Food and Agriculture Organization
of the United Nations

Moving forward

ON CHOOSING A STANDARD OPERATIONAL INDICATOR OF WOMEN'S DIETARY DIVERSITY

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Yves Martin-Prével[a], Pauline Allemand[a], Doris Wiesmann[b], Mary Arimond[c], Terri Ballard[d], Megan Deitchler[e], Marie-Claude Dop[a], Gina Kennedy[f], Warren T K Lee[d], Mourad Moursi[g]

[a] Institut de Recherche pour le Développement (IRD), Montpellier, France
[b] Independent consultant, Germany
[c] UC Davis, Davis, California, USA
[d] FAO Headquarters, Rome, Italy
[e] FANTA/FHI360, Washington DC
[f] Bioversity International, Maccarese, Italy.
[g] HarvestPlus, Washington DC

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Acronyms and abbreviations

AI	adequate intake
AED	Academy for Educational Development (USA)
ASF	animal-source food
AUC	area under the curve
BLUP	best linear unbiased predictor
BMI	body mass index
BMR	basal metabolic rate
CHO	carbohydrates
CLHNS	Cebu Longitudinal Health and Nutrition Survey (Philippines)
CV	coefficient of variation
DANIDA	Danish International Development Agency
DHS	Demographic and Health Survey
EAR	estimated average requirements
EU-INCO	European Union International Cooperation
FANTA	Food and Nutrition Technical Assistance Project (USA)
FAO	Food and Agriculture Organization of the United Nations
FCT	food composition table
FGI	food group indicator ("non-restricted")
FGI-R	food group indicator ("restricted")
FGI-6	food group indicator summed from 6 groups, minimum intake 1g per group
FGI-6R	food group indicator summed from 6 groups, minimum intake 15g per group
FGI-7	food group indicator summed from 7 groups, minimum intake 1g per group
FGI-7R	food group indicator summed from 7 groups, minimum intake 15g per group
FGI-9	food group indicator summed from 9 groups, minimum intake 1g per group
FGI-9R	food group indicator summed from 9 groups, minimum intake 15g per group
FGI-10E	food group indicator summed from 10 groups, minimum intake 1g per group
FGI-10ER	food group indicator summed from 10 groups, minimum intake 15g per group
FGI-10R	food group indicator summed from 10 groups, minimum intake 15g per group
FGI-12	food group indicator summed from 12 groups, minimum intake 1g per group
FGI-12R	food group indicator summed from 12 groups, minimum intake 15g per group
FGI-13	food group indicator summed from 13 groups, minimum intake 1g per group
FGI-21	food group indicator summed from 21 groups, minimum intake 1g per group
FGI-21R	food group indicator summed from 21 groups, minimum intake 15g per group
FHI	Food Health International (USA)
FNRI	Food and Nutrition Research Institute of the Philippines
FTF	Feed the Future Program (USA)
g	grams
IFPRI	International Food Policy Research Institute (USA)
INSD	Institut National de la Statistique et de le Démographie (Burkina Faso)
IOM	Institute of Medicine (USA)
IQ	inter-quartile
IRD	Institut de Recherche pour le Développement (France)

IRSS	Institute of Research in Health Sciences (Burkina Faso) Institut de Recherche en Science de la Santé
IYCF	infant and young child feeding
IZiNCg	International Zinc Nutrition Consultative Group (USA)
μg/d	micrograms per day
mg/d	milligrams per day
MPA	mean probability of adequacy
NGO	non-governmental organization
NPNL	non-pregnant non-lactating
OC	oral contraceptives
OFSP	orange-fleshed sweet potatoes
OPS	Office of Population Studies (Cebu, Philippines)
ORC	Opinion Research Corporation (Macro International Inc. USA)
PA	probability of adequacy
RAE	retinol activity equivalent
RDA	recommended dietary allowance
RDI	recommended daily intake
RE	retinol equivalent
REU	HarvestPlus Reaching End-users Project
ROC	receiver-operating characteristics
RPO	red palm oil
SD	standard deviation
USAID	United States Agency for International Development
WDDI	women's dietary diversity indicator
WDDP	Women's Dietary Diversity Project (Phase I and Phase II)
WHO	World Health Organization
WRA	women of reproductive age

Executive summary

Introduction and purpose

Dietary diversity is well-recognized as an important dimension of diet quality but is difficult to achieve in resource-poor settings where monotonous diets fail to meet many micronutrient needs. This is particularly crucial among vulnerable groups which include women of reproductive age (WRA). Yet, dietary surveys using repeat 24-hours recalls that provide quantitative information on micronutrient adequacy of diets remain out of reach for most resource-poor countries. In these settings the lack of such information impedes assessment of needs, advocacy for programmatic actions and tracking of improvements. This has motivated the search for simpler population-level proxy indicators to reflect micronutrient adequacy of the diets of WRA that can be collected via large-scale surveys.

In 2005-2010, the Women's Dietary Diversity Project (WDDP), coordinated by the International Food Policy Research Institute (IFPRI) and funded by the United States Agency for International Development (USAID) through the Food and Nutrition Technical Assistance Project (FANTA), undertook a collaborative data analysis from five sites with dietary intake data from multiple 24-hour recalls to examine the relationship between food group diversity and micronutrient adequacy of the diets of WRA. The WDDP concluded that a quasi-continuous food group diversity indicator (number of food groups consumed) was consistently associated with micronutrient adequacy, but did not conclude with the selection of a dichotomous indicator for use across all contexts. Yet, many users have indicated the need for a dichotomous indicator, similar to the "minimum dietary diversity" indicator of four out of seven food groups now in use for infants and young children, since dichotomous indicators are particularly useful for advocacy purposes and for communication with non-technical audiences, including policy-makers.

In 2012, to help address this need the Food and Agriculture Organization (FAO) initiated a follow-up project (WDDP II) with the objectives of a) identifying additional data sets to analyse, following the same general protocol and syntax developed under WDDP; b) exploring if the inclusion of additional data sets in the analysis will provide stronger evidence to inform the most appropriate food group composition, both in terms of the number and types of food groups to comprise the indicator; c) investigating whether a standard cut-off can be identified to formulate a valid dichotomous women's dietary diversity indicator. These further analyses were led by the Institute of Research for Development (IRD, Montpellier, France) and are described in this document. IRD extended the work done under the WDDP to a larger number of sites (four supplementary datasets) and to complementary analyses. This is expected to provide a more robust evidence base for balancing indicator characteristics and for selecting a dichotomous indicator.

Methods and materials

The nine datasets analysed under WDDP II were collected in rural Bangladesh in 1996 (Ban1; n=412) and in 2008 (Ban2; n=422), urban Burkina Faso in 2007 (BF1; n=178), rural Burkina Faso in 2010 (BF2; n=407), urban Mali in 2007 (Mali; n=102), rural Mozambique in 2006 (Moz; n=391), peri-urban Philippines in 2005 (Phi; n=848), rural Uganda in 2007 (Ug1; n=452) and rural and urban Uganda in 2008 (Ug2; n=954).

The exclusion of outliers was harmonized across datasets by applying Goldberg criteria: women with energy intakes either below 0.9 x BMR (basal metabolic rate) or above 3.0 x BMR were excluded from the analyses. The exclusion rate was of concern for the Philippines dataset (61 percent) but the distribution of energy or nutrients intakes from the remaining sample did not show any unexpected patterns.

Using currently recommended approaches, we assessed the probability of adequacy (PA) for 11 micronutrients and we constructed the "mean probability of micronutrient adequacy" (MPA) which summarizes micronutrient adequacy across the 11 micronutrients.

We reviewed and updated the estimated average requirements (EAR) used to calculate the micronutrient PAs as appropriate, according to available information newly published since WDDP.

For each dataset we looked at various candidate food-group indicators (FGI). Among the indicators chosen for the analysis was the one currently recommended by FAO and FANTA and used in several USAID programmes, FGI-9, comprised of nine food groups: "All starchy staples"; "All legumes and nuts"; "All dairy"; "Organ meat"; "Eggs"; "Flesh foods and other miscellaneous small animal protein"; "Vitamin A-rich dark green leafy vegetables"; "Other vitamin A-rich vegetables and fruits (including yellow- and orange-fleshed sweet potatoes and red palm oil) "; and "Other fruits and vegetables". We also looked at the FGI-7 used to assess the "minimum dietary diversity" as part of the infant and young child feeding indicators, because harmonization would have advantages.

We analysed the contribution of all food groups and sub-groups to the MPA and found that the relationship between FGI and MPA could be enhanced by disaggregating (relative to FGI-9) four food groups: "All starchy staples" into "Grains and grain products" plus "All other starchy staples"; "All legumes and nuts" into "Beans and peas" plus "Nuts and seeds"; "Flesh foods" into "Meat" plus "Fish"; and "Other fruits and vegetables" into "Other fruits" plus "Other vegetables". Thus, two new candidate FGIs were identified. The FGI-12 included the four disaggregations above; the FGI-10 included the disaggregation of "All legumes and nuts" and of "Other fruits and vegetables". For both of these new candidate indicators "Organ meat" was re-aggregated with "Meat".

For all food-group combinations, two indicators were constructed depending on whether or not a minimum consumption of 15g was imposed in order for a food group to count in the score. The indicators were called "restricted" (FGI-R) or "non-restricted" (FGI), respectively. At last, eight candidate indicators were analysed: FGI-7 and FGI-7R, FGI-9 and FGI-9R, FGI-10 and FGI-10R, FGI-12 and FGI-12R.

Results

Each site presented a different dietary pattern according to the frequency of consumption for the main food groups. The contribution of starchy staples to total energy intake was higher in rural areas (from 68 percent in Mozambique to 87 percent in the Ban2 dataset) with the exception of the Ugandan sites (54 percent and 43 percent for Ug1 and Ug2, respectively) because of the frequent consumption of orange-fleshed sweet potatoes in Uganda (OFSP, classified as vitamin A-rich vegetables). Conversely, food groups not considered for constructing dietary diversity scores because of their very poor micronutrient content (i.e. fats, oils, sweets and alcohol) contributed more to total energy intake in urban sites (from 20 percent to 26 percent) than in rural sites (from 3 percent to 9 percent).

When considering the four non-restricted FGIs, the BF1 and the Mali urban sites had the highest mean FGI scores. However, when considering FGI-9R, FGI-10R and FGI-12R, those sites had the biggest decrease of the mean score while the Philippines and both Ugandan datasets showed the highest mean scores. The lowest mean scores were encountered for BF2 and Mozambique, but while the 15g restriction did not change significantly the score in Mozambique, the decrease was high in BF2. Overall, the impact of imposing the 15g minimum consumption for a food group to count varied widely by food group and across contexts.

Median micronutrient intakes varied by site, but intakes were notably low relative to average requirements for a number of micronutrients in each site. Given the much higher requirements during pregnancy and lactation, PAs varied strongly according to physiological status, thus results were described separately for non-pregnant non-lactating (NPNL) and for lactating women (but not for pregnant women that were too few in most sites). Considering all micronutrients and all sites, the estimated PA was below 50 percent for half of the cases for NPNL women and for two thirds for lactating women. Among NPNL women, site by site, out of eleven micronutrients the number for which the PA was below 50 percent was three in Ug2 dataset, four in Ug1, five in BF2, Mali and Philippines, six in Mozambique and Ban2, and seven in Ban1 and BF1. Among lactating women, corresponding numbers were four in the Ug2 dataset, five in Ug1, eight in BF2 and Mozambique, nine in Ban2, and ten in Ban1. There were correspondingly low levels of MPA in almost all settings, reflecting poor diets. Among sites, MPA for the 11 micronutrients ranged from 34-60 percent for NPNL women and from 23-50 percent for lactating women. MPA was highest in the two Ugandan datasets and lowest in BF1.

Correlations and simple linear regressions were used to describe relationships between each candidate FGI and energy intake, PAs and MPA. The relationship between diversity and energy intake was of interest in order to understand if any observed relationship between diversity and MPA was due to higher quantity of food, higher micronutrient density (quality) of diets or both. Correlations between FGIs and energy intakes were low to moderate for both NPNL and lactating women. They tended to be higher for NPNL women than for lactating women and for FGI-12 than for FGI-10E, FGI-9 and FGI-7, in that order, but this pattern was not consistent across all datasets. Correlations with energy intake were higher for restricted FGI. The increases in mean energy intakes at successive values of the FGI scores were fairly consistent across sites. Not controlling for energy intake, correlations between FGIs and PAs were statistically significant for almost all nutrients in almost all sites. Across all sites, there were between 11 percent (FGI-12R) and 24 percent (FGI-7R) non-significant correlations among NPNL women, more frequently in the Ug1, Ban2 and Mozambique datasets, and for vitamin C, B6, B12 and iron. When energy intake was controlled for, correlations were attenuated and many more of them became non-significant. This was particularly visible for the Mozambique dataset, regardless of the physiological status and of the FGI. This may mean that higher quantities rather than higher variety of foods drove micronutrient intakes more strongly in Mozambique than in other sites. Correlations between FGIs and MPA were almost always significant but only moderately strong. Adjusted for energy intake, correlations ranged from 0.12 to 0.52 and were higher for restricted (from 0.12 to 0.52) compared to non-restricted FGIs (0.02 to 0.40) and for NPNL women (from 0.09 to 0.52) compared to lactating women (from 0.02 to 0.38).

The performance of the eight candidate indicators in predicting different thresholds of MPA (0.50, 0.60 or 0.70) was assessed using receiver-operating characteristics (ROC) analysis. The area under the curve (AUC) summarizes the predictive power of each indicator across all possible FGI cutoffs. As a rule of thumb, we considered an AUC ≥ 0.70 to indicate some promise for the indicator. In 87 percent of the pairwise comparisons, higher AUCs were observed when the 15g restriction was applied. For all the FGI-Rs, across all sites, the AUC was ≥ 0.70 in 22 out of 36 cases for a MPA threshold at 0.50, in 18 out of 36 cases for a MPA threshold at 0.60, for 15 out of 32 cases for a MPA threshold at 0.70 (for the Ban2 dataset there were not enough women reaching this MPA level to calculate the AUC). Overall, comparisons of AUC values across restricted FGIs and the various thresholds of MPA were clearly at the disadvantage of FGI-7R and, but to a lesser extent, also at the disadvantage of FGI-9R. There was a tendency of higher performance for the more disaggregated FGIs (i.e. FGI-12R > FGI-10ER > FGI-9R > FGI-7R). However, few differences in AUC were statistically significant. We identified potential dichotomous indicators, according to various FGI cutoffs, by examining the sensitivity, specificity and total misclassification of those indicators associated with several thresholds of MPA. This allowed identification of a "best cutoff" for those FGIs that performed correctly (i.e. AUC ≥ 0.70) in a sufficient number of datasets and at different MPA levels. As a rule of thumb, the "best" FGI cutoff was determined for each MPA threshold by considering the following characteristics: (i) Rate of misclassification: preferably ≤ 30 percent; still considered if ≤ 40 percent; (ii) Sensitivity and specificity: preferably both ≥ 60 percent; still considered if one of the two only is ≥ 50 percent; (iii) At least ten women should have reached the MPA threshold to give some robustness to the analysis; still considered if at least one woman did so. Finally, it was possible to define the "best" dichotomous indicator for the following cases: (i) FGI-9R with a cutoff point of minimum five food groups; (ii) FGI-10ER also with a cutoff point of minimum five food groups; and (iii) FGI-12R with a cutoff point of minimum six food groups.

We examined how well the prevalence of women at-or-above the FGI cutoffs identified through the above analysis matched the prevalence of women above MPA thresholds of 0.50, 0.60, and 0.70. The best matching over all sites was found for MPA > 0.60. Graphically, as well as through use of non-parametric tests, the relationships between both types of prevalence estimates (i.e. according to FGI cutoff or to MPA threshold) was stronger for FGI-12R, followed by FGI-10ER, then FGI-9R, noting that two datasets (BF2 and Mozambique) were considered as outliers for reasons described herein.

We also compared some characteristics of women's diet (mean MPA, percentages of women having consumed at least 15g of several nutrient-dense food groups) between those reaching or not the various FGI cutoffs. Non-negligible differences in the mean MPA and in the frequency of consumption of nutrient-dense food groups were found for the three FGIs. For the "best" FGI-9R cutoff, over all sites the mean MPA was on average 0.13 points higher among women reaching the cutoff than among others. For both the "best" FGI-10ER and FG-12R cutoffs, over all sites the mean MPA was on average 0.16 points higher among women reaching the cutoff than among others. The nutrient-dense food groups of interest were the animal-source food groups, the fruit/vegetable food groups, and the legumes, nuts and seeds food groups. In almost all datasets and whatever the FGI and the cutoff considered women who met or exceeded the FGI cutoff were more likely to consume nutrient-dense food groups than were women below the cutoff.

Conclusions and recommendations

All the above results were carefully and extensively reviewed and also discussed against additional non-technical criteria for evaluating indicators, related to use and communication. We considered the nutritional meaning of the dichotomous indicators, their possible use/misuse at the global or programmatic level and their practical advantages or drawbacks in terms of operationalization or communication. Considering all the above, the WDDP-II group makes the following recommendations:

(i) While acknowledging moderate to poor sensitivity and specificity at the individual level results are consistent enough to recommend the use of a dichotomous food group indicator for global use in population-level assessment and advocacy.

(ii) FGI cutoffs of five groups for FGI-9R, 5 groups for FGI-10ER and six groups for FGI-12R can be recommended as reasonable predictors of a MPA>0.60. However, since disaggregations required for constructing the FGI-12 entail nutritional or environmental drawbacks, only FGI-9R and FGI-10ER are proposed for further consideration.

(iii) Reaching a MPA level of 0.60 is not optimal but was considered reasonable given the yardstick of a mean MPA of 0.83 estimated among a sample of German women with no food access restriction. In recognition that this MPA is not optimal, and in parallel with the infant and young child feeding (IYCF) indicator, we suggest reflecting in an indicator name such as "minimum dietary diversity".

(iv) Neither the FGI scores nor dichotomous indicators should be used for screening or assessment of individuals. Comparisons within and across sites suggest that the FGI could be used also to track changes in dietary diversity across countries and regions, thus contributing to monitoring progress at the global level.

CHAPTER 1

BACKGROUND

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1.1 The need for a women's dietary diversity indicator (WDDI) is well established

Dietary diversity is well-recognized as an important dimension of diet quality and is reflected in all food-based dietary guidelines, usually through daily consumption of recommended food groups. Other dimensions of diet quality include macronutrient balance and avoidance of excessive intakes. Diverse diets provide micronutrients, phytochemicals and fibre, and satisfy consumer preferences. In resource-poor settings where food choices may be very constrained, monotonous diets dominated by one or a few staple foods fail to meet many micronutrient needs (Torheim, *et al.*, 2010). Vulnerable groups include women of reproductive age (WRA), infants and young children. For WRA micronutrient-poor diets harm both women and their infants (Allen, 2005; Bartley, *et al.*, 2005).

In developed countries and in a small number of developing countries, quantitative dietary surveys using repeat 24-hour recalls provide rich information on micronutrient adequacy and many other dimensions of diet quality. Such surveys remain out of reach for most resource-poor countries and, in the few cases where they have been conducted, are very unlikely to be repeated sufficiently frequently to track progress on a large, national scale. In these settings, there is an urgent need for simple indicators to be developed, validated and collected as proxies of this dimension of diet quality. The lack of availability of such indicators constrains advocacy for programmatic action n to improve diets. Population-level indicators are therefore needed to assess and to track improvements or declines in this dimension of diet quality. Such a need has motivated the search for simpler proxy indicators to reflect micronutrient adequacy of diets, with the goal of identifying indicators that can be collected via large-scale surveys such as the Demographic and Health Surveys (DHS) and that can be used for programme monitoring and evaluation.

In resource-poor settings where micronutrient deficiencies are serious public health problems, the association of food group diversity with micronutrient density and micronutrient adequacy of diets has already been explored among infants and young children, notably through the Infant and Young Child Feeding Project (Daelmans, *et al.*, 2009; WHO, 2008) and among WRA, in particular through the Women's Dietary Diversity Project (WDDP) (Arimond, *et al.*, 2010; Arimond, *et al.*, 2011).

For infants and young children, World Health Organization (WHO) recognized the lack of feeding and dietary indicators as a constraint to action. They responded by leading a multi-stakeholder process that resulted in the adoption of a new set of indicators for the quality of complementary feeding, including a food group diversity indicator (WHO, 2008; WHO, 2010). These indicators are now in wide use (Dibley, *et al.*, 2010; Joshi, *et al.*, 2012; Mariott, *et al.*, 2012; ICF International, 2011). The first step in that process was a collaborative data analysis activity to examine the relationship between food group diversity and micronutrient density of infant diets from a range of geographic areas. The analysis activity was coordinated by the International Food Policy Research Institute (IFPRI). The results were presented in several stakeholder meetings and supported the adoption of the new "minimum dietary diversity" indicator for global use. At these meetings, other considerations were also emphasized along with indicator performance (e.g. WHO and other stakeholders strongly urged the need for a positive indicator of "good practice" vs. a negative one).

Subsequently, the Food and Nutrition Technical Assistance Project (FANTA), with funding from USAID, chose IFPRI to coordinate a similar analysis project for WRA. The Women's Dietary Diversity Project (WDDP) undertook a series of analyses for five sites and showed consistent associations between food group diversity indicators and micronutrient adequacy for WRA. More specifically, the WDDP concluded that a quasi-continuous indicator (number of food groups) was associated with micronutrient adequacy, but did not conclude with the selection of a dichotomous indicator for use across all contexts (Arimond, *et al.*, 2010; Arimond, *et al.*, 2011). This was because all dichotomous indicators entailed substantial misclassification, and also because the best choice indicator varied among the five sites included in the analysis. Further, the WDDP was less "demand-driven" than the IYCF project as there was no end-user global agency coordinating dialogue and promoting harmonization.

However, the demand for a WDDI has recently increased, in part in relation to a surge of interest in integrating agriculture and nutrition programming. The Food and Agriculture Organization of the United Nations (FAO) and the United States Agency for International Development (USAID) have both adopted a quasi-continuous WDDI reflecting the conclusions of the WDDP (see below), but many users have indicated the need for a dichotomous indicator, similar to the "minimum dietary diversity" indicator of four out of seven food groups now in use for IYC. The dichotomous indicator for IYC also entailed misclassification but was considered satisfactory enough to provide a population-level yardstick for global use in assessing and tracking progress. Dichotomous indicators are particularly useful for advocacy purposes and for communication with non-technical audiences, including policy-makers.

The analyses proposed in this document are meant to extend the work done under the WDDP to a larger number of sites and to complementary analyses. This is expected to provide a more robust set of evidence for balancing indicator characteristics and for selecting a dichotomous indicator to be proposed to a multi-stakeholder group.

