean Probability of Adequacy (MPA)
- Statistical analysis
- Criteria of indicator performance

Criteria for data sets

- Resource-poor setting
- Women of reproductive age (15-49 years)
- Dietary data from 24-hour recall/direct observation or weighing of food
  - Good standard practice
  - Recipes disaggregated into ingredients
  - Food composition table (FCT) specific to study area
  - Sample size: ≥ 100 women with ≥ 40 repeat records
- Information on age, height, weight, pregnancy and lactation status

Exclusions from the sample

- Extremely low or high energy intakes
  - Ratio of Estimated Energy Intake/Basal Metabolic Rate (BMR):
    <0.9 (underreporter), >3.0 (overreporter) (Goldberg et al. 1991)

    BMR = X + Y * weight
    Age 15 – 18 years: BMR = 692.6 kcal + 13.384 kcal/kg * weight
    Age 18 – 30 years: BMR = 486.6 kcal + 14.818 kcal/kg * weight
    Age 30 – 49 years: BMR = 845.6 kcal + 8.126 kcal/kg * weight
  - Personal judgment of principal investigator
- Incomplete or implausible food record
- Age below 15 or above 49 years

Food group indicators

- Disaggregation: 6, 9, 13, and 21 food groups
- Quantity restriction to count:
  - 1 g (FGI)
  - 15 g (FGI-R)
- Vitamin A-rich: > 60 RAE/100g
- Vitamin C-rich: > 9 mg/100g
- Food groups not considered:
  - Fats and oils (except for red palm oil)
  - Sweets and added sugars
  - Alcohol and other beverages (except for 100% juice)

Food group indicators

FGI-6	FGI-9	FGI-13	FGI-21
All starchy staples	All starchy staples	All starchy staples	Grains and grain products
			All other starchy staples
All legumes and nuts	All legumes and nuts	All legumes and nuts	Cooked dry beans and peas
			Soybeans and soy products
			Nuts and seeds
All dairy	All dairy	All dairy	Milk/yoghurt
			Cheese
Other animal source foods	Organ meat	Organ meat	Organ meat
	Eggs	Eggs	Eggs
	Flesh foods and other miscellaneous small animal protein	Small fish eaten whole with	Small fish eaten whole with bones
		All other flesh foods and miscellaneous small animal protein	Large whole fish/dried fish/shellfish and other
			Beef, pork, veal, lamb, goat, game meat
			Chicken, duck, turkey, pigeon, guinea hen, game
			Insects, grubs, snakes, rodents and other small
Vitamin A-rich fruits and vegetables	Vitamin A-rich dark green leafy	Vitamin A-rich dark green leafy vegetables	Vitamin A-rich dark green leafy vegetables
	Other vitamin A-rich vegetables and fruits	Vitamin A-rich deep yellow/orange/red	Vitamin A-rich deep yellow/orange/red vegetables
		Vitamin A-rich fruits	Vitamin A-rich fruits
Other fruits and vegetables	Other fruits and vegetables	Vitamin C-rich vegetables	Vitamin C-rich vegetables
		Vitamin C-rich fruits	Vitamin C-rich fruits
		All other fruits and vegetables	All other vegetables
			All other fruits

Selected nutrients

Vitamins	Minerals
Thiamin	Calcium
Riboflavin	Iron
Niacin	Zinc
Vitamin B6	
Folate	
Vitamin B12	
Vitamin A	
Vitamin C	

- Other nutrients considered, but not selected:
  - Iodine (no reliable FCT data)
  - Vitamin D (no EAR, missing in many FCTs)

Estimated Average Requirements (EARs)