1.2 Women's Dietary Diversity Project: analyses and limitations

The WDDP looked at eight candidate food group indicators (FGI) comprised of 6, 9, 13 or 21 food groups (FGI-6, FGI-9, FGI-13, FGI-21) and with or without imposing a minimum consumption quantity of 15g of a food group in order to count in the score (respectively called "restricted" or "non-restricted" indicators – e.g. FGI-6R and FGI-6).

Important WDDP results were:

- Significant and moderately strong correlations between all FGI and the mean probability of adequacy (MPA) calculated over 11 micronutrients;
- Low levels of MPA in all settings;
- Better results for all FGI when the 15g restriction was applied (FGI- 'restricted' indicators);
- Best statistical performance (across all FGI) varying by sites: the three best candidate indicators were FGI-9R, FGI-13R and FGI-21R. There was a tendency towards better results when the disaggregation of food groups was higher (i.e. FGI with more food groups) but no single FGI could be identified that out-performed others across all five settings;
- Moderate to high misclassification rates, confirming the food group diversity indicators should not be used at individual level;
- Identification of indicators and cutoffs providing reasonable estimates of the proportion of women above selected MPA cutoffs, but which varied by study sites.

Limitations of the WDDP work

- Though they represented a variety of settings there were only five datasets in the analysis - rural (2), urban (2), and urban/peri-urban (1), and of continents - African (3) and Asian (2);
- Sample size was rather small for two datasets;
- No dataset allowed the ability to look separately at pregnant women;
- There was a large rate of exclusion (because of under-reporting) for one dataset and a medium one (because of both under and over-reporting) for two other datasets;

- There were statistical issues related to the possibility of correlated errors inflating measures of association, and conversely some noise in dietary data attenuating correlations, but both these statistical issues are inherent to such an analysis.

Further work was done in one WDDP study to compare FGI to dietary diversity indicators derived from a simple qualitative recall (such as the ones used in large surveys) (Martin-Prevel, *et al.*, 2010). This study showed that the risk of misreporting was higher when the disaggregation of food groups was higher; it also highlighted the challenges in operationalizing dietary diversity questionnaires, in particular to avoid counting foods consumed in negligible amounts (i.e. operationalizing the 15g minimum quantity to construct 'restricted' FGI). Therefore, the two conditions increasing the strength of the performances of FGI (15g minimum and higher disaggregation) were shown to pose problems when the indicator is built from a list-based questionnaire. These considerations related to operationalizing an FGI for use in larger scale surveys go beyond analysis of the pure statistical performance of FGI and include ease of data collection and burden on both enumerator and respondent.

1.3 Current uses and operationalization of women's dietary diversity indicators

The FAO has produced guidelines for measuring household as well as individual-level dietary diversity. These guidelines for individual measurement are based on use of the FGI-9 examined in the WDDP; however, it is recognized that depending on the purpose of the survey, other choices can be made. In addition, several USAID programme initiatives (notably Feed the Future initiative [FTF]), and the Title II Development Food Assistance Programs) have adopted and are using the FGI-9 as a standard indicator. There is also potential leverage to advocate with DHS to adopt this indicator.

Both the FTF handbook (Feed The Future, 2012) and FAO guidelines (FAO, 2010) recommend that a more disaggregated set of food groups than the nine food groups of the indicator should be used in the questionnaire; a list of 17 or 16 food groups, respectively, is currently proposed in these documents. Whatever the number of food groups in a questionnaire, to get good results in the assessment of dietary diversity, careful work is always needed to adapt the questionnaire to the local context, to train enumerators in using the questionnaire in a standardized manner and to decide which foods need to be excluded because they are consumed in small quantities. This last topic leads to the issue of the operationalization of the 15g minimum consumption which still needs to be refined. While WDDP results consistently showed that restricted indicators increased the statistical performance of FGI when derived from 24-hour recall data, in the study that compared FGI to dietary diversity indicators derived from simple qualitative recall, the FGI-9 (non-restricted) showed the highest performance to predict an MPA > 0.60 (Martin-Prevel, *et al.*, 2010).

1.4 Defining a dichotomous indicator

As stated above, while there are many advantages to using a continuous FGI – and even to look at the frequency of consumption of specific food groups – there is a strong need for dichotomous indicators for advocacy and communication purposes.

Defining a dichotomous indicator relies on two cutoffs. First, a cutoff has to be chosen for the gold standard indicator of micronutrient adequacy (here the MPA). Second, one needs to select a cutoff for the number of food groups, to examine how well it predicts the status indicated by the gold standard indicator. The above selection of cutoffs leads to choosing one in two options for the indicator: either a "positive" one (i.e. indicator of "good" dietary diversity) or a "negative" one (i.e. indicator of "poor" dietary diversity).

In WDDP, because of the rather low values of the gold standard indicator of micronutrient adequacy (MPA) in all datasets, cutoffs for FGI could be looked at only for MPA levels of 0.50, 0.60 and 0.70. Even the last one can hardly be considered to define "good micronutrient adequacy" of the diet. However, it is very likely that a similar situation would be found in any developing country since, even in developed countries, there are gaps for some key micronutrients (Troesch*, et al.*, 2012) (see also **Section 4.4.2** in this report and **Appendix 5**). The best results of the WDDP in terms of performance to predict MPA were obtained with the 0.50 MPA cutoff but it is hard to say that an MPA above 0.50 indicates a good or even acceptable level of micronutrient adequacy.

Regarding the benefits of "positive" vs "negative" dichotomous indicators, a positive indicator is favoured for programming because it encourages the definition of optimal targets vs minimal targets. In addition, this would be coherent with the FGI recommended and used for IYC. On the other hand, better results for a positive indicator are likely to be obtained with more disaggregated FGI. A negative indicator can still provide a population yardstick, but defines an "undesirable" or "unacceptable" dimension of the dietary quality problem and will run the risk of misuse in programme messages if those above the cut-point are defined as "adequate" or "acceptable". However, based on the low MPA found in the WDDP datasets, it is more likely that a dichotomous cutoff representing poor MPA could yield more robust and consistent results across countries.

The same result was obtained in the IYCF indicators project, i.e. indicator performance was better for a negative indicator. However, the multi-stakeholder process revealed a strong necessity for a positive indicator, partly in order to include dietary diversity as one element in a composite positive indicator for IYCF practices "minimum acceptable diet". The "minimum dietary diversity" indicator was so named in order to emphasize that achievement of the four food group cutoffs is not a guarantee of micronutrient adequacy.

CHAPTER 2

DATASETS CHARACTERISTICS OF THE WDDP-II

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Among the limitations pointed out in the final WDDP-I report was the limited number of datasets included in the analysis (n=5). Consequently, we looked for additional datasets in order to carry out this phase of the project (hereafter referred to as WDDP-II). In the end, four additional datasets were identified and provided thanks to the HarvestPlus Challenge Program. All datasets are succinctly presented in this chapter and their characteristics are summarized in **Table A1 - 1** (**Appendix 1**).

Datasets already analysed in WDDP-I	New datasets provided by HarvestPlus
• Bangladesh, rural (Ban1)	• Bangladesh, rural (Ban2)
• Burkina Faso, urban (BF1)	• Burkina Faso, rural (BF2)
• Mali, urban (Mali)	• Uganda, rural (Ug1)
• Mozambique, rural (Moz)	• Uganda, urban and rural (Ug2)
• Philippines, peri-urban (Phi)	

Several datasets came from the same country. In order to easily distinguish them, throughout this report all datasets will be referred to using the references in brackets in the above lists.

As in WDDP-I, dietary data collection methods were not standardized because this is a secondary analysis project. Yet, since analysis of all datasets was centralized, conversion of units, adaptation of variable names, creation of missing variables (such as source of protein) and many other data transformations were easier to manage.

Each dataset was provided as a food-level file in order to allow construction of new candidate indicators as envisaged in the second part of the analysis. Rural Bangladesh and Mozambique datasets, already used in WDDP-I, were also provided in a ready-to-analyse file (i.e. for direct running of the Stata syntax)[1]. This means that all FGIs considered in WDDP-I were already constructed and variables containing information about amount and energy intakes of each food group were already created.

Food composition tables (FCTs) used for the primary analysis of each dataset were collected, except for the Philippines' peri-urban study (WDDP-I). As well as in WDDP-I, no standardization of FCTs was made due to the existence of true nutrient content variations of a same food between countries and regions.

Several observations can be made from the examination of FCTs and survey reports:

- Dietary data came from 24-hour recalls in all studies except the Ban2 dataset, where direct observation with weighing of food was performed;
- Overall, methods reflected good standard practices;
- Datasets were distributed and analysed over two rounds in all studies except the BF1 dataset, which comprised three rounds;
- The minimum number of subjects and repetitions that was required for a dataset to be included in the analysis was at least 100 women with at least 40 repetitions (or 10 percent repetitions when sample size was >300). In the same way, sub-groups (non-pregnant non–lactating, lactating and pregnant women) were considered for analysis only if the sample size was at least 100;
- The smallest sample was the one collected in Mali. It had 102 women in the first round with 96 repeated observations. The largest sample was collected in the

[1] Arimond, *et al*., 2008.

Philippines and had 2 191 women in the first round with repeated observations for all of them.

- A separate analysis on lactating women was feasible for six datasets only: Ban1, Ban2, BF2, Mozambique, Ug1 and Ug2;
- No dataset had enough pregnant women to allow a separate analysis. Results will therefore be presented for all women, non-pregnant non-lactating (NPNL) women, and lactating women when possible;
- In all datasets, information was present for the intake of: energy, total protein, total carbohydrate, total fat, thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, vitamin A, vitamin C, iron, calcium and zinc (see **Chapter 4** and **Appendix 2**).

A brief description of all datasets is given below:

2.1 Bangladesh, rural (Ban1)

The entire dataset comprised a subset of women's dietary intake data from surveys undertaken by IFPRI and collaborators in 1996. The surveys were originally designed to determine both nutrition and resource allocation effects of several non-governmental organizations (NGO)-disseminated agricultural technologies in three rural areas in Bangladesh.

While the three study areas varied according to a number of characteristics (e.g. landholding), they were similar to each other – and to rural Bangladesh in general – in average per capita income (approximately USD 200 per capita per year). Diets were dominated by rice, with similar rice intakes across all income strata. No fortified foods were consumed by women in the study sample. Intakes of animal-source foods, fruits and vegetables were low. Anemia prevalence was very high (50–60 percent of women, depending on study area). There was no information gathered on iron/folate supplement consumption during pregnancy, but approximately 20 percent of the non-pregnant women reported receiving and consuming iron tablets that were routinely distributed with birth control pills, for a median duration of approximately two years. No information was available on the actual consumption of iron tablets.

The study also showed that, within their household, women consumed a disproportionately low share of preferred foods, such as animal-source foods, potentially exacerbating a poor nutrition (and micronutrient) situation. Further details are available from the WDDP-I country report (Arimond, *et al.*, 2009) and from the original study (Bouis, *et al.*, 1998).

2.2 Bangladesh, rural (Ban2)

This rural Bangladesh dataset was part of a multi-stage cluster survey conducted in two rural rice-producing regions in Bangladesh in 2007-2008. The survey was carried out as a first phase of a HarvestPlus multi-stage research programme aiming at determining the potential impact of zinc-biofortified rice on the zinc and health status of children in Bangladesh. The two rural districts, Trishal and Pirgaccha Upazillas, were located in northern Bangladesh and showed a high prevalence of poverty and food insecurity. The local economy was centered on agriculture and fish farming, although the latter was more common in Trishal than in Pirgaccha.

Data were collected from late October 2007 through June 2008, depending on the district, on 240 children 24-48 months old and their primary adult female caregiver. Dietary intakes were assessed by direct observation in the homes using 12-hour weighed food records and recall of any foods consumed during the subsequent 12-hour period. Two non-consecutive days of dietary information were obtained over one week. Further details are available from the survey report[2].

2.3 Burkina Faso, urban (BF1)

Data from urban Burkina Faso were from the last survey in a series of qualitative and quantitative explorations of food habits and dietary intakes conducted in the study area (Becquey, 2006; Savy, *et al.*, 2008). This survey shared the WDDP main objective, i.e. data were gathered with the aim of validating simple dietary diversity indicators as a measure of micronutrient adequacy among women of reproductive age (WRA). Secondary objectives were to explore links between nutrition knowledge, food habits and the nutritional status of women, and also to examine changes in dietary diversity over time since data from a previous (2005) survey was available for the same individuals.

[2] Survey report available upon request from HarvestPlus.

The study was conducted in two districts of Ouagadougou, the capital city of Burkina Faso, in 2006. The city is divided into districts with amenities in the town centre (the so-called "structured districts") and peripheral districts without amenities (the so-called "non-structured districts"). One "structured" district and one "non-structured" district were purposely selected for the study because of the availability of demographic and socio-economic data from an already existing monitoring system. Comparison of study sample characteristics, including level of education, size of the household, gender of the head of household, water and electricity supply, quality of housing and ownership of some assets (television, radio, bicycle, moped, car, refrigerator, telephone) showed good agreement with same indicators derived from demographic and health survey (DHS) data for Ouagadougou[3]. A more detailed description of the study is available in the WDDP-I country report (Becquey, *et al.*, 2009).

2.4 Burkina Faso, rural (BF2)

Data from rural Burkina Faso was from a food consumption and iron status multi-stage cluster survey carried out jointly by the French Institute of Research for Development (IRD), the Institute of Research in Health Sciences (IRSS) of Burkina Faso and HarvestPlus. The survey took place in two rural provinces of Burkina Faso, the Sourou and the Sanguié provinces, in 2010. The main objective of this study was to provide reliable information on micronutrient deficiencies and quantitative estimates of the intakes of sorghum and some key nutrients among women and preschool children. The two provinces were part of two regions (Northwest and West) that were selected based on a combination of health, agriculture, living conditions and demographic criteria, which included data on sorghum production, household consumption and prevalence of malnutrition. The provinces were chosen purposely based on available information on sorghum production and/or consumption and on some of the principal investigators' general knowledge of the field.

Dietary data collection was performed through 24-hour recalls among children 36-59 months old and their mother, with repetition on a sub-sample (three out of eight in each cluster). The survey comprised two rounds of data collection, one in the lean season and one in the post-harvest season, conducted for the same mother and child pair. For the purpose of the current project, only the second round of data was used[4]. This round was deemed to be a bit more reliable due to the experience gained during the first round by both the survey team and the surveyed women. Further details are available from the survey report (Martin-Prével, *et al.*, 2013).

2.5 Mali, urban (Mali)

Data from urban Mali was from a European Union (EU)-funded research project, Fonio[5], which aimed at enhancing the quality and competitiveness of fonio in West Africa by improving production, technology and market systems for local and export markets. Data collection included two 24-hour recalls of food consumption among women aged 15-49 years with the objective of determining the role of fonio in dietary patterns and the contribution of fonio to iron and zinc intake as well as the iron status of women of reproductive age living in an urban area in Mali.

The research was carried out in Bamako, the capital city of Mali. The study sample was selected to be representative of NPNL women of reproductive age. Women belonged to a homogenous Malian sociolinguistic group and respondents were preferably responsible for household food preparation. Please see the WDDP-I country report for further details (Kennedy, *et al.*, 2009).

2.6 Mozambique, rural (Moz)

Data from rural Mozambique was gathered as part of a baseline survey for an impact evaluation of a HarvestPlus Reaching End Users (REU) Project implemented in

[3] INSD, 2004

[4] Other options would have been to estimate a cross-seasonal MPA using all 24-hour recalls available for each woman, regardless of the season, or to use each season as a separate dataset. The first option would have weakened the association between FGI and MPA since the FGI would have come from one round only while the MPA would have been calculated from the two rounds. The second option was discarded since it would have given too much weight to the dataset compared to the others, because same women were studied.

[5] EU/INCO, 2009.

Zambezia Province. The REU project aimed at reducing vitamin A deficiency through encouraging the adoption of vitamin A-rich orange-fleshed sweet potatoes (OFSP) as an agricultural crop and a household food. Infants and young children, and women of reproductive age constituted two targeted groups. The project aimed at simultaneously increasing access to planting materials and markets, and at increasing demand for OFSP. Agricultural and nutrition "extensionists" worked with volunteer "promoters" to reach large numbers of households with new knowledge and practices.

The study areas in Mozambique were characterized by high levels of malnutrition, very monotonous diets and very poor resources. Few households had regular cash income and most practised subsistence agriculture, in some cases supplemented by fishing and other activities. Much of the area was drought- and/or flood-prone, although some areas of higher elevation were less so. Maize, and to a lesser extent, cassava and rice were the primary staples. Both maize and cassava were cooked as a paste and served with simple sauces, usually made of beans, dark green leaves and/or dried or fresh fish. Coconut was available in some parts of the study area. Importantly, the baseline survey was carried out during the mango season. More details are available from the WDDP-I country report (Wiesmann, *et al.*, 2009).

2.7 Philippines, peri-urban (Phi)

Data were from the Cebu Longitudinal Health and Nutrition Survey (CLHNS) and included all women of reproductive age present during the 2005 round of that study. The CLHNS began in 1983 as a prospective study of infant feeding patterns, their determinants and consequences. At the inception of the CLHNS, all pregnant women in selected communities were invited to participate in the survey. Since that time, extensive data have been collected on mothers and their offspring, as well as other family members and household residents. The initial phase led to an expanded focus on pregnancy outcomes, maternal and child health, and birth spacing issues for which a prospective research design was favoured[6]. No interventions have been provided to the subjects belonging to the cohort.

The CLHNS was a community-based survey of metropolitan Cebu which surrounded and included Cebu City, the second largest city of the Philippines. Families were surveyed face-to-face in a variety of settings, including densely-populated urban areas, urban squatter settlements, peri-urban neighbourhoods, rural areas stretching into the mountains and some small surrounding islands. Sampling consisted of two independent two-stage cluster samples, one urban and one rural. The CLHNS did not originally intend to be nationally or provincially representative of Filipino women, but only to reflect existing variations in infant feeding strategies. However, women in the CLHNS were generally similar in socio-economic status to women in the Philippine Demographic and Health Surveys (DHS), as well as to women in national surveys from the Food and Nutrition Research Institute of the Philippines (FNRI)[7]. See the WDDP-I country report for further details (Daniels, 2009).

2.8 Uganda, rural (Ug1)

Data from rural Uganda was collected in 2007 as part of the baseline survey of the HarvestPlus Reaching End Users (REU) Orange-fleshed Sweet Potato Project which aimed at inducing broad orange-fleshed sweet potato (OFSP) adoption, increasing vitamin A intakes and reducing vitamin A deficiency among children and women in Uganda and Mozambique (see description in the Mozambique paragraph above). This multistage cluster survey focused on three rural regions of Eastern and Central Uganda: Bukedea, Kamuli and Mukono. The baseline survey included 1 500 farmers in 84 villages. A sample of households with a child aged 3-5 years (n=544) and their mothers or primary female caregivers (n=539) was drawn from this survey. Dietary intake was assessed through the interactive, 24-hour recall method. One day of dietary intake data was obtained for all individuals, and a second day of data was obtained on a non-consecutive day for a randomly-selected subset of individuals[8].

6 OPS, 1989.

7 Personal communication from Linda Adair, principal investigator for CLHNS, August 1, 2008.

8 Survey report available upon request from HarvestPlus.

2.9 Uganda, urban and rural (Ug2)

Data were extracted from the Uganda food consumption survey that was carried out in one urban and two rural regions of Uganda in 2008 to characterize the dietary patterns of children 24-59 months of age and of WRA (15-49 years). The study was undertaken to serve as a baseline for strengthening Uganda’s National Food Fortification Program and to help in developing a food fortification strategy. The survey focused on two rural regions (in Southwest and North) and on one urban sector (Kampala) that were purposely selected.

Within each region, districts and then households were randomly selected in a two-stage process that provided samples representative of that area. The study design planned to include 320 WRA in each area. The multi-pass 24-hour recall method was used to assess dietary intakes and repeat dietary recalls were conducted on 10 percent of the sampled subjects in each region, on a non-consecutive day. Results showed that dietary patterns varied across the three regions with the diet in the rural Southwest providing larger amounts of most nutrients than the diets of other regions, including urban Kampala. Further details are available from the survey report (Harvey, *et al.*, 2010).

CHAPTER 3

OBJECTIVES AND TASKS

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Based on the analysis of the nine datasets described above, the first objective of the current project (WDDP-II) was to look for a cutoff to define a standard dichotomous indicator based on FGI-9R which is currently recommended by FAO and FANTA and used in several USAID programmes. The corresponding steps were as follows:

a. Construction of the FGI-9 and FGI-9R;
b. Definition of two levels of MPA: one defining a positive indicator and one defining a negative indicator (see **Section 4.4.2**);
c. Assessment of the performance of FGI-9 and FGI-9R in predicting MPA above the two levels defined at the previous step;
d. Determination of the best choice of FGI cutoff (if any) for each level of MPA;
e. Comparison of prevalence rates at/above FGI cutoffs and above MPA cutoffs;
f. Stratification of the above results according to physiological status (depending on the number of lactating women in each dataset).

The second objective was to look for alternate candidate FGI which should be as – or almost as – simple as the FGI-9R to collect but could show better performance in predicting MPA and/or provide higher sensitivity and specificity when used as a dichotomous indicator. The corresponding tasks were to:

a. analyse the mean contribution to the MPA of each food group among the 21 used in WDDP-I in each dataset (see **Table 2**);
b. Based on the above, construct one to two new candidate FGIs that are both meaningful and still easy to collect; and consider also the FGI-7 which is used for IYCF since using the same indicator for both women and children would simplify data collection;
c. For each promising candidate FGI perform the tasks ‘c’ to ‘f’ described for the first objective.

The third objective was to provide recommendations for the choice of a food-group indicator and dichotomous cut-point valid across cultures, balancing statistical performance with practicality. The corresponding tasks were:

a. Summarize the results of objectives 1 and 2;
b. Make written recommendations, considering the current indicators in common use and trade-offs in statistical performance.

Beyond the analytical work covered by WDDP-II (the three objectives above), the final objective is to recommend a standard operational indicator of women’s dietary diversity suitable for global use. This will imply:

a. Disseminating the written recommendations among a group of experts and stakeholders;
b. Convening a consensus meeting to come to a final choice for a standard operational indicator of women’s dietary diversity for global tracking of progress at population level and, possibly, for other programmatic needs and uses;
c. Defining recommendations that should accompany the operationalization of such an indicator;
d. Writing and disseminating guidelines.