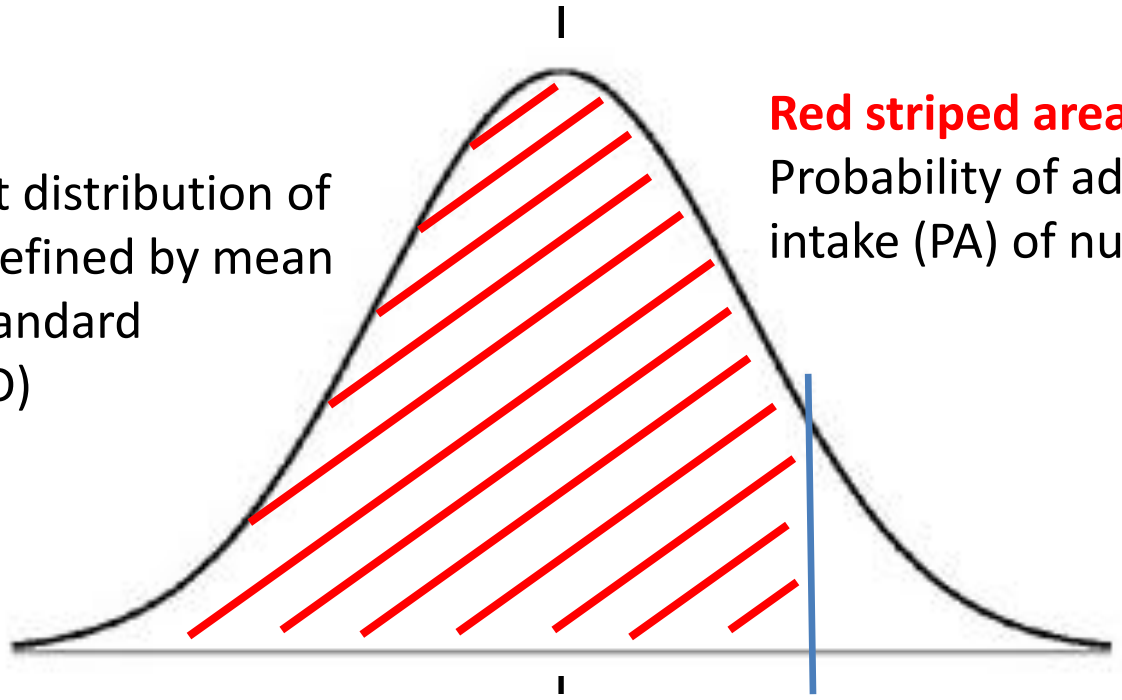
- For adolescent girls and for adult women by physiological status:
  - Non-pregnant non-lactating (NPNL)
  - Pregnant
  - Lactating
- Main source of EARs: WHO/FAO (2004)
- Exceptions
  - Iron: skewed distribution of requirements for NPNL women, tables adapted from IOM (2000)
  - Zinc: IZiNCG (2004)
  - Calcium: method by Foote et al. (2004) using U.S. Adequate Intake

Mean Probability of Adequacy (MPA)

- Probability approach to assess nutrient adequacy (Barr et al. 2002) considers:
  - Intra-individual variation of nutrient intakes
  - Distribution of nutrient requirements
- Stata syntax provided by Maria Joseph and Alicia Carriquiry from Iowa State University
- Probability of adequacy (PA) for each micronutrient
- MPA: average PA across 11 micronutrients for each woman
- Three dichotomous indicators: MPA >50%, >60% and >70%

Mean Probability of Adequacy (MPA)