CHAPTER 4

PARAMETERS FOR THE ANALYSIS

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Years have passed since WDDP-I, new references have been published and several members of the group have gained in practical experience using food group indicators. All the above made the group reconsider some parameters of the WDDP-I analysis for the current phase. This chapter describes changes operated in WDDP-II. **Appendix 2** briefly presents how and why nutrients have been selected in WDDP-I.

4.1 Review of the estimated average requirements (EAR)

Table A3 - 1 shows the EAR and standard deviations (SD) selected for WDDP-II. Requirements are presented for both adolescents and adult women, respectively from 15 to 18 years and from 19 to 65 years. The full range of “reproductive age” (from 15 to 49 years) is therefore completely covered.

Given the purpose of the WDDP, it was agreed that the WHO and FAO EAR would generally be the most appropriate. Nevertheless, exceptions were made in the cases of calcium, iron and zinc. Values from the Institute of Medicine of the United States of America (IOM values) were used for the first two and International Zinc Nutrition Consultative Group (IZiNCG) values for zinc. In addition, IOM values were also used when standard deviations (SD) or coefficients of variation (CV) were not available from WHO and FAO, as was the case for vitamin A and niacin.

For iron and zinc, the appropriate absorption level has to be applied depending on dietary patterns observed in each country (see **Appendix 3**). For the purpose of WDDP-I, it was agreed that this selection could be made at the sample level rather than characterizing each individual diet in order to choose the appropriate absorption levels. For each dataset the choice was made by the principal investigator of the study, based on his/her knowledge of the usual dietary pattern in the context. Therefore, the results presented in this document intend to reflect at best the reality of the different contexts. Choices made for the five datasets within WDDP-I were applied again within WDDP-II. For the four additional datasets levels of absorption for iron and zinc were either those indicated in the survey report, when available, or determined after a quick review of literature and an overview of the dietary patterns as reflected in the dataset. When women were identified as both pregnant and lactating, the higher requirement was selected for each nutrient.

Final decisions made are presented in **Appendix 3**.

4.1.1 Iron

Regarding requirements for iron, the decision was made in WDDP-I to use EAR from the Institute of Medicine because it provides a separate reference table to evaluate probability of adequacy (**Tables I-6 and I-7** in IOM, 2000). Indeed, as the requirement distribution for iron is strongly skewed, the corresponding probability of adequacy cannot be directly assessed since the usual method assumes a symmetric distribution of requirements in the population.

However, IOM guidelines give an EAR for an absorption level of 18 percent while, according to WHO and FAO (WHO, 2004), only a very low (5 percent) or low (10 percent) iron absorption level can be assumed in developing countries. Thus, within WDDP-I the EAR was back-calculated from IOM (IOM, 2001) for these two levels of absorption for NPNL and lactating women. Only the EAR used for pregnant women remained similar

Table 1. Calculations for assumed iron bioavailability for pregnant women

Bioavailability (%)	2nd trimester factor	2nd trimester (%)	3rd trimester factor	3rd trimester (%)	Mean (%)
5	*1.5*	7.5	*2.5*	12.5	**10.0**
10	*1.5*	15.0	*2.5*	25.0	**20.0**

to the one given by IOM, i.e. 22 mg/d for an assumed bioavailability of 23 percent – which was a weighted average of the bioavailability across the three trimesters of pregnancy. Subsequently, back-calculation from **Tables I-6 and I-7** of the Institute of Medicine (IOM, 2001) were used to assess the probability of adequacy for non-pregnant non-lactating women. Since IOM gives CVs for pregnant and lactating women, the usual method was used to estimate probability of adequacy for these two categories.

For WDDP-II, the group carefully reviewed the issue of iron availability during pregnancy. It seems unlikely indeed that, starting from a 5 percent or 10 percent (depending on the context) iron absorption level when non-pregnant, women in developing countries would reach the iron absorption levels of 18 percent in the first trimester of pregnancy and of 25 percent in other trimesters that are assumed by IOM (even though iron absorption level would increase in the second and third trimesters). It was therefore decided to define new values for iron absorption level during pregnancy to be used in the WDDP-II analysis, based on the fact that bioavailability during the first trimester is estimated to be roughly the same as for non-pregnant women, and using the WHO and FAO guidance for the second and third trimesters (WHO, 2004). This document states that "*iron absorption is increased by about 50* percent"[9] in the second trimester; therefore for the second trimester we applied to the bioavailability level for non-pregnant women a factor of 1.5. The same document states also that iron absorption "*may increase by up to about four times the norm*" [10]in the last trimester. Our interpretation of this was that four times is a maximum and should not be taken as an average. We arbitrarily chose to apply, for the third trimester, a factor of 2.5 to the bioavailability level used for non-pregnant women. Our method thus gives averaged absorption rates over the last two trimesters of 10 percent and 20 percent for an initial bioavailability of 5 percent and 10 percent, respectively (**Table 1**). These are lower than IOM values but not by much. As information about the month of pregnancy was not available in most datasets, these averaged absorption levels were used for all pregnant women.

4.1.2 Calcium

At the time of WDDP-I no reliable EAR was available for calcium. Only an adequate intake (AI) value was established (IOM, 1997) but without SD. By the time of WDDP-II, new EAR values for calcium have been released by IOM (IOM, 2011). We therefore decided to use them.

The IOM report indicates an EAR value of 800 mg/d for women from 19 to 50 years and of 1 100 mg/d for women from 14 to 18 years. Whether women are pregnant or lactating does not modify the EAR. No CV is specified but recommended dietary allowance (RDA) values are defined as 200 mg above the EAR in all cases, i.e. 1 000 mg/d for adults and 1 300 mg/d for adolescents. This allowed us to back-calculate two CVs: 12.5 percent for adult women and 9 percent for adolescent women. We then applied the usual method for calculating probability of adequacy for calcium instead of the Foote *et al*. method used within WDDP-I (Foote, *et al.*, 2004).

4.2 Review of the food group diversity indicators

Compared with WDDP-I indicators, the only changes that were decided were related to the flesh foods group. New instructions were given (FAO, 2010; WHO, 2010) and it was deemed that some specific food groups were not adequately classified. Thus, in the proposed new classification, reptiles and amphibians are considered alongside mammals, and molluscs are considered alongside fish, shellfish and seafood (**Table 2** and **Appendix 4** for further indications on assigning foods to groups).

9 WHO, 2004: Chapter 13.4 Iron requirements during pregnancy and lactation, p .265.

10 WHO, 2004: Chapter 13.4 Iron requirements during pregnancy and lactation, p. 265.

Table 2. Food groups summed in diversity indicators

FGI-21	FGI-9	FGI-7 [a]
Grains and grain products	All starchy staples	Grains, roots and tubers
All other starchy staples		
Cooked dry beans and peas	All legumes and nuts	Legumes and nuts
Soybeans and soy products		
Nuts and seeds		
Milk and yoghurt	All dairy	Dairy
Cheese		
Organ meat	Organ meat	
Eggs	Eggs	Eggs
Small fish eaten whole with bones	Flesh foods and other miscellaneous small animal protein	Flesh foods and other miscellaneous small animal protein (including organ meat)
Large whole fish, dried fish, shellfish, other seafood and molluscs		
Large or small wild or domesticated mammals, reptiles and amphibians		
Wild or domesticated birds		
Insects and grubs		
Vitamin A-rich dark green leafy vegetables	Vitamin A-rich dark green leafy vegetables	Vitamin-A rich fruits and vegetables (including yellow- and orange-fleshed sweet potatoes and red palm oil)
Vitamin A-rich deep yellow/orange/red vegetables [b]	Other vitamin A-rich vegetables and fruits (including yellow- and orange-fleshed sweet potatoes and red palm oil)	
Vitamin A-rich fruits (including red palm oil)		
Vitamin C-rich vegetables	Other fruits and vegetables	Other fruits and vegetables
Vitamin C-rich fruits		
All other vegetables		
All other fruits		

[a] FGI-7 refers to the infant and young child feeding practices (IYCF) indicator recommended by WHO (WHO, 2008). It will be explored as an alternative indicator as explained in **Chapter 5**.

[b] Including yellow- and orange-fleshed sweet potatoes (OFSP).

4.3 Food group indicator restriction (15g)

As indicated earlier in this report, results from WDDP-I clearly showed better performance of all FGI when a 15g restriction was applied (FGI-'R'; i.e. 'Restricted' indicators). However, a key remaining question is how such a restriction can be operationalized. Within WDDP-I the 15g limit was calculated over all foods eaten at all meals during the 24h. Another option under consideration would be to calculate the 15g limit over each food/dish eaten on any occasion; this would bear the advantage of being more easily operationalized. It was envisaged that analyses could be made with the WDDP-II data to explore changes that such a strategy might cause in the results. However this would have required a rather huge work on the syntax and some datasets would have had to be reorganized. In addition, it was found that many datasets are lacking a variable to indicate meals so this issue was not explored in the end.

4.4 Summary measure of diet quality: the mean probability of adequacy

4.4.1 Definition

As in WDDP-I the probability approach was used to assess nutrient adequacy for groups. This approach is based on information or assumption about both the distribution of nutrient requirements in the population and the day-to-day variations (intra-individual) in nutrient intakes (Barr, *et al.*, 2002). This is appropriate given the ultimate objective of this work, which is to develop simple indicator(s) for use at population level. Using the repetition of the 24-hour recalls on a subsample of subjects, the probability of adequacy associated with "usual intake" was calculated for each of them and the prevalence of adequacy was estimated as the average of these probabilities. Once probability of adequacy is estimated for all nutrients, they were averaged across 11 nutrients to construct the mean probability of adequacy (MPA).

The following summarizes the steps required to construct the MPA as described in the WDDP-I protocol:

- Transform nutrient intakes: nutrient intakes are nearly always skewed. Thus, intake distributions need to be adjusted to approximate normal. We have used a Box-Cox transformation (a power transformation) for energy and each micronutrient;
- Calculate individual and population means for intakes of each nutrient, using the transformed variables (note that some individuals have only one observation);
- Calculate within- and between-person variances for the transformed intake variables;
- Using these variances, calculate the best linear unbiased predictor (BLUP) of the *usual* intake for each nutrient, for each woman;
- Using the BLUPs, calculate the probability of adequacy for iron (non-pregnant non-lactating women) from tables in **Appendix 3**;
- With the exception of iron for NPNL women, information on the distribution of requirements (CV/SD) is available and distributions are assumed to be approximately normal for all nutrients. By generating a random normal variable (with "n"=800) the requirement distribution for each nutrient is simulated, and this distribution is then transformed using the same power transformation as above.
- The probability of adequacy (PA) for each nutrient (excluding iron) can now be calculated.
- Finally all PA, including iron, are averaged to form MPA.

4.4.2 Choice of the MPA cutoff

As stated above, the low distribution of the MPA in all datasets only allowed choosing MPA levels of 0.50, 0.60 and 0.70 within WDDP-I. In order to support the choice of a threshold, typical MPA values encountered among women from developed countries where the population is not economically constrained and does not benefit from general fortification can serve as comparison. The report of a nationally representative dietary study carried out in Germany in 2005-06 was used for this purpose (Max Rubner Institut, 2008). The mean MPA for German women was calculated, across the same 11 micronutrients considered in WDDP, from the results tables presented in the report. The details of the analyses are presented in **Appendix 5**. It has to be noted that food fortification is only performed by manufacturers for a few selected food products in Germany and the authors of the study considered them in the FCT they used. The tables used to derive MPA for the purpose of our study therefore included nutrient intakes from fortified foods; however, given the small number of fortified foods the impact of food fortification on the mean MPA across the sample should be minimal. In contrast, nutrient intakes from supplements were presented in separate tables in the report and those not taken into account in the calculation of mean MPA.

The German data thus demonstrated an MPA of 0.83 for women of reproductive age, showing that even in a highly favourable context the micronutrient adequacy is unlikely to be total. Even though the methods used by the German authors differed slightly from the WDDP-II approach (data collection, derivation of "usual" nutrient intakes, etc.) it was deemed that the magnitude is comparable. Therefore a threshold of 0.70 seemed a reasonable choice to define a positive indicator in resource-poor contexts. In contrast, there is no real clue to help defining a negative indicator. In this report, thresholds of 0.50, 0.60 and 0.70 have been considered. In some occasions a threshold of 0.80 has been also investigated, but there was only a few datasets with enough women reaching this MPA level to allow sound analyses (these results are consequently not presented in this report).

CHAPTER 5

SUMMARY OF THE ANALYTICAL APPROACH AND STATISTICAL METHODS

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The global analytical approach followed that of the WDDP-I even though some stages have been added. Prerequisite for the first step was that datasets needed to be clean and ready-to-analyse. This was already done for WDDP-I datasets but had to be done for new datasets. This was performed using SAS software.

The first step was to run analyses similar to those in WDDP-I (Arimond, *et al.*, 2008) on all datasets, for the FGI-9 and FGI-9R (**Table 2**). These analyses can be summarized as follows:

1. Compute the indicators of dietary diversity (FGI-9 and FGI-9R), the probability of adequacy of each micronutrient (PA) and the mean probability of micronutrient adequacy (MPA).

2. Describe the relationships between the two FGI, energy intake and MPA, using correlations and simple linear regressions on transformed or untransformed variables, according to their initial distribution[11]. When sub-sample sizes are sufficient, stratify the analyses according to physiological status (pregnant, lactating and non-pregnant non-lactating women).

3. Assess the performance of each FGI in predicting MPA through receiver-operating characteristics (ROC) analysis.

4. In order to support the choice of FGI cutoffs, examine the proportion of women consuming various nutrient-dense food groups (such as animal-source food) when different FGI cutoffs are selected.

5. Perform sensitivity, specificity and misclassification analysis for various MPA thresholds and FGI cutoffs defining either a positive or a negative dichotomous indicator.

6. Examine prevalence of women above the MPA thresholds and above the FGI cutoffs for the best performing combinations of these two cutoffs.

7. Using the above results for each dataset, try to identify a combination of FGI cutoff and MPA thresholds performing satisfactorily enough across all datasets (or most of them) to allow suggesting a FGI cutoff for an acceptable dietary diversity and/or a minimum dietary diversity.

The second objective, which was to look for an alternative food group indicator, was investigated following the ensuing steps:

8. For each dataset, investigate the mean contribution to the MPA of each of the 21 food groups. The results of this analysis may suggest new candidate FGI (FGI-10E and FGI-12 – see **Chapter 7, Section 7.2**).

9. Construct new food group indicators (see **Appendix 4**):

    a. FGI-7(R), using same food grouping as for the 'minimum dietary diversity' indicator recommended by WHO for assessing IYCF practices (WHO, 2008).

    b. FGI-10E(R) and FGI-12(R), using the results of the above step;

10. Run again steps 2 to 7 on all alternative FGIs.

[11] When intake distributions were skewed a Box-Cox transformation was applied.

Sampling weights

Sampling weights were provided for all datasets (when applicable) and were used in the analyses as appropriate (i.e. descriptive analyses, correlations, regressions, comparisons of prevalence above FGI cut-point and MPA cutoff) but were not used for assessing FGI performance and for the sensitivity – specificity analyses.

Software

Dietary analyses were performed with Stata software (version 12). The initial Stata syntax from WDDP-I has been revised to match with WDDP-II objectives but remained fairly close to the initial one.

Some other analyses were done with SAS 9.3 software. This included initial data management (cleaning, preparation for Stata syntax).

CHAPTER 6

DATA PREPARATION AND EXCLUSION OF OUTLIERS

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For the purpose of WDDP-I, it was initially decided to use the basal metabolic rate (BMR)-based criteria to define exclusion ranges. Distributions were examined and women whose energy intakes were either below a BMR factor of 0.9 or above a factor of 3.0[12] were excluded. However, in a subsequent group meeting it was agreed that those researchers who had been more directly involved in data collection and who could review and assess raw data might make different decisions about exclusion of outliers. It was recognized that single-day intakes can, indeed, be very extreme and that caution must be used in applying BMR-based cutoffs (Black, 2000). Therefore slightly different approaches were employed in Burkina Faso, Mali and Mozambique; they are detailed in the corresponding WDDP-I country reports.

The Philippines dataset presented a particular situation. Across survey rounds, the 24-hour recalls in the CLHNS generated estimated intakes that are low by comparison to other data from the Philippines and by comparison to estimated intakes in other studies from South and South East Asia. Therefore, to avoid excessive bias while eliminating the most extreme low outliers, in WDDP-I it was decided for the CLHNS data to use a 0.3 x BMR cutoff instead of the 0.9 x BMR cutoff used for the other countries.

Within the WDDP-II, the additional datasets provided by HarvestPlus were almost in a "raw" state in the sense that no exclusion had been applied. Indeed, except for some obviously flawed cases, it was considered that if 24-hour recalls are properly administered, the probabilities of under and over estimation are nearly equivalent so that the average of intakes among the survey population is ultimately not biased. Nevertheless, it appeared that a primary exclusion rule was applied to the Ug2 dataset. Outliers were identified according to several steps: exploration of implausible values using the SPSS Explore procedure; adjustment of the amount of food consumed by cost or by food frequency questionnaire data from the 24-hour recall (Gibson and Ferguson, 2008), analysis of mean, median, SD and scatter plot of each nutrient density per age group and region; and finally use of the inter-quartile range to define a threshold for outliers (Q3 + 3 * IQR) for each consumed food quantity and nutrient density per age group and region.

Finally, to ensure consistency between all datasets it was decided to apply the same exclusion criteria to all of them before carrying out the WDDP-II analysis. The criteria used previously in WDDP-I were considered and women with energy intakes either below 0.9 x BMR or above 3.0 x BMR were excluded. **Table 3** presents the percentage of exclusion arising from this.

As stated above, the use of the 0.9 x BMR cutoff in the Philippines dataset implied a high rate of exclusions. The sub-sample obtained after exclusions was compared to the original sample for available women's characteristics. It turned out that women in the final sub-sample were slightly younger, more educated and had a lower body mass index (BMI) than excluded women. However, a visual inspection of the shape of the distributions of energy and micronutrient intakes, PA and FGI revealed that they remained quite unchanged.

12 Goldberg, *et al.*, (1991) provide a method for assessing the quality of dietary data through evaluating estimated energy intake. The estimated energy intake (EIrep) is compared with the person's estimated BMR (BMRest). The ratio between EIrep and BMRest is called the BMR factor. The BMR factor can be used as a lower cutoff value for identifying under-reporters. The lower cutoff value, with a 95 percent confidence interval, is based on an energy requirement of 1.55 X BMR for a person with a sedentary lifestyle, adjusted for the number of days of recall data. For a single recall day, the lower cutoff value is 0.90 X BMR. The highest energy intake that can be sustained over a longer period of time is 2.4 X BMR (FAO, 2004). An upper cutoff value of 2.4 X BMR has therefore been used by some. However, a single day's energy intake can be more extreme. For our purposes we set the upper cutoff to 3.0 X BMR to identify likely over-reporters.

Table 3. Percentage of exclusions based on Goldberg criteria in each dataset [a]

Country	N initial [b]	N final [b]	% exclusion
Ban1	642	570	11.2
Ban2	461	422	8.5
BF1	222	182	18.0
BF2	471	407	13.6
Mali	102	102	0.0
Moz	439	396	9.8
Phi	2 191	848	61.3
Ug1	532	452	15.0
Ug2 [c]	954	954	0

[a] Some women were excluded for other reasons (older than 49 years, evident errors in the food record, etc.). Thereby, the N final sample sizes do not necessarily correspond to the sample sizes presented in **Table 4** and **Table A1 - 1**.

[b] This corresponds to the first round of data except for the BF1 for which this corresponds to the second round of data.

[c] Information about women's weight is not available. For that reason, no exclusions based on Goldberg criteria could be performed. However, as explained above other means were used by the investigators to exclude outliers.

CHAPTER 7

RESULTS

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The characteristics of each dataset considered in the WDDP-II are presented in **Table 4**. It provides the final sample sizes according to physiological status and, when information was available, a basic description of mean age, height, weight, BMI and level of education of the women.

Total sample sizes ranged from 102 women (Mali) to 954 (Ug2). This wide range should be kept in mind when interpreting the results. Three datasets (Mali, BF1 and the Philippines) included too few or no lactating women to allow a separate analysis of this group. No dataset had enough pregnant women to allow a separate analysis.

The mean age of women was approximately 30 years, ranging from 27 years (Ban2) to 32 years (Ug1). As could be expected, non-pregnant non-lactating (NPNL) women were older than lactating women in every study site (when the comparison was possible). Women were tallest in the West African samples, and heaviest in the urban West African samples (mean BMI of 23.2 kg/m² for BF1 and 23.6 kg/m² for Mali), followed by the peri-urban Philippines dataset (22.0 kg/m²) and the rural African sites: Ug1 (22.5 kg/m²), Mozambique (21.5 kg/m²) and BF2 (20.8 kg/m²). In contrast, the women from Bangladesh datasets had much lower mean BMI (Ban1: 18.8 kg/m²; Ban2: 19.7 kg/m²). Accordingly, the prevalence of overweight ranged from 1.7 percent (Ban1) to 36.5 percent (BF1) and the prevalence of underweight from 6.8 percent (Ug1) to 47.8 percent (Ban1).

Available data on the level of education or literacy varied across studies and therefore were not directly comparable. However, it is possible to say that education and literacy levels appeared higher in the urban/peri-urban samples, as expected, and lower in Mozambique, as expected as well given the extreme poverty and absence of infrastructure and services in the study area.

7.1 Food group patterns

Table 5 and **Figure 1** present the proportions of women who consumed the different food groups[13]. The table gives information for the nine food groups of the FGI-9, but two of the nine groups are omitted from the figure: starchy staples because they were consumed by 100 percent of women across almost all sites – with the exception of Ug1 and Ug2 datasets for which the consumption reached 99 percent and 95 percent, respectively; and organ meat because it was not consumed at all, except in the Philippines dataset.

7.1.1 Staple foods

Starchy staples were consumed by almost all women in all sites, with the exception of the Ugandan datasets where some women consumed orange-fleshed sweet potatoes (OFSP) instead of starchy staples. Consumption of legumes and nuts with the 15g minimum ranged from 33 percent to 38 percent of women in the Bangladesh sites to 78 percent and 85 percent in the Ugandan sites. Imposing a restriction of 15g minimum consumption had no impact for starchy staples. For legumes and nuts, this made a real difference for the urban West African study sites (24 and 33 percentage points of difference in the BF1 and Mali datasets, respectively), maybe because of the use of rather small quantities of groundnut paste in sauces. No strong differences were found in the other datasets.

[13] In general, food group patterns did not vary markedly with physiological status. Therefore, results in this section are presented for all women together and not for subgroups of lactating and NPNL women.