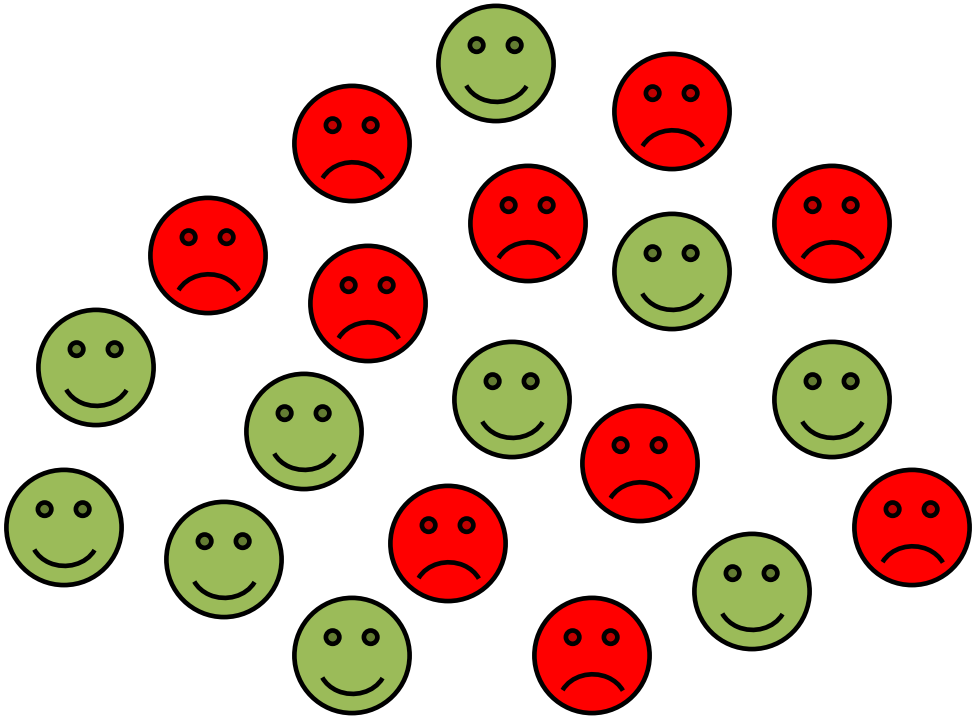
Probability approach to estimate probability of adequacy at individual and population level



Statistical analysis

- Stata software
- Descriptive analysis
  - Dietary patterns and FGIs
  - Energy, macro- and micronutrient intakes
  - PA of each micronutrient, MPA
- Correlation and regression analysis, scatter plots
  - FGIs and energy intakes
  - FGIs and MPA
- Receiver-operating characteristic (ROC) analysis
  - FGI performance in predicting MPA
- Sensitivity-specificity analysis
  - Selection of FGI cutoffs

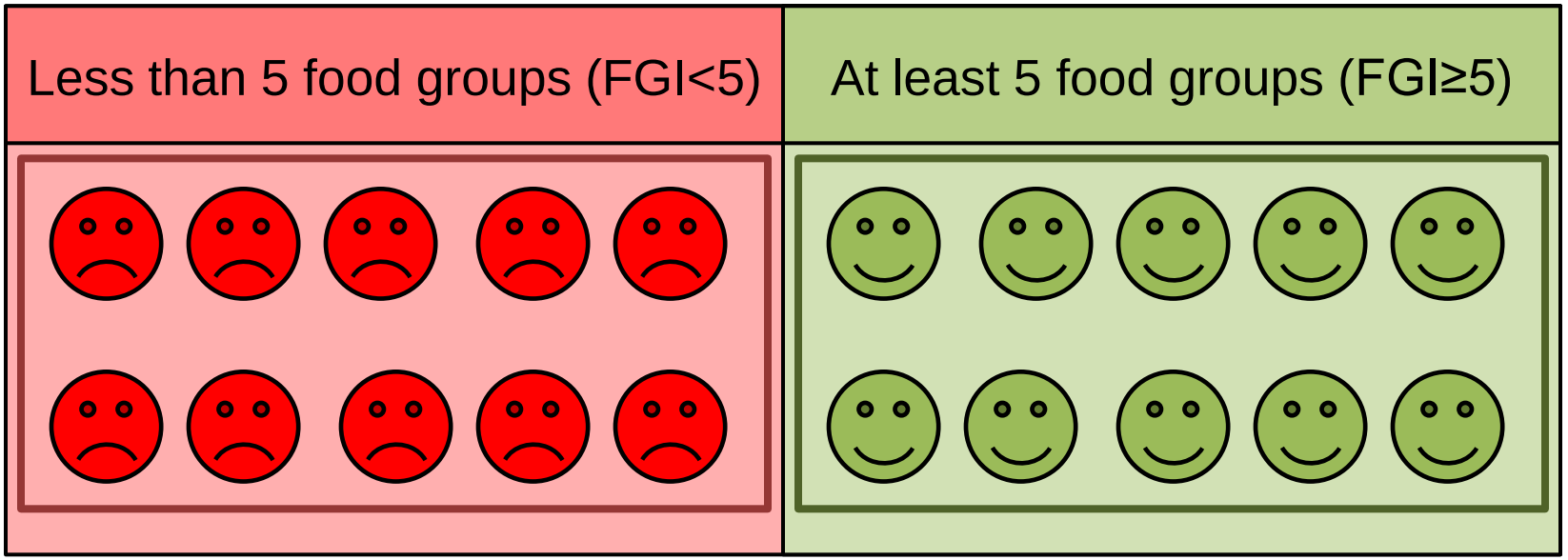
Statistical analysis: sensitivity + specificity