Table 4. Characteristics of samples

		n [a]	2nd recall (3rd recall)	Age (mean)	Height (cm) (mean)	Weight (kg) (mean)	BMI (mean)	BMI < 18.5 (%)	BMI ≥ 25 (%)	Education (%)	Description of education variable
Ban1	All	412	147	31.3	150.3	42.6	18.8	47.8	1.7	32.5	Literate
	Lactating	111	48	27.6	150.4	42.1	18.6	50.4	0.0	36.0	
	NPNL	301	99	32.7	150.3	42.7	18.9	47.2	2.0	30.8	
Ban2	All	422	397	26.9	149.9	44.4	19.7	36.3	4.5	-	-
	Lactating	221	208	26.6	149.6	43.3	19.3	43.0	4.5	-	
	NPNL	201	189	27.2	150.3	45.7	20.2	28.9	4.5	-	
BF1	All	178 [b]	172 [c] (169) [d]	31.1	163.1	61.7	23.2	9.2	29.1	53.3	Ever attended school
	NPNL	130 [b]	124 [c] (122) [d]	31.7	163.3	63.1	23.7	8.7	33.1	48.4	
BF2	All	407	140	31.2	162.4	54.9	20.8	14.3	4.6	-	-
	Lactating	228	90	29.8	162.1	54.5	20.7	12.6	3.0	-	
	NPNL	134	40	34.0	162.6	54.6	20.6	18.6	5.9	-	
Mali	All	102	96	31.4	166.0	65.0	23.6	17.2	28.1	-	-
	NPNL	102	96	31.4	166.0	65.0	23.6	17.2	28.1	-	
Moz	All	391	88	28.8	153.7	50.9	21.5	7.1	7.2	19.2	Literate
	Lactating	242	48	28.4	153.7	50.6	21.4	6.2	6.2	19.8	
	NPNL	97 [e]	28	30.1	153.7	49.9	21.1	12.4	6.2	16.5	
Phi	All	848	848	30.8	151.0	50.2	22.0	20.5	22.5	98.8	Completed grade 3 or higher
	NPNL	723	723	31.9	151.1	50.4	22.0	21.1	23.8	99.0	
Ug1	All	452	121	32.4	157.8	57.5	22.5	6.8	29.2	-	-
	Lactating	198	53	30.0	158.0	56.6	22.4	5.6	23.7	-	
	NPNL	197	54	35.3	156.6	58.8	22.8	8.1	36.6	-	
Ug2	All	954	95	28.5	-	-	-	-	-	-	-
	Lactating	344	36	27.2	-	-	-	-	-	-	
	NPNL	610	59 [f]	29.2	-	-	-	-	-	-	

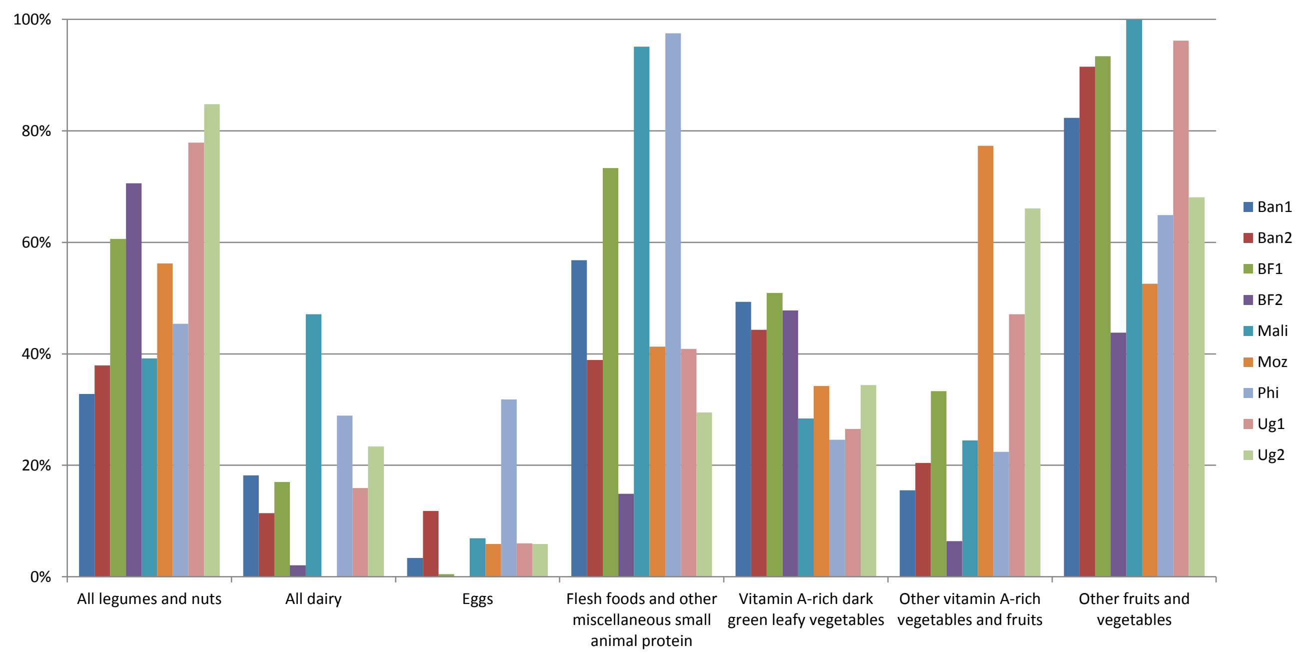
[a] In some sites, sample sizes for subgroups do not sum to the sample size for "All women" because "All women" include subgroups too small for conducting a separate analysis.
[b] This sample size corresponds to the second day of recall.
[c] This sample size corresponds to the first day of recall.
[d] This sample size corresponds to the third day of recall.
[e] Strictly speaking this sub-dataset does not meet the N=100 minimal sample size that was theoretically required for being included in the analysis. This was due to the application of Goldberg criteria in WDDP-II while less strict exclusion rules were applied in WDDP-I. This dataset was nevertheless kept in the analysis (only three subjects missing).
[f] Similarly, this sub-dataset does not exactly meet the 10 percent repetition requirement. This dataset was nevertheless kept in the analysis (only two subjects missing).

Table 5. Percentage of all women who consumed each of the 9 food groups, by study site

		Ban1	Ban2	BF1	BF2	Mali	Moz	Phi	Ug1	Ug2
All starchy staples	> 1g	100	100	100	100	100	100	100	99	95
	> 15g	100	100	100	100	100	100	100	99	95
All legumes & nuts	> 1g	35	50	85	83	73	58	48	83	86
	> 15g	33	38	61	71	39	56	45	78	85
All dairy	> 1g	19	14	18	2	48	0	35	16	23
	> 15g	18	11	17	2	47	0	29	16	23
Organ Meat	> 1g	0	0	0	0	0	0	13	0	0
	> 15g	0	0	0	0	0	0	13	0	0
Eggs	> 1g	7	18	1	0	8	6	34	6	6
	> 15g	3	12	1	0	7	6	32	6	6
Flesh foods [a]	> 1g	72	64	93	55	98	46	99	49	37
	> 15g	57	39	73	15	95	41	98	41	30
Vitamin A-rich DGLV [b]	> 1g	51	51	79	64	41	34	29	33	43
	> 15g	49	44	51	48	28	34	25	27	34
Other vitamin A-rich F&V [c]	> 1g	64	38	72	28	86	77	29	66	79
	> 15g	16	20	33	6	25	77	22	47	66
Other F&V [c]	> 1g	100	100	96	66	100	63	71	99	93
	> 15g	82	92	93	44	100	53	65	96	68

[a] Flesh foods include other miscellaneous small protein sources such as insects, grubs, snakes, etc.
[b] DGLV: dark green leafy vegetables.
[c] F&V: fruits and vegetables.

Figure 1. Percentage of all women who consumed at least 15g of selected food groups, by study site



7.1.2 Animal-source foods

As noted, organ meat was only consumed in the Philippines dataset. Among animal-source foods that were rarely consumed eggs came next: frequency of consumption was null for BF2 and under 10 percent for the Ugandan sites, Mali, Mozambique, BF1 and Ban1. Only the Ban2 and Philippines datasets showed a noticeable frequency of egg consumption (12 percent and 32 percent, respectively, with the 15g restriction).

Consumption of dairy was null in Mozambique, very small for BF2 dataset (2 percent), intermediate (11 percent to 29 percent, with the 15g restriction) in the two Bangladesh sites, BF1, Philippines and Ugandan datasets, and widely consumed in Mali (47 percent). The 15g restriction had virtually no impact on the indicator, with the exception of the Philippines where women use small amounts of milk or cream in coffee (leading to a 6 percentage points of difference).

Flesh foods were the most frequently consumed animal-source foods and were widely consumed in almost all study sites. The percentages of consumption were higher in urban sites than in rural ones: with the 15g restriction, values were up to 73 percent in BF1, 95 percent in Mali and 98 percent in Philippines datasets. Only the BF2 dataset showed a relatively low percentage of consumption (only 15 percent with the 15g restriction). Besides, this restriction did not matter much in Mali, Mozambique, Philippines and Ugandan sites while it made a relatively large difference in the other sites (from 16 percentage points difference in the Ban1 dataset to 40 points difference in the BF2 dataset).

7.1.3 Fruits and vegetables

Considering the 15g restriction, consumption of vitamin A-rich dark green leafy vegetables ranged from 25 percent in the Philippines to 51 percent in the urban Burkina Faso. The 15g restriction made remarkable differences in all West African sites (from 13 percentage points difference in Mali to 28 in urban Burkina Faso). This may be related to the use of dried leaves in small quantities in mixed dishes and sauces.

Consumption of other vitamin A-rich fruits and vegetables (such as mango, pumpkin and yellow/orange squash or yellow/orange-fleshed sweet potatoes) tended to be lower in rural than in urban areas: from 6 percent in BF2 to 23 percent in Ug1 datasets, versus 25 percent and 33 percent in Mali and BF1 datasets, respectively. The Ug2 and the Mozambique datasets showed very high level of consumption of vitamin A-rich fruit and vegetables (66 percent and 77 percent, respectively). This was due to the mango season in Mozambique and the wide consumption of orange-fleshed sweet potatoes in Uganda. The 15g restriction made rather large differences: from 7 percentage points in the Philippines to 61 percentage points in Mali, but this was not the case in Mozambique where the mango season rubbed out the difference. These differences occurred for different reasons according to the sites. In Bangladesh, this was entirely due to the use of chilies in very small quantities, and in Burkina Faso and Mali to the use of tomato paste in dishes.

Other fruits and vegetables, even with the 15g restriction, were consumed by at least half of the women in all sites (except the BF2 dataset: 44 percent). The frequency of consumption was even > 80 percent in many datasets (Ban1, BF1, Mali and Ug1). The 15g restriction made no substantial difference in the BF1, Mali and Ug1 datasets. The differences in other sites ranged from 6 to 25 percentage points.

7.1.4 Summary

In summary, with the exception of starchy staples, each site presented a different pattern of consumption for the main food groups. The impact of imposing the 15g minimum consumption for a food group to count also varied by food group and by site. However, overall it was clear that for a number of food groups and in a number of sites, imposing the 15g minimum consumption made a substantial difference in the proportion of women who were considered to have consumed the group. This was true in most sites for at least three of the nine food groups. This was less important in Mozambique, Philippines and first Uganda sites. This may reflect the fact that where diets and mixed dishes in these poor rural sites were generally very simple, the few foods/ingredients consumed tended to be consumed in substantial quantities.

Two very simple indicators of diet quality are the proportion of total energy intake that is accounted for by starchy staples and the proportion contributed by animal-source foods. Other micronutrient-dense foods such as fruits and vegetables are generally not expected to contribute to a substantial proportion of energy, although there are exceptions, such as mangos and orange-fleshed sweet potatoes. **Table 6** shows the proportion of energy intakes accounted for by several foods groups, for all sites.

The contribution of starchy staples to total energy intake was higher in rural areas (from 68 percent in Mozambique to 87 percent in the Ban2 dataset) with the exception of the Ugandan sites (54 percent and 43 percent for Ug1 and Ug2, respectively) because of the consumption of OFSP (classified as vitamin A-rich vegetables); by contrast, the contribution of starchy staples to energy intakes was lower in urban areas (46 percent and 56 percent for Mali and BF1 datasets, respectively). In Mali, the proportion of animal-source foods was noticeably higher than in other sites. Regarding the contribution of fruits and vegetables to energy intakes, Mozambique and the second Ugandan study stood out. As explained above, mangos and OFSP highly contributed to energy intakes from this group. The bottom line in **Table 6** corresponds to food groups not considered for constructing diversity scores because of their very poor micronutrient content but still contributing to energy intakes (sometimes highly). These groups include fats, oils (except red palm oil which was counted along with vitamin A-rich fruits and vegetables), sweets and alcohol. Frequency of consumption of these foods varied widely across sites, and more specifically depending on the urban or rural milieu. As a matter of fact, their contribution to total energy intake reached 20 percent to 26 percent in urban sites, 11 percent in urban-rural Uganda, and 3 percent to 9 percent in rural sites.

7.2 Contribution of food groups to MPA

The first phase of the analysis (July 2013) concerned only the FGI-9 and FGI-9R. In the second phase of the analysis, we investigated the contribution of each food group to the individual PAs and to the MPA with the aim of constructing new food group indicators that might perform better than the FGI-9(R). These results are presented first to allow the subsequent presentation of the results of analyses for new candidate FGI along with results for FGI-9, and FGI-7.

The list of 21 food groups which constituted the most disaggregated FGI in WDDP-I was considered. We investigated first the contribution of each food group to the individual PAs, in each dataset and for each micronutrient. For this we calculated the aggregate of all intakes of nutrient X from the FG (summed over all women) and divided it by the aggregate of all total intakes of nutrient X (summed over all women). This resulted in the contribution of the FG in the sum of all total nutrient intakes. The percent contribution of each FG to each nutrient was then weighted with each woman's PA to obtain the mean, assuming that each FG contributed to the PA of X proportionally to its contribution to the total intake of nutrient X. Similarly, for each food group, a "partial MPA" was calculated based on the contribution of the food group to each of the 11 PA values to derive FG contribution to overall MPA. The aim was to highlight which food sub-groups contributed "significantly" to the MPA across the datasets, in order to be able to suggest alternate food groupings that maximize the odd of a good correlation, at the individual level, between the FGI and the MPA.

Table 6. Percent of energy (kcal) from different food groups, by study site

	Ban1	Ban2	BF1	BF2	Mali	Moz	Phi [a]	Ug1	Ug2
All starchy staples	86	87	56	72	46	68	n/a	54	43
All legumes & nuts	2	2	10	15	11	11	n/a	15	17
All animal-source foods	4	3	7	2	12	4	n/a	5	4
All vegetables & fruits	4	3	7	5	6	15	n/a	18	25
Fats, oil [b], sweets, alcohol	4	5	20	7	26	3	n/a	9	11

[a] The low energy intakes reported by women in this sample triggered concerns that underreporting of intakes might have been different across food groups. Food group contributions to individual nutrient intakes might therefore be misleading and are not presented here.

[b] Red palm oil (RPO) is not counted in this group but with the vitamin A-rich fruits; this did not alter the results much because it was not widely consumed in any of the datasets.

Table 7 presents the percent contribution to the MPA of each food group included in the FGI-21. It should be noted that the total of these contributions did not reach 100 percent because other food groups such as "Other fats and oils", "All other beverages" and "Spices and condiments" contributed to the MPA but are not included in the FGI-21.

The food group which contributed the most to the MPA was undoubtedly the "Grains and grain products" group, ranging from 10.8 percent for the Ug1 dataset to 59.2 percent for the Ban2 dataset. The contribution of "All other starchy staples" was also noticeable, especially in the both Ugandan datasets. The "Vitamin A-rich DGLV" contributed more than 5 percent for 6 out of 9 datasets, ranging from 7.0 percent in Mali to 25.1 percent for BF2. The "Cooked dry beans and peas" and "Nuts and seeds" groups contributed to the MPA from 0.3 percent (Mali) to 12.3 percent (Ug2) and from 0.1 percent (Phi) to 13.2 percent (BF2), respectively. The contributions of "Mammals, reptiles and amphibians" as well as "Large fishes" groups were particularly important in the Philippines dataset. Finally, vitamin A-rich fruits highly contributed to the MPA in the Mozambique and BF1 datasets, due to mango season.

From **Table 7**, one can observe that some food groups which seem to contribute independently to the MPA are aggregated in the FGI-9. For example, both "Grains and grains products" and "All other starchy staples" showed good contribution to the MPA across all datasets. Yet, the FGI-9 includes only one aggregated group. In this example, however, one should be cautious since contribution to MPA is in part a function of the quantities consumed; this in turn leads to a diet dominated by starchy staples, which is not what we are aiming for when we talk about diversification. Indeed, we would rather see diversification of animal-source foods, vegetables and fruits.

The fact remains, nevertheless, that the assessment of dietary diversity of women who had consumed both food groups was attenuated by aggregating them in the FGI-9, even though this does not mean that the relationship between the FGI value and the MPA would be modified if both food groups had been counted separately. To investigate this we first aimed to gauge the proportion of women who consumed simultaneously two sub-groups of an aggregated one (in the FGI-9). **Table 8** shows for each pair of sub-groups of potential interest that we identified from **Table 7** the proportion of women having consumed none, one or the other, or both of them (without the 15g restriction). For information, mean MPA among women presenting each combination has been computed. We can imagine that if women having consumed both sub-groups have a higher mean MPA than other women, disaggregating the original food group in a new candidate FGI might improve the relationship between the FGI value and the MPA, particularly if this relationship was robust when controlling for energy intake.

Many women consumed both "Grains and grain products" and "All other starchy staples" sub-groups. When they consumed only one of them, it was generally "Grains and grain products". Overall, mean MPA tended to be higher for women who had consumed both sub-groups. The same pattern appeared for "Cooked dry beans and peas" and "Nuts and seeds", "Meat" and "Fish", and to a lesser extent "Vegetables" and "Fruits". For all the above, differences were of varying magnitude, depending on the dataset and on which pair of food groups was considered. Finally, for "Mammals" and "Birds", and "Large fish" and "Small fish", there was only a very limited overlap for most datasets (0 – 1 percent consuming both groups), with the exception of the Philippines (18 percent consuming both).

Consequently, some new candidate FGIs could be articulated around the following disaggregations:

- All starchy staples ➔ "Grains and grain products" (group 1 in **Table 7**) and "All other starchy staples" (group 2);

- All legumes and nuts ➔ "Cooked dry beans and peas including soybeans and soy products" (groups 3 + 4) and "Nuts and seeds" (group 5);

- Flesh foods ➔ "Meat" (groups 8 + 9 + 10 + 13) and "Fish" (groups 11 + 12);

- Other fruits and vegetables ➔ "Other vegetables" (groups 17 + 18) and "Other fruits" (groups 20 + 21).

Table 7. Contribution (%) of the 21 food groups to the MPA, by study site

	FGI-21	Ban1	Ban2	Bf1	Bf2	Mali	Moz	Phi	Ug1	Ug2
1	Grains and grain products	38.1	59.7	24.3	45.0	27.7	19.1	28.1	10.8	16.1
2	All other starchy staples	4.5	6.5	5.3	0.8	6.4	8.3	1.3	30.7	13.7
3	Cooked dry beans and peas	2.3	2.6	7.4	6.7	0.3	9.1	1.7	3.9	12.1
4	Soybeans and soy products	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
5	Nuts and seeds	1.2	0.4	4.9	14.0	9.3	1.1	0.1	9.6	6.4
6	Milk and yoghurt	1.3	0.3	1.8	0.5	11.7	0.0	2.5	1.7	2.8
7	Cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
8	Large or small wild or domesticated mammals, reptiles and amphibians	0.7	0.5	6.9	0.7	6.5	0.3	20.4	3.9	2.8
9	Organ meat	0.0	0.0	1.3	0.0	0.0	0.0	3.9	0.0	0.2
10	Wild or domesticated birds	0.3	0.3	0.4	0.3	0.0	0.9	5.4	0.3	0.4
11	Large whole fish, dried fish, shellfish, other seafood and molluscs	6.6	2.1	1.8	1.3	3.9	3.0	18.6	3.0	0.9
12	Small fish eaten whole with bones	4.6	0.3	0.3	0.0	0.2	4.0	1.3	0.0	0.4
13	Insects and grubs	0.0	0.0	0.0	0.1	0.0	0.6	0.0	0.4	0.0
14	Eggs	0.4	0.6	0.3	0.0	0.9	0.6	2.7	0.4	0.4
15	Vitamin A-rich dark green leafy vegetables	23.1	9.6	14.1	20.7	7.0	7.3	2.1	3.6	4.6
16	Vitamin A-rich deep yellow, orange, red vegetables	4.0	4.0	1.0	0.7	1.8	0.5	0.8	14.9	3.9
17	Vitamin C-rich vegetables	3.3	8.6	8.2	5.2	19.5	2.0	0.5	3.5	0.8
18	All other vegetables	2.5	1.1	2.1	0.1	1.1	3.2	0.5	0.4	2.3
19	Vitamin A-rich fruits	2.3	0.0	16.8	1.4	1.1	37.1	0.9	2.2	2.4
20	Vitamin C-rich fruits	1.7	1.0	0.8	0.0	1.1	1.0	1.5	7.7	22.7
21	All other fruits	0.9	0.4	0.0	0.3	0.0	0.9	0.1	2.1	1.3
Total		**97.8**	**98.0**	**97.7**	**97.8**	**98.5**	**99.1**	**92.6**	**99.2**	**94.3**

Table 8. Percent of women having consumed none, one or the other, or both food sub-groups, coming from the disaggregation of selected food groups of the FGI-9 (without restriction), and mean MPA for each case, by study site

	Ban1		Ban2		BF1		BF2		Mali		Moz		Phi1		Ug1		Ug2	
	%	Mean MPA	%	Mean MPA	%	Mean MPA	%	Mean MPA	%	Mean MPA	%	Mean MPA	%	Mean MPA	%	Mean MPA	%	Mean MPA
Both	49	0.31	80	0.36	31	0.33	7	0.36	42	0.47	37	0.40	36	0.52	72	0.54	57	0.59
Grains and grain products	50	0.30	20	0.33	68	0.34	93	0.40	58	0.43	57	0.37	64	0.48	11	0.47	27	0.50
All other starchy staples	0	-	0	-	1	0.35	0	-	0	-	6	0.42	0	-	16	0.54	11	0.56
None	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1	0.59	5	0.50
Both	6	0.41	4	0.38	20	0.41	21	0.50	1	0.42	7	0.45	3	0.55	21	0.57	28	0.58
Cooked dry beans and peas	17	0.30	44	0.34	8	0.27	9	0.33	3	0.42	44	0.39	34	0.51	18	0.50	42	0.57
Nuts and seeds	13	0.38	3	0.37	57	0.34	52	0.40	69	0.48	8	0.41	3	0.54	43	0.54	16	0.55
None	63	0.29	50	0.36	15	0.26	18	0.27	27	0.38	40	0.37	60	0.48	18	0.52	14	0.48
Both	1	0.21	0	-	1	0.30	0	0.87	0	-	0	-	18	0.54	1	0.46	1	0.62
Large or small wild or domesticated mammals, reptiles and amphibians	6	0.34	6	0.35	49	0.37	4	0.34	70	0.46	2	0.35	58	0.51	19	0.59	15	0.60
Wild or domesticated birds	6	0.30	4	0.38	1	0.36	2	0.48	0	-	8	0.41	6	0.45	2	0.56	3	0.58
None	86	0.31	89	0.35	50	0.31	94	0.39	30	0.42	90	0.39	18	0.42	78	0.52	81	0.55
Both	16	0.35	8	0.34	31	0.35	0	-	2	0.40	6	0.43	9	0.47	0	-	1	0.55
Large whole fish, dried fish, shellfish, other seafood and molluscs	38	0.31	54	0.36	27	0.35	50	0.36	54	0.47	12	0.42	66	0.51	27	0.54	10	0.56
Small fish eaten whole with bones	14	0.30	5	0.37	24	0.31	0	-	3	0.60	17	0.34	4	0.39	0	-	11	0.56
None	32	0.29	33	0.34	18	0.32	50	0.42	41	0.42	65	0.39	21	0.48	73	0.54	78	0.56
Both	8	0.33	6	0.36	39	0.37	2	0.46	30	0.53	1	0.49	61	0.52	2	0.61	3	0.60
Meat (Group 8 or 10)	5	0.29	5	0.37	11	0.35	4	0.38	39	0.41	8	0.38	20	0.48	20	0.58	15	0.60
Fish (Group 11 or 12)	60	0.31	61	0.35	43	0.32	48	0.36	28	0.41	34	0.38	18	0.42	25	0.53	19	0.55
None	27	0.29	28	0.34	7	0.27	45	0.43	2	0.50	57	0.39	1	0.45	53	0.52	63	0.55
Both	32	0.33	20	0.37	13	0.34	1	0.30	9	0.43	16	0.43	18	0.54	62	0.55	56	0.60
Vegetables (Group 17 or 18)	67	0.30	80	0.35	83	0.34	61	0.37	91	0.45	49	0.39	50	0.50	33	0.51	35	0.53
Fruits (Group 20 or 21)	0	-	0	-	1	0.46	1	0.57	0	-	2	0.37	4	0.44	3	0.52	2	0.42
None	1	-	0	-	3	0.31	37	0.43	0	-	32	0.36	29	0.47	1	0.46	7	0.40

Given that “Organ meat” was never or very rarely consumed in all datasets, one can suggest that it be aggregated with “Meat”. We acknowledge however that this is debatable since, thinking about future use of the indicator, particularly if programmes are to recommend consumption of organ meats (and succeed in that), it might be better to keep organ meat separate.