Low micronutrient adequacy (MPA≤60%)

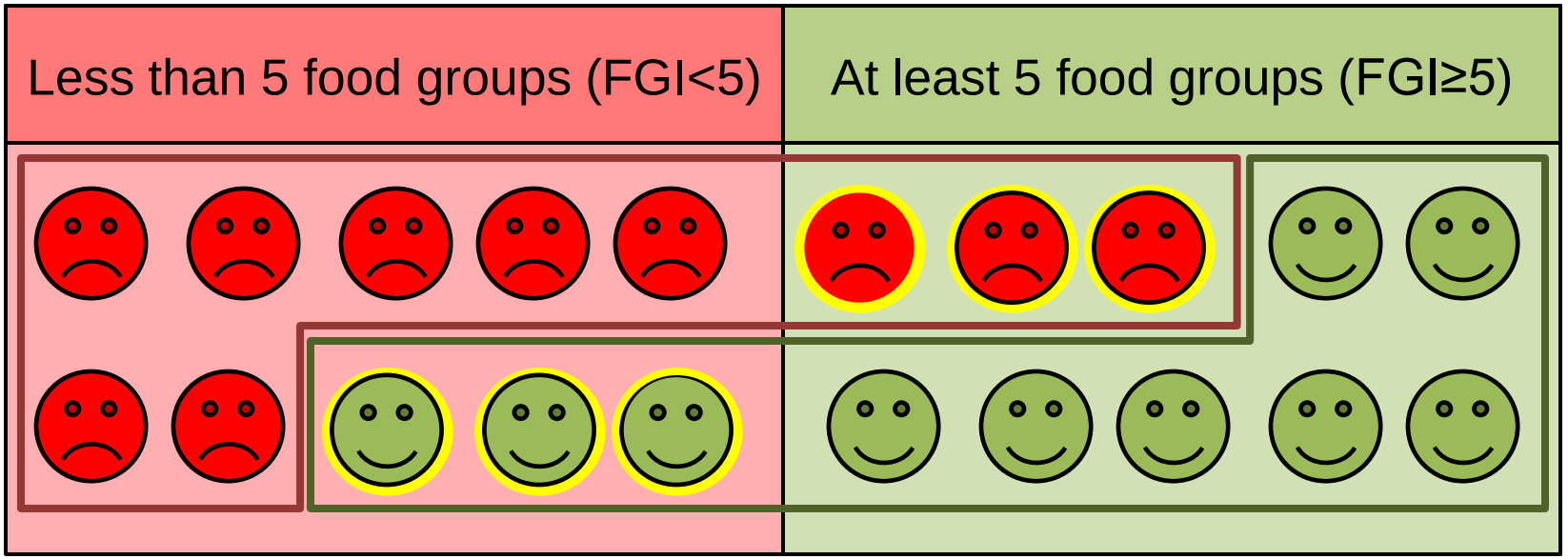
Acceptable micronutrient adequacy (MPA>60%)

Statistical analysis: sensitivity + specificity



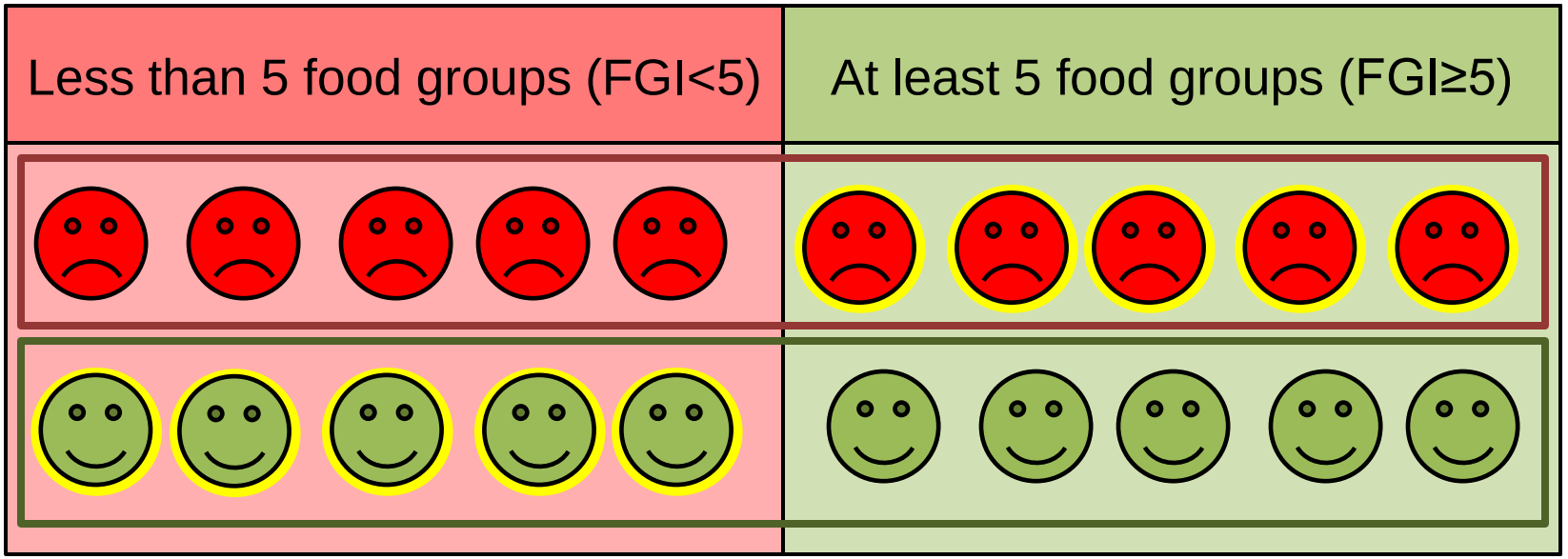
- Perfect classification!
  - Sensitivity: 100% **(green smileys in green field/all green smileys)**
  - Specificity: 100% **(red smileys in red field/all red smileys)**
  - Misclassification: 0% (misclassified smileys/all smileys)
  - Prevalence above MPA cutoff = prevalence at/above FGI cutoff = 50%