Finally, various combinations of the above can be worked out:

- The four new sub-groups at the same time: would lead to a FGI-12;
- One new sub-group by one: would lead to four new FGI-9;
- Two new sub-groups by two: would lead to six new FGI-10;
- Three new sub-groups by three: would lead to four new FGI-11.

All new candidate FGIs are presented in **Table 9**.

We first analysed the performance of FGI-12 in predicting MPA (through correlations, regressions, AUCs, sensitivity – specificity analyses) because this new candidate indicator includes the four disaggregations identified above. Therefore, it maximizes the odds of enhancing the relationship of the indicator with MPA through those disaggregations. Corresponding results, which will be presented later in the report along with those of other candidate indicators, were good enough to merit further exploration and comparison with the original FGI-9.

We then carried out a similar analysis to assess the performance of each of the four alternate ‘new’ FGI-9 (FGI-9A/B/C/D). These FGIs all aggregate “Organ meat” with “Meat foods” and each of them presents one of the four disaggregations presented above. The aim was to assess if the performances obtained with the FGI-12 were likely to be more supported by one or several of these four disaggregations. It appeared that FGI-9B (disaggregating “Beans and peas” and “Nuts and seeds”) and FGI-9D (disaggregating “Other vegetables” and “Other fruits”) performed better than the two others. These results are presented in **Appendix 6** of this report. We thus carried out new analyses with the FGI-10E (which includes these two disaggregations).

Finally, the continuation of the analyses presented hereafter included and compared the performances of the FGI-7(R), FGI-9(R), FGI-10E(R) and FGI-12(R).

7.3 Food group diversity indicators

Descriptive statistics (mean and range) for the FGI-7, FGI-9, FGI-10E and FGI-12, restricted and not restricted, are presented by study sites for all women in **Table 10**.

The highest mean scores for FGI-7, restricted or not, were observed in the two urban West African sites: BF1 (4.9 and 4.2) and Mali (5.2 and 4.4). It remained the same for FGI-9 (5.4 for BF1 and 5.5 for Mali), but for FGI-9R the score of the Phi dataset was at the same level as BF1 (4.3; Mali was 4.4). For FGI-10 and FGI-12 again BF1 and Mali came first (FGI-10: 5.8 for BF1 and 5.6 for Mali; FGI-12: 6.1 for both), but for the restricted indicators it was Ug1 (4.8 for FGI-10R and 5.5 FGI-12R), Ug2 (4.6 for FGI-10R and 5.2 for FGI-12R), then Mali, Phi, BF1.

Overall, Mali and BF1 were the datasets for which the decrease of the mean score was the biggest when the 15g restriction was applied (-0.8 to -1.7 point depending on the FGI). This is consistent with the results shown in **Table 5**.

The lowest mean scores were encountered for BF2 and Mozambique; but while the 15g restriction did not change significantly the score in Mozambique (-0.2 point for FGI-7, FGI-10 and FGI-12 and -0.1 for FGI-9) the decrease was high in BF2 (-1 point for FGI-7, -1.1 for FGI-9 and -1.2 for FGI-10 and FGI-12). The two Bangladesh sites also showed a substantial decrease of the mean score (from -0.7 to -1.1 points) while for Ugandan sites and for the Philippines site mean scores decreased from 0.3 to -0.9 depending on the site and on the FGI. Overall, the decrease from non-restricted to restricted FGIs was more important when there were more food groups in the FGI. This appears logical, because a larger number of food groups implies a smaller amount per food group on average. Food groups with smaller quantities are therefore more affected by the restriction.

Table 9. Potential new candidate FGIs

	FGI-21		Current FGI-9		New FGI-12
1	Grains and grain products	1	All starchy staples	1	Grains and grain products
2	All other starchy staples			2	All other starchy staples
3	Cooked dry beans and peas	2	All legumes and nuts	3	Beans and peas
4	Soybeans and soy products				
5	Nuts and seeds			4	Nuts and seeds
6	Milk and yoghurt	3	All dairy	5	All dairy
7	Cheese				
8	Large or small wild or domesticated mammals, reptiles and amphibians			6	Meat foods (including organ meat and small animal protein)
9	Organ meat	4	Organ meat		
10	Wild or domesticated birds	6	Flesh foods and other miscellaneous small animal protein		
11	Large whole fish, dried fish, shellfish, other seafood and molluscs				
12	Small fish eaten whole with bones			7	Fish, seafood and molluscs
13	Insects and grubs				
14	Eggs	5	Eggs	8	Eggs
15	Vitamin A-rich dark green leafy vegetables	7	Vitamin A-rich dark green leafy vegetables	9	Vitamin A-rich dark green leafy vegetables
16	Vitamin A-rich deep yellow, orange, red vegetables	8	Other vitamin A-rich vegetables and fruits	10	Other vitamin A-rich vegetables and fruits
19	Vitamin A-rich fruits				
17	Vitamin C-rich vegetables	9	Other fruits and vegetables	11	Other vegetables
18	All other vegetables				
20	Vitamin C-rich fruits			12	Other fruits
21	All other fruits				

Table 9 (continued) Potential new candidate FGIs

	FGI-9A		FGI-9B
1	Grains and grain products	1	All starchy staples
2	All other starchy staples		
3	All legumes and nuts	2	Beans and peas
		3	Nuts and seeds
4	All dairy	4	All dairy
5	Flesh foods	5	Flesh foods
6	Eggs	6	Eggs
7	Vitamin A-rich dark green leafy vegetables	7	Vitamin A-rich dark green leafy vegetables
8	Other vitamin A-rich vegetables and fruits	8	Other vitamin A-rich vegetables and fruits
9	Other fruits and vegetables	9	Other fruits and vegetables
	FGI-9C		**FGI-9D**
1	All starchy staples	1	All starchy staples
2	All legumes and nuts	2	All legumes and nuts
3	All dairy	3	All dairy
4	Meat foods (including organ meat and small animal protein)	4	Flesh foods
5	Fish, seafood and mollusc		
6	Eggs	5	Eggs
7	Vitamin A-rich dark green leafy vegetables	6	Vitamin A-rich dark green leafy vegetables
8	Other vitamin A-rich vegetables and fruits	7	Other vitamin A-rich vegetables and fruits
9	Other fruits and vegetables	8	Other vegetables
		9	Other fruits

Table 9 (continued). Potential new candidate FGIs

FGI-10A		FGI-10B		FGI-10C	
1	Grains and grain products	1	Grains and grain products	1	Grains and grain products
2	All other starchy staples	2	All other starchy staples	2	All other starchy staples
3	Beans and peas	3	All legumes and nuts	3	All legumes and nuts
4	Nuts and seeds				
5	All dairy	4	All dairy	4	All dairy
6	Flesh foods	5	Meat foods (including organ meat and small animal protein)	5	Flesh foods
		6	Fish, seafood and mollusc		
7	Eggs	7	Eggs	6	Eggs
8	Vitamin A-rich dark green leafy vegetables	8	Vitamin A-rich dark green leafy vegetables	7	Vitamin A-rich dark green leafy vegetables
9	Other vitamin A-rich vegetables and fruits	9	Other vitamin A-rich vegetables and fruits	8	Other vitamin A-rich vegetables and fruits
10	Other fruits and vegetables	10	Other fruits and vegetables	9	Other vegetables
				10	Other fruits

FGI-10D		FGI-10E		FGI-10F	
1	All starchy staples	1	All starchy staples	1	All starchy staples
2	Beans and peas	2	Beans and peas	2	All legumes and nuts
3	Nuts and seeds	3	Nuts and seeds		
4	All dairy	4	All dairy	3	All dairy
5	Meat foods (including organ meat and small animal protein)	5	Flesh foods	4	Meat foods (including organ meat and small animal protein)
6	Fish, seafood and mollusc			5	Fish, seafood and mollusc
7	Eggs	6	Eggs	6	Eggs
8	Vitamin A-rich dark green leafy vegetables	7	Vitamin A-rich dark green leafy vegetables	7	Vitamin A-rich dark green leafy vegetables
9	Other vitamin A-rich vegetables and fruits	8	Other vitamin A-rich vegetables and fruits	8	Other vitamin A-rich vegetables and fruits
10	Other fruits and vegetables	9	Other vegetables	9	Other vegetables
		10	Other fruits	10	Other fruits

Table 9 (continued). Potential new candidate FGIs

FGI-11A		FGI-11B	
1	Grains and grain products	1	Grains and grain products
2	All other starchy staples	2	All other starchy staples
3	Beans and peas	3	Beans and peas
4	Nuts and seeds	4	Nuts and seeds
5	All dairy	5	All dairy
6	Meat foods (including organ meat and small animal protein)	6	Flesh foods
7	Fish, seafood and mollusc		
8	Eggs	7	Eggs
9	Vitamin A-rich dark green leafy vegetables	8	Vitamin A-rich dark green leafy vegetables
10	Other vitamin A-rich vegetables and fruits	9	Other vitamin A-rich vegetables and fruits
11	Other fruits and vegetables	10	Other vegetables
		11	Other fruits

FGI-11C		FGI-11D	
1	Grains and grain products	1	All starchy staples
2	All other starchy staples		
3	All legumes and nuts	2	Beans and peas
		3	Nuts and seeds
4	All dairy	4	All dairy
5	Meat foods (including organ meat and small animal protein)	5	Meat foods (including organ meat and small animal protein)
6	Fish, seafood and mollusc	6	Fish, seafood and mollusc
7	Eggs	7	Eggs
8	Vitamin A-rich dark green leafy vegetables	8	Vitamin A-rich dark green leafy vegetables
9	Other vitamin A-rich vegetables and fruits	9	Other vitamin A-rich vegetables and fruits
10	Other vegetables	10	Other vegetables
11	Other fruits	11	Other fruits

7.4 Energy and macronutrient intakes

Table 11 provides information on energy and macronutrient intakes by study site and physiological status for a single observation day. The first observation day was used for the majority of datasets (among a maximum of two available observation days per woman); urban Burkina Faso data was from the second of three observation days.

Considering the median energy intakes, the same pattern emerged regardless of the physiological status. The Ugandan sites presented the highest values (from 2 198 kcal for NPNL women in Ug2 to 2 473 kcal for lactating women in Ug1). On the contrary, the Philippines site and, to a lesser extent, the Ban2 dataset had the lowest median energy intakes (1 665 kcal in the Philippines; and from 1 902 kcal to 1 920 kcal in the Bangladesh, depending on the physiological status). The other sites presented very similar values, ranging from about 2 000 to about 2 100 kcal for NPNL women, to about 2 100 kcal for all women and to about 2 200 kcal for lactating women. In general, lactating women had higher median energy intakes than NPNL women, with the exception of Mozambique for which the difference was not substantial.

The proportion of total energy provided by protein, carbohydrates and fat was examined against WHO recommendations for populations (WHO, 2003[14]). In the urban or peri-urban sites, percentages of energy coming from protein, carbohydrates and fat intakes were within or very close to WHO recommended ranges.

[14] WHO, 2003: Chapter 5.1.3 A summary of population nutrient intake goals - p.56

Table 10. Mean (standard deviation) and range of the FGI scores, restricted or not, for all women and by study site

		Ban1	Ban2	BF1	BF2	Mali	Moz	Phi	Ug1	Ug2
FGI-7	Mean (SD)	4.2 (0.9)	4.1 (0.9)	4.9 (0.7)	3.8 (0.8)	5.2 (0.8)	3.6 (1.0)	4.4 (1.4)	4.3 (0.9)	4.3 (1.0)
	Range	2-7	2-7	2-6	2-6	3-7	2-6	2-7	2-7	2-7
FGI-7R	Mean (SD)	3.5 (1.0)	3.5 (1.0)	4.2 (1.0)	2.8 (0.8)	4.4 (1.0)	3.4 (0.8)	4.1 (1.4)	4.0 (0.9)	3.9 (1.1)
	Range	1-6	1-6	2-6	1-5	2-6	1-6	2-7	2-7	1-7
FGI-9	Mean (SD)	4.5 (1.1)	4.3 (1.1)	5.4 (1.0)	4.0 (0.9)	5.5 (1.0)	3.8 (0.9)	4.6 (1.6)	4.5 (1.0)	4.6 (1.1)
	Range	2-7	2-7	2-7	2-6	3-8	2-7	2-9	2-7	2-9
FGI-9R	Mean (SD)	3.6 (1.1)	3.6 (1.1)	4.3 (1.1)	2.9 (0.8)	4.4 (1.1)	3.7 (0.8)	4.3 (1.6)	4.1 (0.9)	4.1 (1.2)
	Range	1-7	1-7	2-7	1-5	2-7	1-7	2-9	2-7	1-9
FGI-10E	Mean (SD)	4.8 (1.3)	4.6 (1.2)	5.8 (1.1)	4.2 (1.1)	5.6 (1.0)	4.1 (1.2)	4.6 (1.7)	5.3 (1.3)	5.4 (1.3)
	Range	2-8	2-8	2-8	2-7	3-9	2-7	2-9	2-9	2-9
FGI-10ER	Mean (SD)	3.8 (1.2)	3.7 (1.1)	4.4 (1.2)	3.0 (0.9)	4.5 (1.1)	3.9 (1.1)	4.3 (1.6)	4.8 (1.2)	4.6 (1.4)
	Range	1-7	1-7	2-7	1-6	2-8	1-7	2-9	2-8	1-9
FGI-12	Mean (SD)	5.4 (1.4)	5.4 (1.3)	6.4 (1.4)	4.3 (1.1)	6.4 (1.4)	4.5 (1.5)	5.6 (1.9)	6.1 (1.4)	6.1 (1.5)
	Range	2-9	3-9	2-9	2-8	3-10	2-8	2-11	2-10	2-11
FGI-12R	Mean (SD)	4.3 (1.4)	4.4 (1.2)	4.7 (1.4)	3.1 (1.0)	5.1 (1.4)	4.2 (1.3)	5.1 (1.9)	5.5 (1.3)	5.2 (1.5)
	Range	1-8	1-8	2-8	1-6	2-9	2-7	2-11	2-9	1-11

Table 11. Median intakes of energy and macronutrients, by study site and physiological status [a]

		Energy (kcal)	Protein (g)	Protein as % of kcal	CHO (g)	CHO as % of kcal	Fat (g)	Fat as % of kcal
Ban1	All	2 163	51	10	448	84	13	6
	Lactating	2 360	57	10	490	84	13	6
	NPNL	2 083	49	10	435	83	13	6
Ban2	All	1 905	47	10	383	82	15	8
	Lactating	1 902	47	10	385	82	14	8
	NPNL	1 920	47	10	380	82	15	8
BF1	All	2 176	54	11	353	67	47	22
	NPNL	2 044	52	11	336	67	41	21
BF2	All	2 185	88	17	386	66	39	17
	Lactating	2 226	90	17	399	66	39	17
	NPNL	2 109	86	18	363	65	39	17
Mali	All	2 019	54	11	320	59	72	30
	NPNL	2 019	54	11	320	59	72	30
Moz	All	2 029	58	11	435	82	12	7
	Lactating	2 012	56	11	436	82	11	6
	NPNL	2 086	60	11	446	82	11	7
Phi1	All	1 671	61	15	251	59	42	25
	NPNL	1 670	62	16	248	58	44	26
Ug1	All	2 439	57	10	463	75	36	15
	Lactating	2 473	59	10	475	75	38	15
	NPNL	2 457	57	10	460	75	35	15
Ug2	All	2 298	58	10	439	74	38	16
	Lactating	2 414	63	10	461	75	38	15
	NPNL	2 198	54	10	427	74	38	16

[a] Shaded cells are outside WHO (2003) recommended population averages: 10-15 percent of kcal from protein; 55-75 percent of kcal from carbohydrates; 15-30 percent of kcal from fat. However, differences of 1-2 percent points from recommended ranges are not meaningful and are likely to be within range of measurement error.

In rural sites the proportions tended to exceed the recommended range for carbohydrates and, in contrast, to fall behind the minimum recommended level for fats. As underscored in **Table 6**, urban sites had higher percentages of energy coming from fats than rural sites. For protein, intakes were within or very near the accepted range of 10 – 15 percent of energy in all sites.

7.5 Micronutrient intakes

Table 12 presents median intakes of selected micronutrients. It must be kept in mind that even differences between sites reflect differences in diet patterns, but they also reflect differences between food composition tables (FCTs). It is realistic to use different FCTs in different countries since they are often constructed using local information, however this means that different nutrient values may be used for some of the same foods, depending on the site, since nutrient values can vary by geographical area and may are affected by the biodiversity of crops. Of course, part of the differences in assigned nutrient values may also be attributable to errors and different measurement methods. All this will be reflected in micronutrient intakes. In the case of the first Philippines site, under-reporting may have resulted in low estimates of intakes for some or all micronutrients.