Statistical analysis: sensitivity + specificity



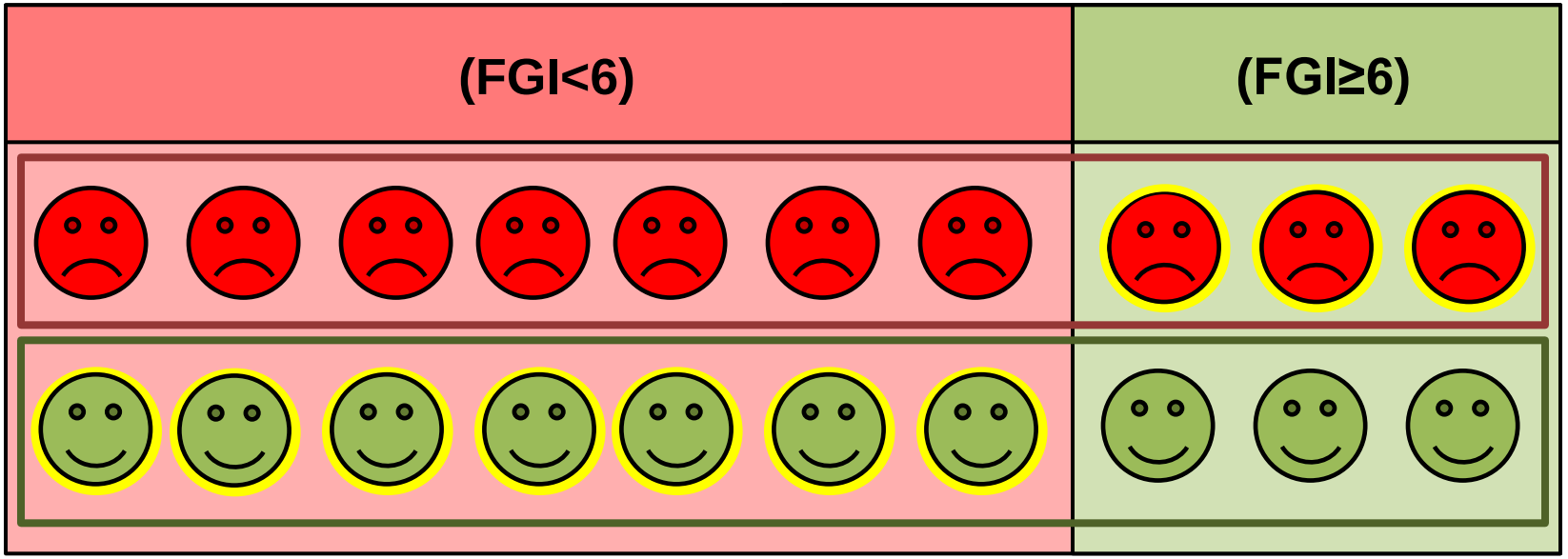
- (Almost) acceptable classification
  - Sensitivity: 70% **(green smileys in green field/all green smileys)**
  - Specificity: 70% **(red smileys in red field/all red smileys)**
  - Misclassification: 30% **(smileys with yellow border/all smileys)**
  - Prevalence above MPA cutoff = prevalence at/above FGI cutoff = 50%

Statistical analysis: sensitivity + specificity



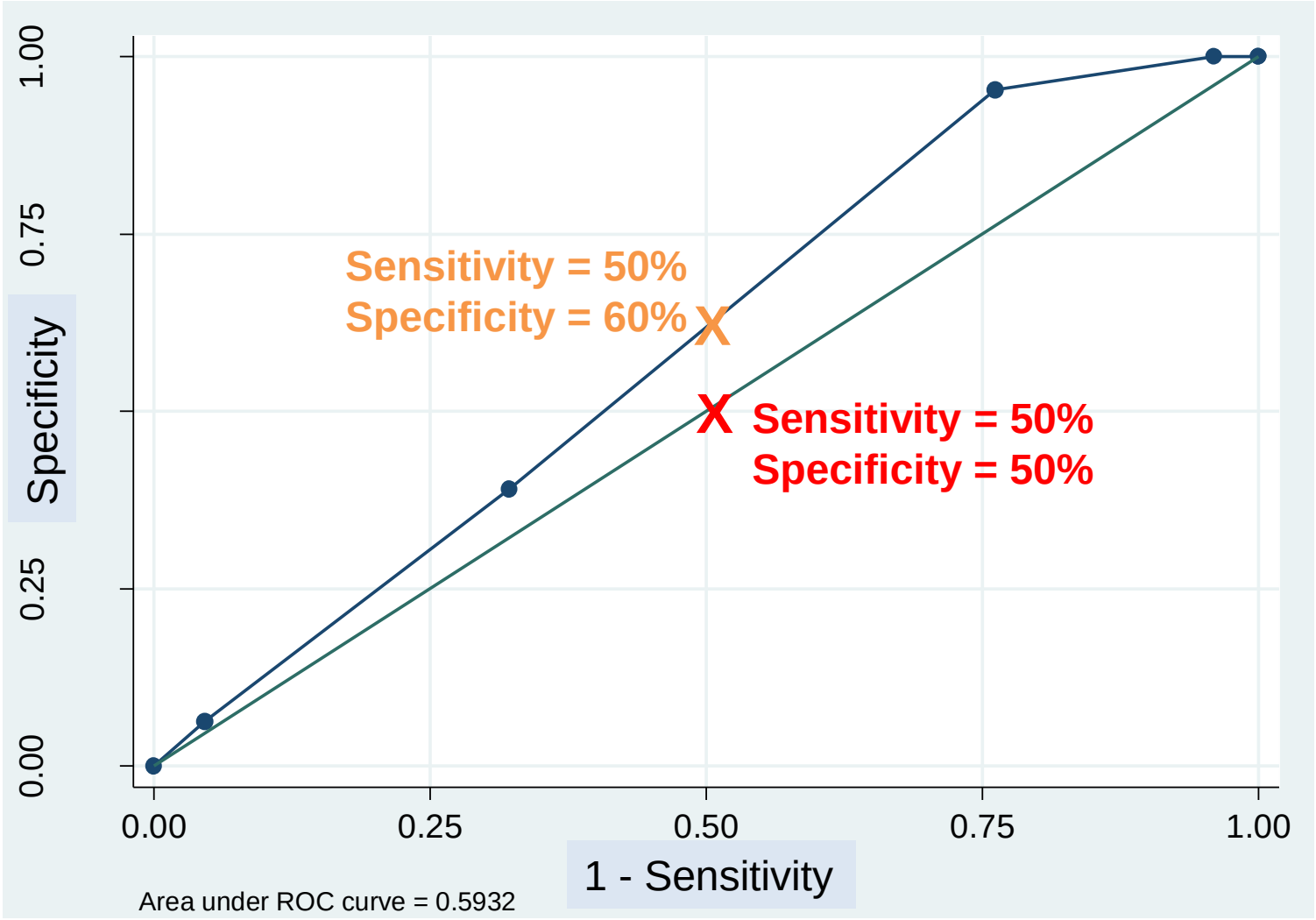
- Inacceptable classification (no association)
  - Sensitivity: 50% **(green smileys in green field/all green smileys)**
  - Specificity: 50% **(red smileys in red field/all red smileys)**
  - Misclassification: 50% **(smileys with yellow border/all smileys)**
  - Prevalence above MPA cutoff = prevalence at/above FGI cutoff = 50%