For some nutrients, median intakes were quite close to the EAR values: thiamin (from 0.6 to 1.6 mg/d depending on the study site and physiological status); riboflavin (0.4 to 1.2 mg/d); vitamin A (from 219 to 924 RE/d); and niacin (8.3 to 23.8 mg/d). For others, median intakes were relatively low compared to the EAR

Table 12. Median micronutrient intakes per day, by study site and physiological status

		Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1	All	0.6	0.7	9.9	1.5	133	0.6	41	322	308	8.5	8.0
	Lactating	0.7	0.7	11.1	1.6	137	0.8	42	363	358	9.4	9.0
	NPNL	0.6	0.6	9.3	1.4	132	0.5	41	311	283	8.2	7.8
Ban2	All	1.0	0.4	23.8	2.3	86	0.4	51	209	151	8.4	5.4
	Lactating	1.0	0.4	23.8	2.3	87	0.4	51	226	147	8.5	5.4
	NPNL	0.9	0.4	23.7	2.3	86	0.3	53	189	152	8.3	5.4
BF1	All	1.0	0.6	8.6	1.3	206	0.5	44	397	413	21.5	9.2
	NPNL	0.9	0.6	8.5	1.3	197	0.5	45	413	400	20.4	8.7
BF2	All	1.1	1.1	15.2	1.2	296	0.3	28	196	567	27.5	12.2
	Lactating	1.1	1.2	15.8	1.3	323	0.3	27	201	596	28.5	12.5
	NPNL	1.1	1.0	14.4	1.2	271	0.2	27	185	519	26.0	11.6
Mali	All	0.9	0.7	8.3	1.2	119	1.3	58	245	375	14.0	8.8
	NPNL	0.9	0.7	8.3	1.2	119	1.3	58	245	375	14.0	8.8
Moz	All	1.0	0.8	10.4	1.7	289	0.1	119	695	285	10.8	9.0
	Lactating	1.0	0.7	10.0	1.6	289	0.1	112	652	279	10.7	8.9
	NPNL	1.1	0.9	10.8	1.9	310	0.0	129	792	305	10.8	9.4
Phi	All	0.7	0.7	17.4	1.4	398	3.7	17	304	356	10.9	6.4
	NPNL	0.7	0.7	17.8	1.4	388	3.7	17	310	354	10.8	6.5
Ug1	All	1.5	0.9	15.7	3.0	333	0.4	167	697	383	15.2	8.9
	Lactating	1.6	1.0	16.2	3.1	351	0.1	173	710	396	15.7	9.2
	NPNL	1.4	0.9	15.7	3.0	340	0.5	167	658	376	15.0	8.9
Ug2	All	1.4	1.1	15.2	2.5	446	0.1	121	847	336	14.7	7.9
	Lactating	1.5	1.2	16.1	2.7	470	0.1	127	904	346	15.8	8.4
	NPNL	1.3	1.1	14.8	2.5	434	0.1	116	833	332	14.1	7.8

Table 13. Probability of adequacy (mean of each micronutrient) and mean probability of adequacy (MPA) across 11 micronutrients, by study site [a]

		Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)	MPA	SD of MPA
Ban1	All	0.07	0.11	0.28	0.67	0.01	0.19	0.44	0.49	0.05	0.14	0.93	0.31	0.16
	Lactating	0.00	0.02	0.21	0.28	0.00	0.18	0.23	0.38	0.07	0.26	0.94	0.23	0.13
	NPNL	0.09	0.15	0.30	0.82	0.02	0.20	0.52	0.53	0.04	0.10	0.93	0.34	0.16
Ban2	All	0.38	0.00	1.00	0.96	0.00	0.01	0.56	0.29	0.00	0.17	0.48	0.35	0.12
	Lactating	0.16	0.00	1.00	0.93	0.00	0.01	0.40	0.22	0.00	0.25	0.37	0.30	0.11
	NPNL	0.62	0.01	1.00	1.00	0.00	0.01	0.74	0.38	0.00	0.09	0.60	0.40	0.11
BF1	All	0.39	0.08	0.17	0.53	0.12	0.07	0.62	0.67	0.03	0.23	0.76	0.33	0.18
	NPNL	0.45	0.11	0.19	0.64	0.15	0.08	0.66	0.73	0.03	0.16	0.77	0.36	0.18
BF2	All	0.43	0.47	0.71	0.36	0.22	0.03	0.22	0.23	0.23	0.51	0.93	0.39	0.22
	Lactating	0.36	0.38	0.70	0.26	0.17	0.03	0.16	0.18	0.25	0.68	0.94	0.37	0.21
	NPNL	0.61	0.67	0.79	0.59	0.36	0.03	0.33	0.32	0.18	0.37	0.95	0.47	0.22
Mali	All	0.60	0.28	0.31	0.67	0.00	0.17	0.88	0.50	0.04	0.53	0.96	0.45	0.18
	NPNL	0.60	0.28	0.31	0.67	0.00	0.17	0.88	0.50	0.04	0.53	0.96	0.45	0.18
Moz	All	0.43	0.17	0.30	0.60	0.19	0.22	0.83	0.74	0.00	0.05	0.64	0.38	0.22
	Lactating	0.35	0.06	0.23	0.47	0.12	0.20	0.78	0.67	0.00	0.07	0.65	0.33	0.20
	NPNL	0.68	0.45	0.49	0.90	0.45	0.23	0.90	0.86	0.01	0.01	0.76	0.52	0.16
Phi	All	0.26	0.20	0.86	0.67	0.67	0.83	0.21	0.55	0.02	0.24	0.57	0.46	0.19
	NPNL	0.29	0.23	0.89	0.74	0.71	0.84	0.22	0.60	0.01	0.23	0.60	0.49	0.18
Ug1	All	0.84	0.33	0.76	0.97	0.32	0.18	0.96	0.75	0.06	0.08	0.65	0.54	0.16
	Lactating	0.81	0.19	0.74	0.95	0.20	0.14	0.93	0.68	0.07	0.15	0.67	0.50	0.16
	NPNL	0.91	0.50	0.83	0.99	0.53	0.21	0.98	0.82	0.05	0.04	0.76	0.60	0.14
Ug2	All	0.77	0.56	0.73	0.83	0.67	0.03	0.83	0.81	0.07	0.13	0.58	0.55	0.21
	Lactating	0.67	0.40	0.67	0.73	0.52	0.02	0.77	0.75	0.09	0.23	0.54	0.49	0.23
	NPNL	0.83	0.65	0.76	0.89	0.76	0.04	0.87	0.85	0.06	0.07	0.61	0.58	0.19

[a] When the probability of adequacy is averaged for a group, it is equivalent to an estimated prevalence of adequacy.

[b] A low level of absorption was assumed for both iron and zinc for Burkina Faso, Mozambique and Uganda sites; and an intermediate level of absorption was assumed for both micronutrients for Bangladesh, Mali and the Philippines sites.

Table 14. Datasets with very low, low or high probability of adequacy for each micronutrient

Table 14 – A. NPNL women			
	PA < 25%	**25% ≤ PA < 50%**	**PA > 75%**
Thiamin	Ban1	BF1, Phi	Ug1, Ug2
Riboflavin	Ban1, Ban2, BF1, Phi	Mali, Moz, Ug1	
Niacin	BF1	Ban1, Mali, Moz	Ban2, BF2, Phi, Ug1, Ug2
Vitamin B6			Ban1, Ban2, Moz, Ug1, Ug2
Folate	Ban1, Ban2, BF1, Mali	BF2, Moz	Ug2
Vitamin B12	Ban1, Ban2, BF1, BF2, Mali, Moz, Ug1, Ug2		Phi
Vitamin C	Phi	BF2	Mali, Moz, Ug1, Ug2
Vitamin A		Ban2, BF2, Mali	Moz, Ug1, Ug2
Calcium	Ban1, Ban2, BF1, BF2, Mali, Moz, Phi, Ug1, Ug2		
Iron	Ban1, Ban2, BF1, Moz, Phi, Ug1, Ug2	BF2	
Zinc			Ban1, BF1, BF2, Mali, Moz, Ug1

Table 14 – B. Lactating women			
	PA < 25%	**25% ≤ PA < 50%**	**PA > 75%**
Thiamin	Ban1, Ban2	BF2, Moz	Ug1
Riboflavin	Ban1, Ban2, Moz, Ug1	BF2, Ug2	
Niacin	Ban1, Moz		Ban2
Vitamin B6		Ban1, BF2, Moz	Ban2, Ug1
Folate	Ban1, Ban2, BF2, Moz, Ug1		
Vitamin B12	Ban1, Ban2, BF2, Moz, Ug1, Ug2		
Vitamin C	Ban1, BF2	Ban2	Moz, Ug1, Ug2
Vitamin A	Ban2, BF2	Ban1	
Calcium	Ban1, Ban2, Moz, Ug1, Ug2	BF2	
Iron	Moz, Ug1, Ug2	Ban1, Ban2	
Zinc		Ban2	Ban1, BF2

values: folate (86 to 470 µg/d); vitamin B12 (ranging from 0 to 1.3 µg/d, reflecting very low intakes of animal-source foods, with the exception of the Philippines: up to 3.7 µg/d for lactating women); calcium (from 147 to 596 mg/d). For some others nutrients, median intakes were highly variable: vitamin C (from 17 to 173 mg/d) and to a lesser extent iron (from 8.3 to 23.8 mg/d) and zinc (from 5.4 to 12.5 mg/d – largely related to the consumption of sorghum, dried leaves and dried okra).

For most of the micronutrients, Ugandan sites showed the highest median intakes. One can notice that median intakes for vitamin A and C in Mozambique approximated those of the Ugandan sites. One can also notice that the first Philippines site and the second Bangladesh site were often those exhibiting the lowest median intakes.

7.6 Probability of adequacy

Dietary patterns and micronutrient intakes were fairly similar across physiological subgroups. However, given the much higher requirements during pregnancy and lactation, PAs varied strongly according to physiological status. Therefore, PA results are described separately for NPNL and lactating women but, as stated previously, no study site had a sufficiently large subsample of pregnant women to describe PA results separately for this group. **Table 13** provides the estimated PA for each micronutrient by study site and physiological status and **Figures 2 – A** and **B** summarize the results for NPNL women.

Considering all micronutrients and all sites, the estimated prevalence of adequacy was below 50 percent for half of the cases (49 of 99 cells) for NPNL women and was two thirds (44 of 66 cells) for lactating women (**Table 14**).

Figure 2. Estimated prevalence of adequacy for micronutrients, by study site, for NPNL

Figure 2 – A. Estimated prevalence of adequacy for thiamin, riboflavin, niacin, vitamin B6, folate and vitamin B12, by study site, for NPNL

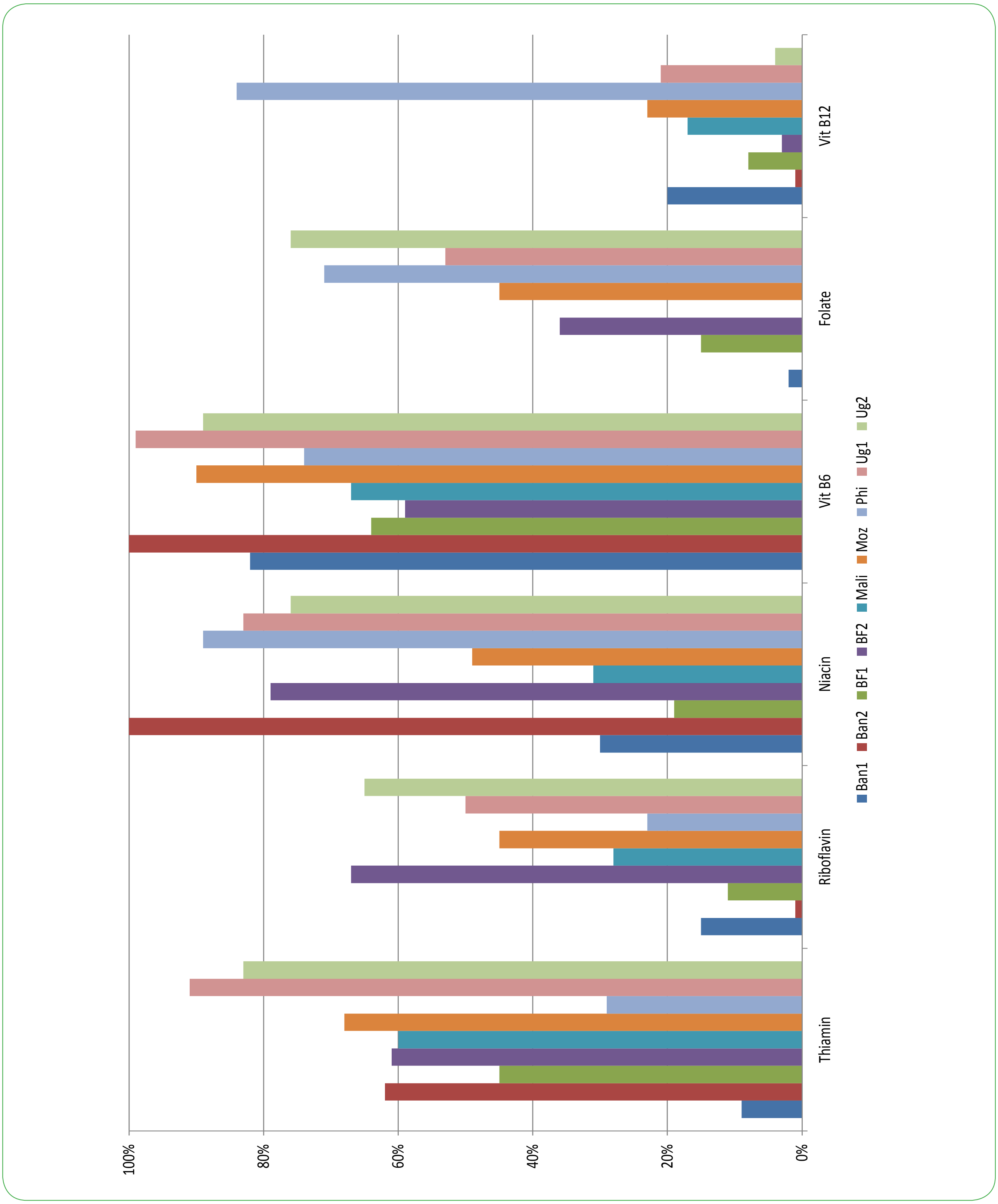
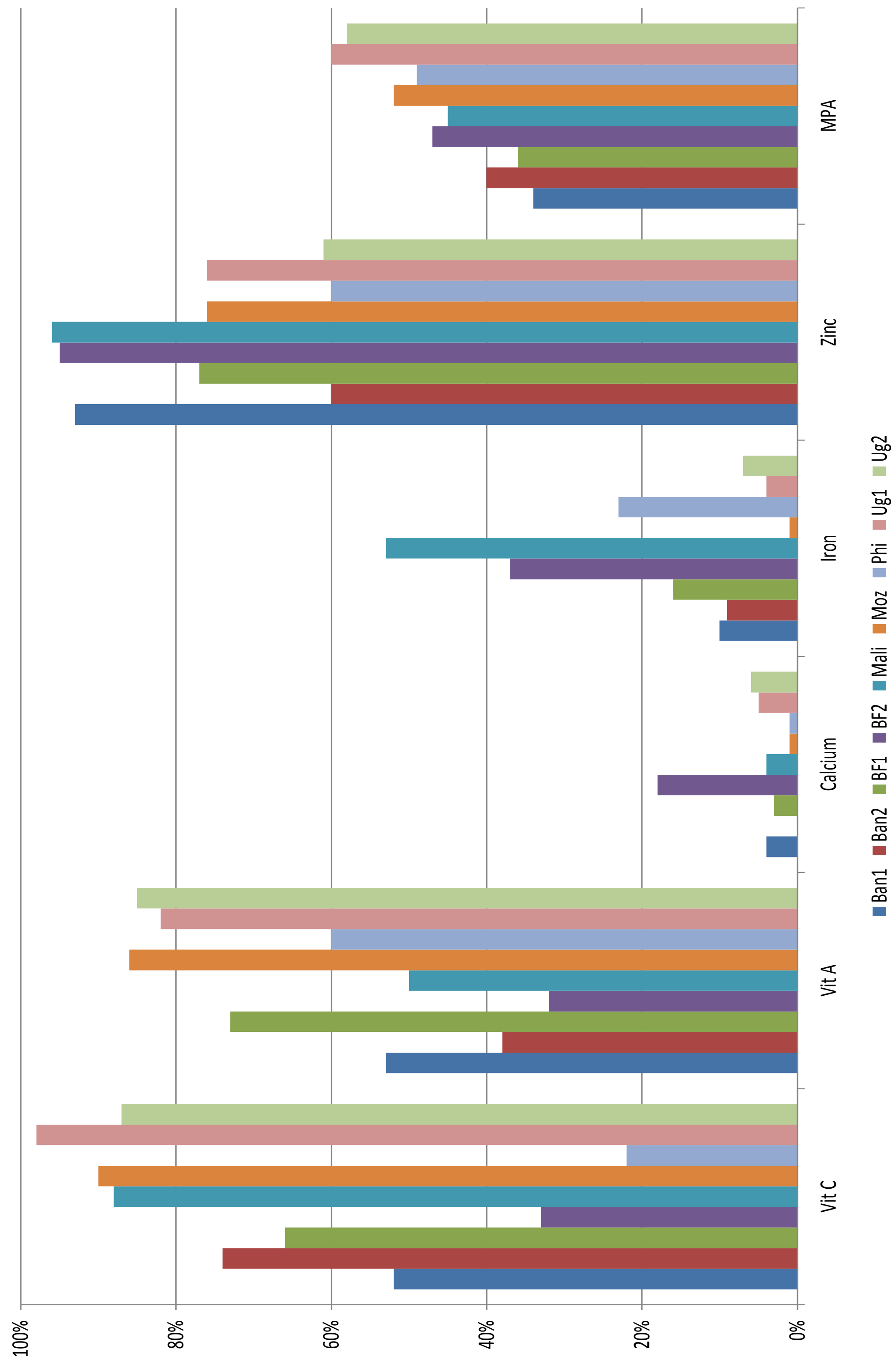


Figure 2. Estimated prevalence of adequacy for micronutrients, by study site, for NPNL

Figure 2 – B. Estimated prevalence of adequacy for vitamin C, vitamin A, calcium, iron, zinc and MPA, by study site, for NPNL



Site by site, out of eleven micronutrients the number for which the PA was below 50 percent among NPNL women was four and three in Ug1 and Ug2 datasets, respectively, five in BF2, Mali and Phi, six in Mozambique and in Ban2, and seven in Ban1 and BF1. Among lactating women, who have higher requirements, corresponding numbers were four in the Ug2, five in Ug1, eight in BF2 and Mozambique, nine in Ban2 and ten in Ban1.

PA estimates exceeded 75 percent in 27 instances for NPNL (12 of them being in the Ugandan sites) and in ten instances for lactating women (five of them in the Ugandan sites). Another way to summarize the magnitude and consistency of micronutrient gaps across sites is to consider the number of cells (i.e. number of sites per nutrient) with very low PA estimates, arbitrarily set below 25 percent. Estimated PA was very low for 35 out of 99 cells among NPNL women and for 29 out of 66 cells among lactating women.

There were low levels of MPA in almost all settings. Among NPNL women the highest mean MPA were of 0.58 and 0.60 in the Ug2 and Ug1 datasets, respectively; the lowest MPA were of 0.34 and 0.36 in the Ban1 and BF1 datasets, respectively.

7.7 Food group diversity and energy intake

As demonstrated in previous studies[15] and confirmed in WDDP-I, there were positive relationships between dietary diversity and energy intakes in all WDDP-II datasets. Even if the main objective was to characterize the relationship between food group diversity and micronutrient adequacy, the relationship between diversity and energy intake was also of interest in order to understand if any observed relationship between diversity and MPA was due to higher quantity of food, higher micronutrient density (quality) of diets or both.

Table 15 shows simple correlations between the four FGIs, restricted and not, and energy intake. Most relationships were significant but differences in levels of statistical significance between sites should be interpreted cautiously as sample sizes and therefore statistical power varied largely across sites. The number of significant correlations tended to increase along with the level of disaggregation of the FGI but the pattern was not so clear for the restricted indicators.

Correlations were low to moderate for both NPNL and lactating women. They tended to be higher for NPNL women than for lactating women (with the exception of the Ug1 dataset). They tended also to be higher for FGI-12 than for FGI-10E, FGI-9 and FGI-7, in that order, but this pattern was not consistent across all datasets. Generally speaking, correlations with energy intake were higher for restricted FGI. The highest correlations were found for the Ug2, then Mozambique, then Ban1 datasets; the lowest correlations were found for the Phi, then Ban2, then Ug1 datasets.

Figures 3 to **6** illustrate the relationship between energy intakes and FGI-7, FGI-9, FGI-10E and FGI-12, restricted and not, among all women. This relationship was positive and quite similar across sites for the eight indicators, even if in some cases it was a bit uneven. The increases in mean energy intakes at successive values of the FGI scores were fairly consistent across sites, with the exception of the Philippines for which there was a substantially lower energy intake.

7.8 Food group diversity and intakes of micronutrients

Table 16 to **19** show correlations between restricted FGIs and estimated usual intakes of each micronutrient, by study site and for each physiological status. Correlations for non-restricted FGIs were generally weaker and more often non-significant; they are not presented here.

Raw correlations (i.e. not controlling for energy) were statistically significant for almost all nutrients in almost all sites, regardless of the women's physiological status and of the FGI. Across all sites, there were between 11 percent (FGI-12R) and 24 percent (FGI-7R) non-significant correlations among NPNL women. These non-significant correlations were more frequent in the Ug1, Ban2 and Mozambique datasets, and more frequently for vitamin C, B6, B12 and iron.

When energy intake was controlled for, correlations were attenuated and many more of them became

[15] Ogle, Hung and Tuyet, 2001; Foote, *et al*,. 2004; Torheim, *et al*,. 2004.

Table 15. Correlations between FGIs or FGI-Rs and total energy intake (kcal/d), by study site and physiological status [a], [b]

	Ban1	Ban2	BF1 [c]	BF2	Mali [c]	Moz	Phi [c]	Ug1	Ug2
NPNL									
FGI-7	0.255 ***	0.056	0.171	0.064	0.158	0.229 *	0.047	0.053	0.308 ***
FGI-7R	0.285 ***	0.165 *	0.151	0.250 **	0.244 *	0.239 *	0.067	0.034	0.392 ***
FGI-9	0.247 ***	0.113	0.204 *	0.091	0.214 *	0.260 **	0.064	0.049	0.329 ***
FGI-9R	0.261 ***	0.167 *	0.200 *	0.248 **	0.208 *	0.345 ***	0.090 *	0.031	0.417 ***
FGI-10E	0.248 ***	0.135	0.193 *	0.212 *	0.177	0.284 **	0.042	0.107	0.388 ***
FGI-10ER	0.262 ***	0.194 **	0.220 *	0.349 ***	0.188	0.293 **	0.065	0.135	0.493 ***
FGI-12	0.304 ***	0.178 *	0.256 **	0.215 *	0.191	0.358 ***	0.064	0.176 *	0.404 ***
FGI-12R	0.322 ***	0.260 ***	0.228 **	0.341 ***	0.161	0.387 ***	0.101 **	0.194 **	0.507 ***
Lactating									
FGI-7	0.337 ***	0.137 *		0.079		0.140 *		0.169 *	0.344 ***
FGI-7R	0.205 *	0.155 *		0.221 ***		0.173 **		0.223 **	0.427 ***
FGI-9	0.275 **	0.076		0.097		0.138 *		0.204 **	0.322 ***
FGI-9R	0.217 *	0.121		0.252 ***		0.168 **		0.255 ***	0.411 ***
FGI-10E	0.236 *	0.112		0.134 *		0.124		0.264 ***	0.392 ***
FGI-10ER	0.180	0.116		0.293 ***		0.153 *		0.346 ***	0.475 ***
FGI-12	0.344 ***	0.164 *		0.146 *		0.177 **		0.273 ***	0.394 ***
FGI-12R	0.286 **	0.193 **		0.303 ***		0.205 **		0.348 ***	0.478 ***

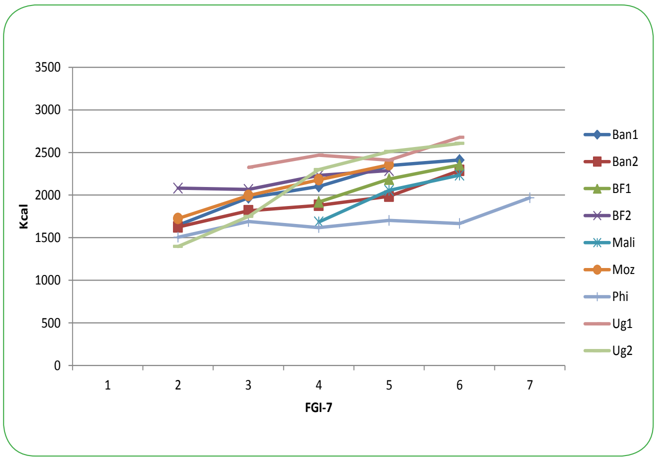
[a] FGI scores are from one observation day; BLUP for energy intake (calculated using repeat observations for a subset of the sample) is used for correlation analysis.

[b] Significance: * indicates $P < 0.05$; ** < 0.01; *** $P < 0.001$.

[c] There were too few lactating women for carrying out a separate analysis in urban Burkina Faso, Mali and Philippines.