Statistical analysis: sensitivity + specificity



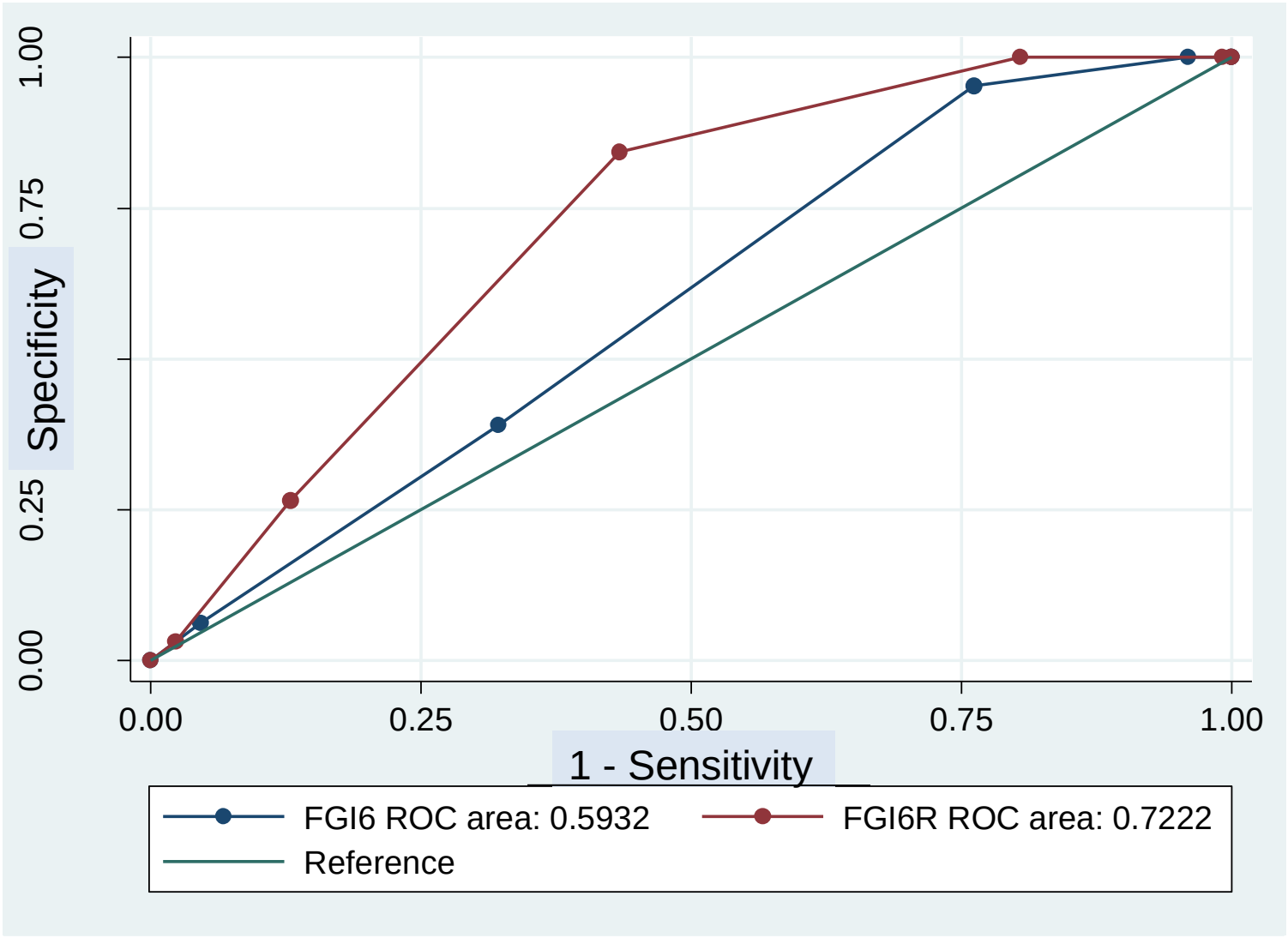
- Inacceptable classification (no association), higher FGI cutoff
  - Sensitivity: 30% **(green smileys in green field/all green smileys)**
  - Specificity: 70% **(red smileys in red field/all red smileys)**
  - Misclassification: 50% **(smileys with yellow border/all smileys)**
  - Prevalence above MPA cutoff = 50%, prevalence at/above FGI cutoff = 30%

Statistical analysis: ROC analysis



FGI-6 versus MPA > 50%, Bangladesh site, WDDP I

Statistical analysis: ROC analysis



FGI-6 and FGI-6R vs. MPA > 50%, Bangladesh site, WDDP-I

Criteria for indicator performance

- Area under the Curve (AUC) from ROC analysis
  - Significantly ($p < 0.05$) greater than 0.50
  - AUC ≥ 0.70: “reasonable potential”
  - Statistically significant differences ($p < 0.05$) between AUC of food group indicators
- Sensitivity-specificity analysis
  - Sensitivity > 60%
  - Specificity > 60%
  - Total misclassification < 30%

Funding for this meeting was provided by the European Union (EU) through the Food and Agriculture Organization (FAO) of the United Nations, and by the Office of Health, Infectious Diseases and Nutrition, Bureau for Global Health, U.S. Agency for International Development (USAID), under terms of Cooperative Agreement No. AID-OAA-A-12-00005, through the Food and Nutrition Technical Assistance III Project (FANTA), managed by FHI 360.