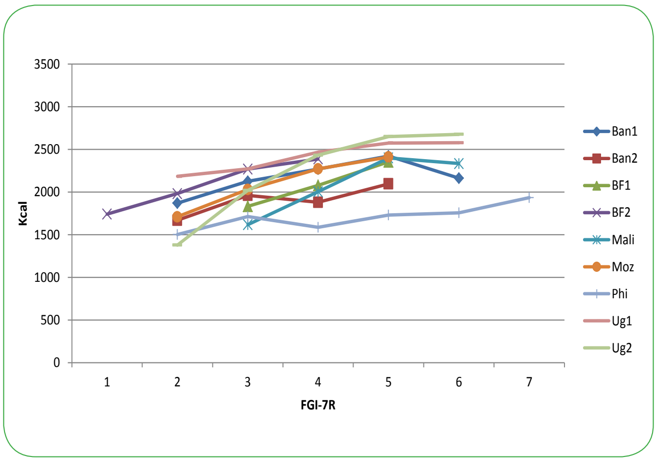
Figure 3. Total energy intake by FGI-7 levels among all women, by study site [a]

Figure 3 – A. Total energy intake by FGI-7 level among all women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

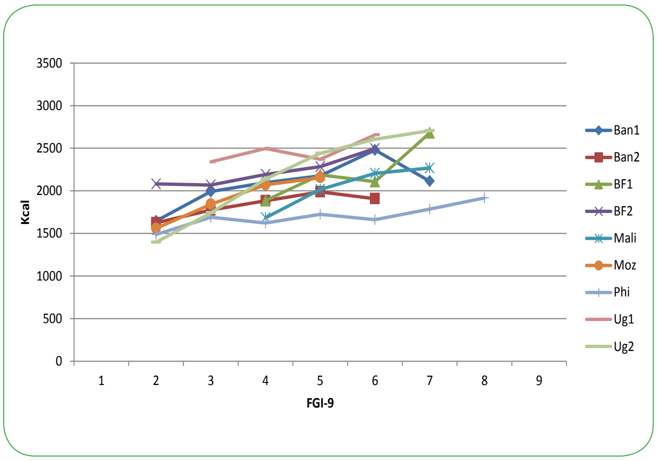
Figure 3 – B. Total energy intake by FGI-7R level among all women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

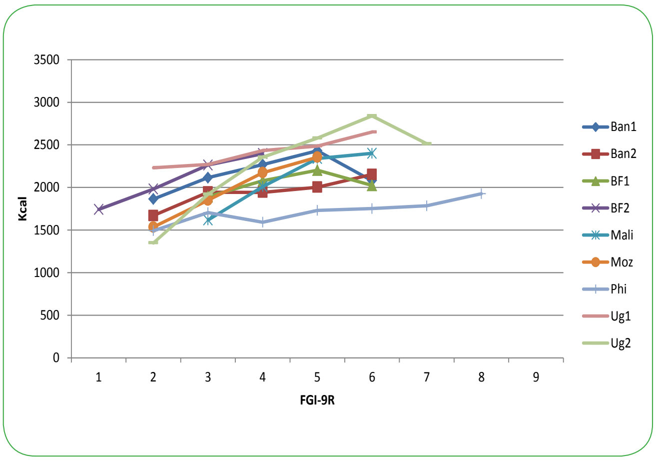
Figure 4. Total energy intake by FGI-9 levels among all women, by study site [a]

Figure 4 – A. Total energy intake by FGI-9 level among all women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

Figure 4 – B. Total energy intake by FGI-9R level among all women, by study site [a]

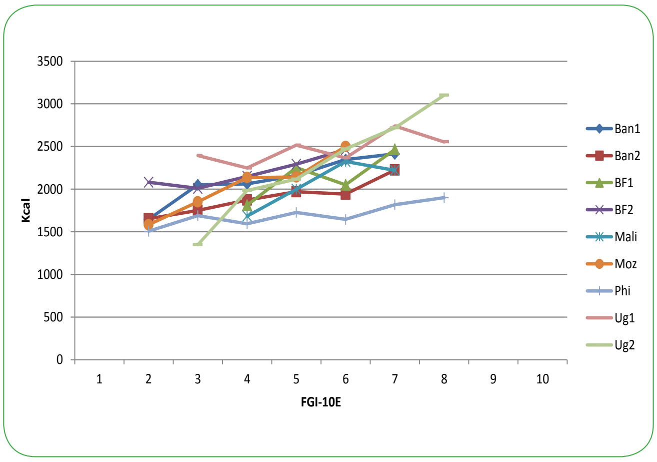


[a] Data points representing fewer than ten women are not presented on the graph.

non-significant. This was particularly visible for the Mozambique dataset, regardless of the physiological status and of the FGI. This probably means that higher quantities rather than higher variety of foods, or than more micronutrient-dense foods, drove micronutrient intakes more strongly in Mozambique than in other sites. This is consistent with previous observations about the very limited number of foods in the Mozambique diet and specifically with the lack of animal-source foods. There were also quite remarkable changes for Ug2 and sometimes Ug1 datasets, even with some correlations assuming a negative sign instead of a positive one (and remaining significant) when controlling for energy. In general, West African sites presented lower correlations than other African sites or Asian sites. However, one should keep in mind that sample size matters here.

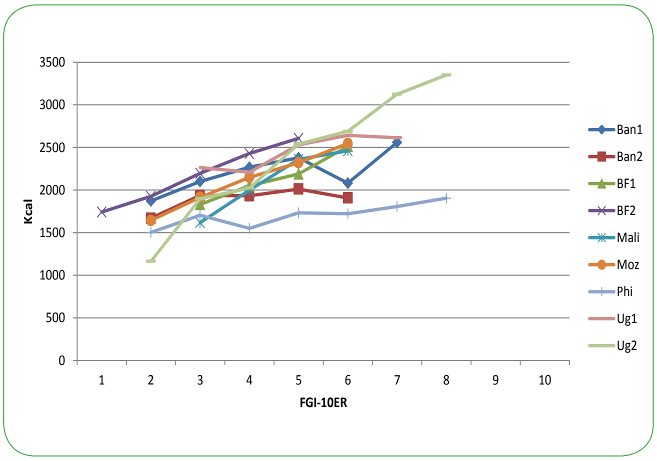
Figure 5. Total energy intake by FGI-10E levels among all women, by study site [a]

Figure 5 – A. Total energy intake by FGI-10E level among all women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

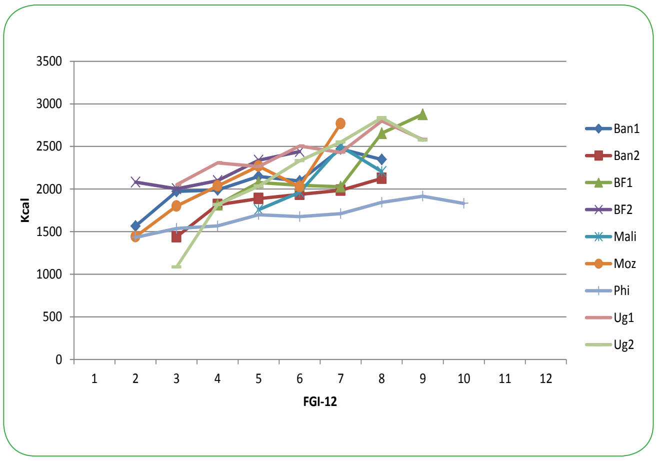
Figure 5 – B. Total energy intake by FGI-10ER level among all women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

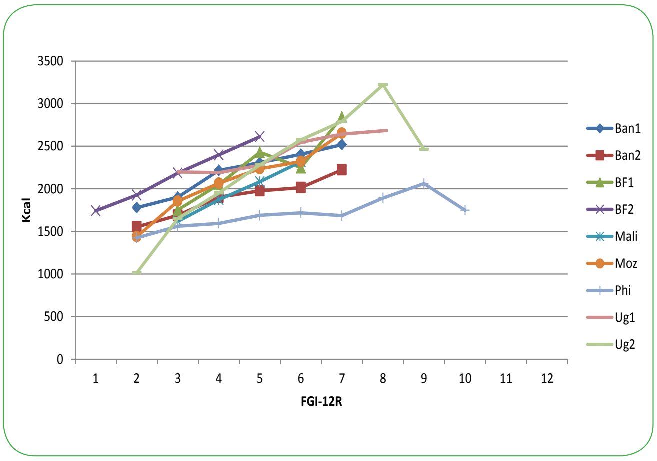
Figure 6. Total energy intake by FGI-12 levels among all women, by study site [a]

Figure 6 – A. Total energy intake by FGI-12 level among all women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

Figure 6 – B. Total energy intake by FGI-12R level among all women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

7.9 Food group diversity and mean probability of adequacy

Tables 20 – A and B show correlations between the food group diversity indicator and the MPA by study site and physiological status for the eight FGIs (FGI-7, FGI-9, FGI-10E and FGI-12, restricted and not).

Without controlling for energy, correlations between FGIs and MPA ranged from 0.10 to 0.57 among NPNL women and from 0.02 to 0.53 among lactating women. These correlations were significant in almost all sites, with the exception of some non-restricted indicators, mainly in rural Burkina Faso. Correlations were almost always higher for restricted (from 0.24 to 0.57) than for non-restricted (from 0.10 to 0.48) FGIs. On average, correlations were the highest for the first Bangladesh site, the second Ugandan site, the Mozambique and the Mali and the lowest for the rural Burkina Faso and the first Philippines site.

Table 16. Correlation between FGI-7R and estimated intakes of micronutrients, by study site [a, b]

Table 16 – A. Correlation between FGI-7R and estimated intakes of micronutrients among NPNL women, by study site [a, b]													
		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1 (n=301)	NC [c]	0.285 ***	0.417 ***	0.524 ***	0.342 ***	0.374 ***	0.467 ***	0.356 ***	0.341 ***	0.422 ***	0.472 ***	0.455 ***	0.373 ***
	C [c]		0.323 ***	0.460 ***	0.210 ***	0.257 ***	0.409 ***	0.317 ***	0.301 ***	0.377 ***	0.426 ***	0.385 ***	0.259 ***
Ban2 (n=201)	NC	0.165 *	0.203 **	0.402 ***	0.092	0.103	0.313 ***	0.423 ***	0.098	0.376 ***	0.404 ***	0.140 *	0.352 ***
	C		0.131	0.378 ***	-0.205 **	-0.119	0.270 ***	0.406 ***	0.032	0.363 ***	0.373 ***	0.041	0.427 ***
BF1 [d] (n=130)	NC	0.151	0.179 *	0.381 ***	0.370 ***	0.360 ***	0.240 **	0.293 ***	0.386 ***	0.376 ***	0.216 *	0.072	0.069
	C		0.105	0.359 ***	0.343 ***	0.336 ***	0.193 *	0.284 **	0.362 ***	0.349 ***	0.170	-0.011	-0.050
BF2 (n=134)	NC	0.250 **	0.249 **	0.268 **	0.440 ***	0.445 ***	0.277 **	0.230 **	0.473 ***	0.400 ***	0.427 ***	0.265 **	0.271 **
	C		0.102	0.159	0.387 ***	0.383 ***	0.169	0.238 **	0.447 ***	0.391 ***	0.382 ***	0.172 *	0.128
Mali [d] (n=102)	NC	0.244 *	0.257 **	0.534 ***	0.349 ***	0.251 *	0.490 ***	0.425 ***	0.108	0.628 ***	0.524 ***	0.163	0.312 **
	C		0.090	0.507 ***	0.259 **	0.115	0.438 ***	0.366 ***	0.028	0.600 ***	0.488 ***	0.018	0.200 *
Moz (n=97)	NC	0.239 *	0.299 **	0.154	0.260 *	0.062	0.263 **	0.133	0.183	0.092	0.123	0.193	0.357 ***
	C		0.188	0.028	0.141	-0.107	0.144	0.150	0.077	-0.005	-0.017	0.047	0.284 **
Phi [d] (n=723)	NC	0.117 **	0.177 ***	0.227 ***	0.051	0.149 ***	0.064	0.033	0.282 ***	0.213 ***	0.194 ***	0.160 ***	0.182 ***
	C		0.134 ***	0.196 ***	-0.011	0.102 **	0.021	0.007	0.267 ***	0.188 ***	0.166 ***	0.113 **	0.142 ***
Ug1 (n=197)	NC	0.034	0.088	0.101	0.266 ***	-0.053	0.110	0.166 *	-0.025	0.155 *	0.121	0.087	0.270 ***
	C		0.094	0.095	0.297 ***	-0.110	0.112	0.165 *	-0.057	0.153 *	0.118	0.090	0.331 ***
Ug2 (n=610)	NC	0.392 ***	0.173 ***	0.517 ***	0.321 ***	0.344 ***	0.206 ***	0.630 ***	0.319 ***	0.460 ***	0.380 ***	0.104 *	0.230 ***
	C		-0.250 ***	0.368 ***	0.027	0.072	-0.123 **	0.614 ***	0.129 **	0.330 ***	0.215 ***	-0.314 ***	-0.102 *

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).
[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake.

Table 16. Correlation between FGI-7R and estimated intakes of micronutrients, by study site [a, b]

Table 16 – B. Correlation between FGI-7R and estimated intakes of micronutrients among lactating women, by study site [a, b]													
		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1 (n=111)	NC [c]	0.205 *	0.359 ***	0.450 ***	0.310 ***	0.342 ***	0.467 ***	0.358 ***	0.242 *	0.332 ***	0.423 ***	0.416 ***	0.322 ***
	C [c]		0.302 **	0.410 ***	0.241 *	0.283 **	0.431 ***	0.311 ***	0.227 *	0.342 ***	0.395 ***	0.371 ***	0.310 ***
Ban2 (n=221)	NC	0.155 *	0.201 **	0.418 ***	0.056	0.121	0.358 ***	0.470 ***	0.110	0.417 ***	0.493 ***	0.181 **	0.345 ***
	C		0.153 *	0.401 ***	-0.255 ***	-0.053	0.326 ***	0.452 ***	0.056	0.411 ***	0.473 ***	0.106	0.380 ***
BF1 [d] (n=0)	NC												
	C												
BF2 (n=228)	NC	0.221 ***	0.284 ***	0.283 ***	0.380 ***	0.361 ***	0.226 ***	0.152 *	0.315 ***	0.391 ***	0.322 ***	0.264 ***	0.219 ***
	C		0.190 **	0.204 **	0.318 ***	0.296 ***	0.153 *	0.147 *	0.309 ***	0.374 ***	0.302 ***	0.197 **	0.088
Mali [d] (n=0)	NC												
	C												
Moz (n=242)	NC	0.173 **	0.159 *	0.185 **	0.228 ***	0.155 *	0.220 ***	0.207 **	0.177 **	0.111	0.114	0.088	0.129 *
	C		0.038	0.099	0.151 *	0.067	0.147 *	0.209 **	0.126	0.066	0.057	-0.037	0.010
Phi [d] (n=0)	NC												
	C												
Ug1 (n=198)	NC	0.223 **	0.074	0.316 ***	0.149 *	0.051	0.111	0.120	-0.039	0.299 ***	0.295 ***	0.159 *	0.193 **
	C		-0.115	0.255 ***	0.045	-0.117	-0.021	0.141 *	-0.129	0.273 ***	0.230 **	-0.015	0.049
Ug2 (n=344)	NC	0.427 ***	0.210 ***	0.488 ***	0.350 ***	0.413 ***	0.221 ***	0.601 ***	0.329 ***	0.406 ***	0.336 ***	0.120 *	0.223 ***
	C		-0.266 ***	0.281 ***	0.031	0.157 **	-0.147 **	0.563 ***	0.137 *	0.265 ***	0.140 **	-0.322 ***	-0.129 *

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).

[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.

[c] NC = not controlled for energy intake; C = controlled for energy intake.

[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Table 17. Correlation between FGI-9R and estimated intakes of micronutrients, by study site [a, b]

Table 17 – A. Correlation between FGI-9R and estimated intakes of micronutrients among NPNL women, by study site [a, b]

		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1 (n=301)	NC [c]	0.427 ***	0.210 ***	0.488 ***	0.350 ***	0.413 ***	0.221 ***	0.601 ***	0.329 ***	0.406 ***	0.336 ***	0.120 *	0.223 ***
	C [c]		-0.266 ***	0.281 ***	0.031	0.157 **	-0.147 **	0.563 ***	0.137 *	0.265 ***	0.140 **	-0.322 ***	-0.129 *
Ban2 (n=201)	NC	0.167 *	0.215 **	0.436 ***	0.090	0.119	0.357 ***	0.419 ***	0.122	0.407 ***	0.436 ***	0.170 *	0.371 ***
	C		0.157 *	0.418 ***	-0.215 **	-0.083	0.321 ***	0.401 ***	0.058	0.395 ***	0.409 ***	0.080	0.465 ***
BF1 (n=130)	NC	0.200 *	0.200 *	0.413 ***	0.364 ***	0.397 ***	0.259 **	0.228 **	0.502 ***	0.508 ***	0.267 **	0.133	0.087
	C		0.090	0.370 ***	0.312 ***	0.351 ***	0.191 *	0.215 *	0.474 ***	0.478 ***	0.207 *	0.031	-0.072
BF2 (n=134)	NC	0.248 **	0.241 **	0.264 **	0.435 ***	0.430 ***	0.271 **	0.226 **	0.460 ***	0.419 ***	0.427 ***	0.271 **	0.263 **
	C		0.092	0.155	0.381 ***	0.363 ***	0.163	0.233 **	0.433 ***	0.410 ***	0.383 ***	0.180 *	0.116
Mali (n=102)	NC	0.208 *	0.216 *	0.492 ***	0.286 **	0.202 *	0.474 ***	0.389 ***	0.095	0.654 ***	0.483 ***	0.133	0.261 **
	C		0.069	0.478 ***	0.205 *	0.079	0.436 ***	0.339 ***	0.026	0.634 ***	0.459 ***	0.008	0.162
Moz (n=97)	NC	0.345 ***	0.353 ***	0.244 *	0.368 ***	0.277 **	0.272 **	0.037	0.404 ***	0.412 ***	0.288 **	0.220 *	0.271 **
	C		0.142	0.039	0.185	0.078	0.042	0.077	0.281 **	0.304 **	0.109	-0.047	0.097
Phi (n=723)	NC	0.123 ***	0.193 ***	0.243 ***	0.040	0.137 ***	0.079 *	0.042	0.269 ***	0.240 ***	0.171 ***	0.183 ***	0.183 ***
	C		0.150 ***	0.213 ***	-0.028	0.083 *	0.035	0.014	0.252 ***	0.215 ***	0.140 ***	0.137 ***	0.137 ***
Ug1 (n=197)	NC	0.031	0.087	0.148 *	0.222 **	-0.009	0.115	0.133	0.023	0.267 ***	0.204 **	0.130	0.255 ***
	C		0.096	0.145 *	0.247 ***	-0.045	0.120	0.132	0.005	0.265 ***	0.214 **	0.156 *	0.314 ***
Ug2 (n=610)	NC	0.417 ***	0.232 ***	0.531 ***	0.357 ***	0.345 ***	0.249 ***	0.570 ***	0.359 ***	0.493 ***	0.434 ***	0.179 ***	0.278 ***
	C		-0.183 ***	0.364 ***	0.056	0.041	-0.085 *	0.548 ***	0.164 ***	0.359 ***	0.270 ***	-0.224 ***	-0.055

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).

[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.

[c] NC = not controlled for energy intake; C = controlled for energy intake.

Table 17. Correlation between FGI-9R and estimated intakes of micronutrients, by study site [a, b]

Table 17 – B. Correlation between FGI-9R and estimated intakes of micronutrients among lactating women, by study site [a, b]

		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1	NC [c]	0.217 *	0.370 ***	0.471 ***	0.322 ***	0.341 ***	0.467 ***	0.350 ***	0.263 **	0.361 ***	0.425 ***	0.426 ***	0.320 ***
(n=111)	C [c]		0.307 **	0.429 ***	0.247 **	0.270 **	0.426 ***	0.297 **	0.248 **	0.373 ***	0.395 ***	0.377 ***	0.283 **
Ban2	NC	0.121	0.174 **	0.427 ***	0.031	0.114	0.366 ***	0.434 ***	0.124	0.456 ***	0.502 ***	0.192 **	0.318 ***
(n=221)	C		0.163 *	0.431 ***	-0.234 ***	0.009	0.352 ***	0.420 ***	0.085	0.451 ***	0.493 ***	0.151 *	0.380 ***
BF1 [d]	NC												
(n=0)	C												
BF2	NC	0.252 ***	0.293 ***	0.283 ***	0.388 ***	0.384 ***	0.252 ***	0.108	0.345 ***	0.452 ***	0.328 ***	0.276 ***	0.237 ***
(n=228)	C		0.176 **	0.187 **	0.305 ***	0.306 ***	0.169 *	0.102	0.341 ***	0.437 ***	0.306 ***	0.198 **	0.082
Mali [d]	NC												
(n=0)	C												
Moz	NC	0.168 **	0.163 **	0.236 ***	0.225 ***	0.302 ***	0.260 ***	0.105	0.318 ***	0.299 ***	0.300 ***	0.147 *	0.071
(n=242)	C		0.048	0.170 **	0.152 *	0.255 ***	0.201 **	0.102	0.281 ***	0.266 ***	0.257 ***	0.043	-0.081
Phi [d]	NC												
(n=0)	C												
Ug1	NC	0.255 ***	0.077	0.435 ***	0.124	0.120	0.191 **	0.087	-0.022	0.470 ***	0.445 ***	0.239 ***	0.225 **
(n=198)	C		-0.144 *	0.377 ***	-0.003	-0.053	0.058	0.112	-0.125	0.449 ***	0.386 ***	0.074	0.062
Ug2	NC	0.411 ***	0.239 ***	0.518 ***	0.374 ***	0.357 ***	0.219 ***	0.542 ***	0.328 ***	0.458 ***	0.410 ***	0.194 ***	0.269 ***
(n=344)	C		-0.184 ***	0.348 ***	0.094	0.082	-0.132 *	0.496 ***	0.145 **	0.334 ***	0.246 ***	-0.179 ***	-0.038

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).

[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.

[c] NC = not controlled for energy intake; C = controlled for energy intake.

[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Table 18. Correlation between FGI-10ER and estimated intakes of micronutrients, by study site [a, b]

Table 18 – A. Correlation between FGI-10ER and estimated intakes of micronutrients among NPNL women, by study site [a, b]

		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1	NC [c]	0.123 ***	0.193 ***	0.243 ***	0.040	0.137 ***	0.079 *	0.042	0.269 ***	0.240 ***	0.171 ***	0.183 ***	0.183 ***
(n=301)	C [c]		0.150 ***	0.213 ***	-0.028	0.083 *	0.035	0.014	0.252 ***	0.215 ***	0.140 ***	0.137 ***	0.137 ***
Ban2	NC	0.194 **	0.236 ***	0.462 ***	0.117	0.152 *	0.359 ***	0.437 ***	0.152 *	0.399 ***	0.451 ***	0.184 **	0.386 ***
(n=201)	C		0.148 *	0.434 ***	-0.213 **	-0.064	0.308 ***	0.417 ***	0.079	0.385 ***	0.415 ***	0.075	0.449 ***
BF1	NC	0.220 *	0.231 **	0.409 ***	0.380 ***	0.436 ***	0.283 **	0.203 *	0.490 ***	0.465 ***	0.245 **	0.152	0.121
(n=130)	C		0.115	0.353 ***	0.320 ***	0.387 ***	0.208 *	0.187 *	0.458 ***	0.426 ***	0.174 *	0.042	-0.045
BF2	NC	0.349 ***	0.371 ***	0.338 ***	0.500 ***	0.504 ***	0.464 ***	0.122	0.495 ***	0.377 ***	0.444 ***	0.363 ***	0.367 ***
(n=134)	C		0.183 *	0.182 *	0.382 ***	0.390 ***	0.344 ***	0.131	0.465 ***	0.370 ***	0.382 ***	0.239 **	0.165
Mali	NC	0.188	0.195 *	0.478 ***	0.258 **	0.206 *	0.473 ***	0.397 ***	0.109	0.640 ***	0.464 ***	0.095	0.217 *
(n=102)	C		0.060	0.474 ***	0.183	0.106	0.444 ***	0.356 ***	0.049	0.623 ***	0.449 ***	-0.026	0.114
Moz	NC	0.293 **	0.373 ***	0.172	0.332 ***	0.203 *	0.315 **	0.055	0.363 ***	0.301 **	0.216 *	0.197	0.283 **
(n=97)	C		0.242 *	0.013	0.193	0.033	0.167	0.074	0.262 **	0.209 *	0.061	0.003	0.168
Phi	NC	0.122 ***	0.197 ***	0.219 ***	0.041	0.150 ***	0.058	0.016	0.283 ***	0.223 ***	0.181 ***	0.170 ***	0.169 ***
(n=723)	C		0.156 ***	0.184 ***	-0.026	0.099 **	0.011	-0.013	0.267 ***	0.198 ***	0.151 ***	0.121 **	0.118 **
Ug1	NC	0.135	0.073	0.189 **	0.165 *	0.032	0.193 **	0.084	0.063	0.280 ***	0.238 ***	0.140 *	0.223 **
(n=197)	C		-0.043	0.156 *	0.109	-0.093	0.142 *	0.080	-0.024	0.271 ***	0.201 **	0.062	0.180 *
Ug2	NC	0.493 ***	0.305 ***	0.557 ***	0.449 ***	0.439 ***	0.365 ***	0.485 ***	0.405 ***	0.512 ***	0.458 ***	0.278 ***	0.339 ***
(n=610)	C		-0.169 ***	0.330 ***	0.117 **	0.105 **	0.013	0.457 ***	0.175 ***	0.349 ***	0.258 ***	-0.161 ***	-0.050

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).

[b] Statistical significance: * indicates $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

c NC = not controlled for energy intake; C = controlled for energy intake.

Table 18. Correlation between FGI-10ER and estimated intakes of micronutrients, by study site [a, b]

Table 18 – B. Correlation between FGI-10ER and estimated intakes of micronutrients among lactating women, by study site [a, b]

		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1	NC	0.180	0.369 ***	0.454 ***	0.273 **	0.350 ***	0.463 ***	0.282 **	0.290 **	0.316 ***	0.393 ***	0.425 ***	0.286 **
(n=111)	C		0.335 ***	0.424 ***	0.213 *	0.317 ***	0.434 ***	0.235 *	0.278 **	0.324 ***	0.368 ***	0.392 ***	0.277 **
Ban2	NC	0.116	0.171 *	0.411 ***	0.020	0.110	0.360 ***	0.421 ***	0.135 *	0.442 ***	0.456 ***	0.168 *	0.306 ***
(n=221)	C		0.167 *	0.415 ***	-0.253 ***	0.011	0.347 ***	0.409 ***	0.098	0.437 ***	0.445 ***	0.123	0.366 ***
BF1	NC												
(n=0)	C												
BF2	NC	0.293 ***	0.331 ***	0.255 ***	0.397 ***	0.379 ***	0.365 ***	0.082	0.308 ***	0.408 ***	0.342 ***	0.314 ***	0.330 ***
(n=228)	C		0.194 **	0.131 *	0.289 ***	0.278 ***	0.281 ***	0.075	0.303 ***	0.390 ***	0.319 ***	0.225 ***	0.179 **
Mali	NC												
(n=0)	C												
Moz	NC	0.153 *	0.164 *	0.207 **	0.221 ***	0.301 ***	0.262 ***	0.043	0.289 ***	0.256 ***	0.265 ***	0.147 *	0.058
(n=242)	C		0.071	0.143 *	0.162 *	0.264 ***	0.215 ***	0.043	0.255 ***	0.224 ***	0.227 ***	0.062	-0.073
Phi	NC												
(n=0)	C												
Ug1	NC	0.135	0.073	0.189 **	0.165 *	0.032	0.193 **	0.084	0.063	0.280 ***	0.238 ***	0.140 *	0.223 **
(n=198)	C		-0.043	0.156 *	0.109	-0.093	0.142 *	0.080	-0.024	0.271 ***	0.201 **	0.062	0.180 *
Ug2	NC	0.493 ***	0.305 ***	0.557 ***	0.449 ***	0.439 ***	0.365 ***	0.485 ***	0.405 ***	0.512 ***	0.458 ***	0.278 ***	0.339 ***
(n=344)	C		-0.169 ***	0.330 ***	0.117 **	0.105 **	0.013	0.457 ***	0.175 ***	0.349 ***	0.258 ***	-0.161 ***	-0.050

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).
[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake.
[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Table 19. Correlation between FGI-12R and estimated intakes of micronutrients, by study site [a, b]

Table 19 – A. Correlation between FGI-12R and estimated intakes of micronutrients among NPNL women, by study site [a, b]

		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 (µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1	NC	0.322 ***	0.474 ***	0.489 ***	0.377 ***	0.486 ***	0.468 ***	0.319 ***	0.387 ***	0.375 ***	0.408 ***	0.432 ***	0.400 ***
(n=301)	C		0.374 ***	0.402 ***	0.226 ***	0.385 ***	0.400 ***	0.273 ***	0.346 ***	0.320 ***	0.350 ***	0.343 ***	0.252 ***
Ban2	NC	0.260 ***	0.281 ***	0.466 ***	0.174 *	0.211 **	0.384 ***	0.415 ***	0.234 ***	0.327 ***	0.432 ***	0.283 ***	0.402 ***
(n=201)	C		0.110	0.401 ***	-0.235 ***	-0.068	0.299 ***	0.388 ***	0.143 *	0.307 ***	0.373 ***	0.152 *	0.369 ***
BF1	NC	0.228 **	0.193 *	0.407 ***	0.415 ***	0.451 ***	0.193 *	0.305 ***	0.532 ***	0.488 ***	0.229 **	0.103	0.102
(n=130)	C		0.054	0.346 ***	0.357 ***	0.400 ***	0.099	0.293 ***	0.501 ***	0.448 ***	0.152	-0.024	-0.080
BF2	NC	0.341 ***	0.343 ***	0.314 ***	0.482 ***	0.517 ***	0.423 ***	0.140	0.504 ***	0.345 ***	0.412 ***	0.302 ***	0.328 ***
(n=134)	C		0.147	0.156	0.362 ***	0.413 ***	0.296 ***	0.149	0.474 ***	0.335 ***	0.347 ***	0.170	0.109
Mali	NC	0.161	0.208 *	0.432 ***	0.243 *	0.234 *	0.470 ***	0.381 ***	0.196 *	0.643 ***	0.414 ***	0.100	0.209 *
(n=102)	C		0.143	0.434 ***	0.184	0.173	0.454 ***	0.350 ***	0.152	0.632 ***	0.403 ***	0.002	0.136
Moz	NC	0.387 ***	0.443 ***	0.206 *	0.405 ***	0.248 *	0.335 ***	0.085	0.338 ***	0.200 *	0.276 **	0.272 **	0.368 ***
(n=97)	C		0.251 *	-0.010	0.216 *	0.018	0.112	0.114	0.182	0.052	0.071	0.021	0.223 *
Phi	NC	0.137 ***	0.220 ***	0.238 ***	0.084 *	0.188 ***	0.064	0.070	0.281 ***	0.230 ***	0.203 ***	0.177 ***	0.185 ***
(n=723)	C		0.175 ***	0.197 ***	0.015	0.136 ***	0.012	0.039	0.263 ***	0.201 ***	0.169 ***	0.118 **	0.127 ***
Ug1	NC	0.194 **	0.140 *	0.135	0.211 **	0.080	0.175 *	0.089	0.118	0.172 *	0.195 **	0.167 *	0.274 ***
(n=197)	C		-0.008	0.079	0.127	-0.086	0.076	0.084	0.000	0.157 *	0.123	0.040	0.198 **
Ug2	NC	0.507 ***	0.345 ***	0.545 ***	0.480 ***	0.425 ***	0.359 ***	0.481 ***	0.399 ***	0.457 ***	0.458 ***	0.303 ***	0.390 ***
(n=610)	C		-0.114 **	0.294 ***	0.155 ***	0.061	-0.015	0.453 ***	0.157 ***	0.269 ***	0.249 ***	-0.139 ***	0.021

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).
[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake.

Table 19. Correlation between FGI-12R and estimated intakes of micronutrients, by study site [a, b]

Table 19 – B. Correlation between FGI-12R and estimated intakes of micronutrients among lactating women, by study site [a, b]

		Energy (kcal)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vit B6 (mg)	Folate (µg)	Vit B12 µg)	Vit C (mg)	Vit A (RE)	Calcium (mg)	Iron (mg)	Zinc (mg)
Ban1 (n=111)	NC	0.286 **	0.431 ***	0.404 ***	0.322 ***	0.466 ***	0.437 ***	0.309 ***	0.262 **	0.160	0.314 ***	0.423 ***	0.363 ***
	C		0.337 ***	0.326 ***	0.170	0.387 ***	0.373 ***	0.227 *	0.244 *	0.171	0.267 **	0.346 ***	0.245 **
Ban2 (n=221)	NC	0.193 **	0.245 ***	0.444 ***	0.098	0.196 **	0.390 ***	0.433 ***	0.212 **	0.359 ***	0.412 ***	0.273 ***	0.298 ***
	C		0.177 **	0.411 ***	-0.239 ***	0.049	0.346 ***	0.408 ***	0.152 *	0.352 ***	0.377 ***	0.197 **	0.248 ***
BF1 (n=0)	NC												
	C												
BF2 (n=228)	NC	0.303 ***	0.317 ***	0.247 ***	0.384 ***	0.379 ***	0.313 ***	0.103	0.315 ***	0.381 ***	0.308 ***	0.283 ***	0.313 ***
	C		0.167 *	0.116	0.263 ***	0.272 ***	0.218 ***	0.097	0.310 ***	0.361 ***	0.282 ***	0.186 **	0.142 *
Mali (n=0)	NC												
	C												
Moz (n=242)	NC	0.205 **	0.166 **	0.161 *	0.223 ***	0.320 ***	0.213 ***	0.083	0.298 ***	0.164 *	0.234 ***	0.140 *	0.053
	C		0.008	0.041	0.108	0.252 ***	0.115	0.084	0.247 ***	0.113	0.176 **	0.006	-0.133 *
Phi (n=0)	NC												
	C												
Ug1 (n=198)	NC	0.348 ***	0.217 **	0.333 ***	0.294 ***	0.183 **	0.275 ***	0.045	0.171 *	0.316 ***	0.289 ***	0.338 ***	0.317 ***
	C		-0.037	0.228 **	0.149 *	-0.047	0.099	0.077	0.055	0.280 ***	0.172 *	0.123	0.102
Ug2 (n=344)	NC	0.478 ***	0.320 ***	0.522 ***	0.439 ***	0.429 ***	0.323 ***	0.444 ***	0.371 ***	0.376 ***	0.456 ***	0.280 ***	0.365 ***
	C		-0.138 *	0.282 ***	0.120 *	0.124 *	-0.044	0.379 ***	0.161 **	0.203 ***	0.268 ***	-0.124 *	0.038

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).

[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.

[c] NC = not controlled for energy intake; C = controlled for energy intake.

[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Table 20. Correlation between FGIs and MPA, by study site and physiological status

Table 20 – A. Correlation between FGIs and MPA among NPNL women, by study site [a, b]										
		NPNL								
		Ban1	Ban2	BF1	BF2	Mali	Moz	Phi	Ug1	Ug2
FGI-7	NC	0.381 ***	0.185 **	0.324 ***	0.102	0.321 **	0.304 **	0.226 ***	0.218 **	0.357 ***
	C	0.301 ***	0.210 **	0.282 **	0.080	0.310 **	0.206 *	0.224 ***	0.236 ***	0.192 ***
FGI-7R	NC	0.493 ***	0.316 ***	0.371 ***	0.468 ***	0.513 ***	0.352 ***	0.252 ***	0.239 ***	0.444 ***
	C	0.420 ***	0.288 ***	0.359 ***	0.413 ***	0.515 ***	0.267 **	0.237 ***	0.278 ***	0.233 ***
FGI-9	NC	0.462 ***	0.273 ***	0.348 ***	0.131	0.380 ***	0.321 ***	0.240 ***	0.256 ***	0.405 ***
	C	0.403 ***	0.277 ***	0.288 ***	0.095	0.340 ***	0.196 *	0.236 ***	0.288 ***	0.251 ***
FGI-9R	NC	0.508 ***	0.341 ***	0.414 ***	0.459 ***	0.473 ***	0.420 ***	0.263 ***	0.268 ***	0.490 ***
	C	0.451 ***	0.323 ***	0.379 ***	0.403 ***	0.491 ***	0.259 **	0.246 ***	0.317 ***	0.285 ***
FGI-10E	NC	0.489 ***	0.319 ***	0.361 ***	0.258 **	0.343 ***	0.359 ***	0.228 ***	0.279 ***	0.465 ***
	C	0.436 ***	0.322 ***	0.314 ***	0.164	0.323 ***	0.233 *	0.223 ***	0.273 ***	0.279 ***
FGI-10ER	NC	0.502 ***	0.361 ***	0.436 ***	0.554 ***	0.449 ***	0.415 ***	0.254 ***	0.309 ***	0.558 ***
	C	0.444 ***	0.325 ***	0.393 ***	0.459 ***	0.475 ***	0.308 **	0.234 ***	0.289 ***	0.308 ***
FGI-12	NC	0.473 ***	0.318 ***	0.330 ***	0.253 **	0.394 ***	0.401 ***	0.256 ***	0.285 ***	0.484 ***
	C	0.386 ***	0.277 ***	0.224 *	0.155	0.388 ***	0.222 *	0.251 ***	0.228 **	0.292 ***
FGI-12R	NC	0.500 ***	0.398 ***	0.439 ***	0.527 ***	0.442 ***	0.469 ***	0.286 ***	0.297 ***	0.573 ***
	C	0.410 ***	0.314 ***	0.391 ***	0.428 ***	0.493 ***	0.298 **	0.265 ***	0.229 **	0.319 ***

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).

[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.

[c] NC = not controlled for energy intake; C = controlled for energy intake.

[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Table 20. Correlation between FGIs and MPA, by study site and physiological status

Table 20 – B. Correlation between FGIs and MPA among lactating women, by study site [a, b]

		Ban1	Ban2	BF1	BF2	Mali	Moz	Phi	Ug1	Ug2
		Lactating								
FGI-7	NC	0.272 **	0.166 *		0.017		0.197 **		0.267 ***	0.328 ***
	C	0.126	0.098		-0.030		0.140 *		0.210 **	0.085
FGI-7R	NC	0.363 ***	0.253 ***		0.372 ***		0.288 ***		0.298 ***	0.413 ***
	C	0.308 **	0.206 **		0.308 ***		0.238 ***		0.207 **	0.120 *
FGI-9	NC	0.327 ***	0.184 **		0.073		0.294 ***		0.368 ***	0.353 ***
	C	0.227 *	0.184 **		0.025		0.283 ***		0.317 ***	0.162 **
FGI-9R	NC	0.382 ***	0.265 ***		0.398 ***		0.382 ***		0.399 ***	0.446 ***
	C	0.323 ***	0.256 ***		0.322 ***		0.380 ***		0.317 ***	0.208 ***
FGI-10E	NC	0.253 **	0.187 **		0.120		0.252 ***		0.424 ***	0.413 ***
	C	0.160	0.155 *		0.058		0.233 ***		0.344 ***	0.172 **
FGI-10ER	NC	0.332 ***	0.256 ***		0.422 ***		0.331 ***		0.450 ***	0.523 ***
	C	0.285 **	0.248 ***		0.330 ***		0.317 ***		0.316 ***	0.264 ***
FGI-12	NC	0.214 *	0.222 ***		0.100		0.243 ***		0.427 ***	0.417 ***
	C	0.050	0.152 *		0.027		0.170 **		0.342 ***	0.177 ***
FGI-12R	NC	0.319 ***	0.283 ***		0.393 ***		0.311 ***		0.449 ***	0.529 ***
	C	0.210 *	0.212 **		0.287 ***		0.241 ***		0.313 ***	0.272 ***

[a] Diversity scores are from one observation day in each study site. Usual intake of energy and nutrients were estimated by best linear unbiased predictor (see **Section 4.4**).
[b] Statistical significance: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake.
[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Figure 7. Correlation between FGIs-R and MPA, by study site

Figure 7 – A. Correlation between FGIs-R and MPA among NPNL women when not controlled for energy, by study site

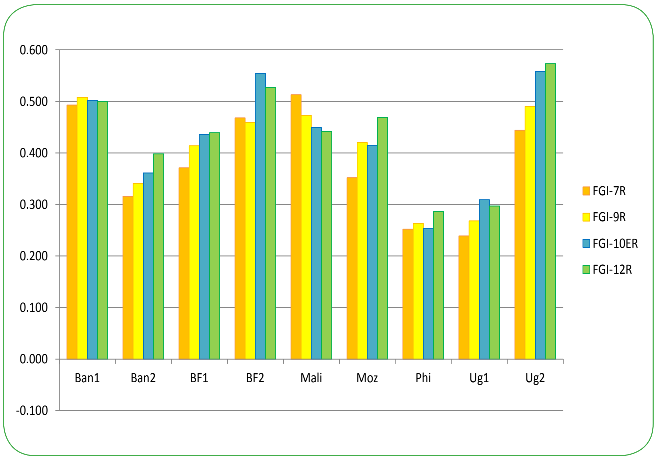


Figure 7 – B. Correlation between FGIs-R and MPA among NPNL women when controlled for energy, by study site

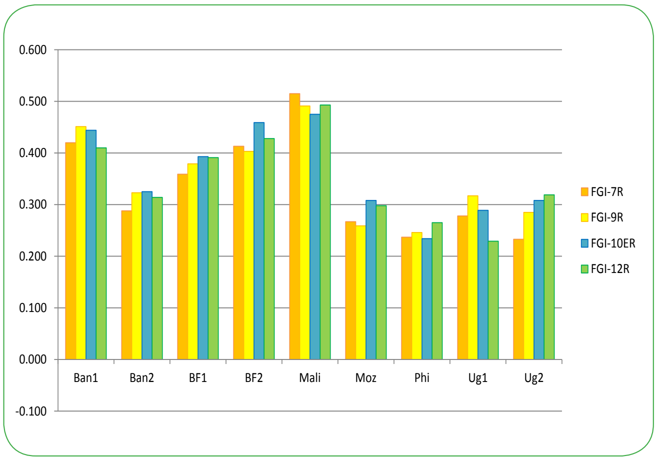


Figure 7 – C. Correlation between FGIs-R and MPA among lactating women when not controlled for energy, by study site

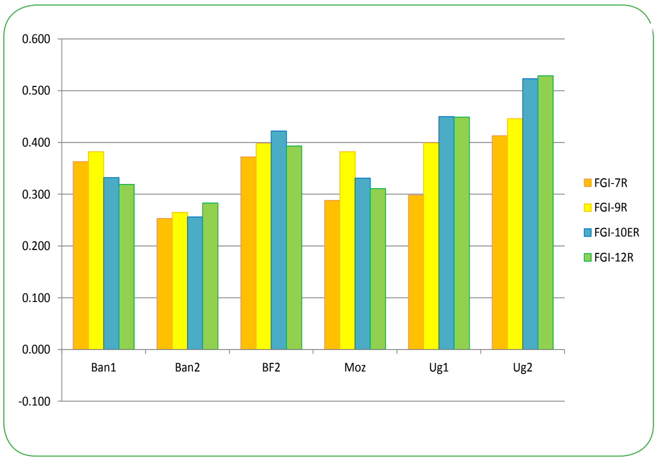
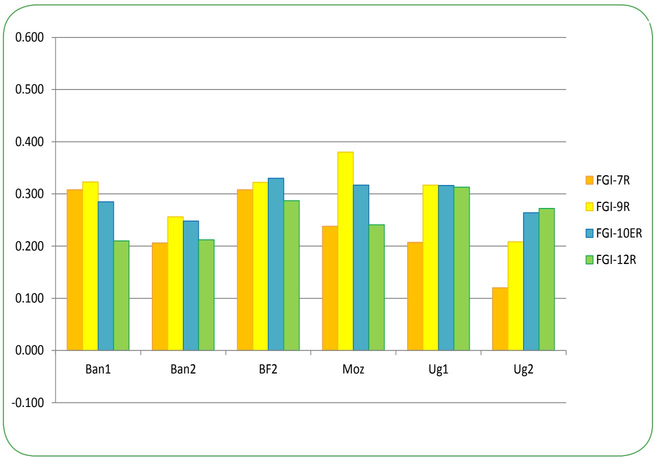


Figure 7 – D. Correlation between FGIs-R and MPA among lactating women when controlled for energy, by study site



When energy was controlled for, correlations tended to be attenuated and some of them became not significant (most often for FGI-7 and among lactating women). This attenuation was most noticeable for the Ug2 dataset. But there were quite a few exceptions where correlations increased slightly (notably for Ug1, Mali, Phi and Ban2 datasets). Correlations adjusted for energy intake ranged from 0.12 to 0.52 and were still higher for restricted (from 0.12 to 0.52) than for non-restricted FGIs (0.02 to 0.40) and for NPNL women (from 0.09 to 0.52) than for lactating women (from 0.02 to 0.38).

In the BF2 dataset the difference between correlations for non-restricted FGIs (weak and non-significant) and restricted ones (strong and highly significant) was striking, whether energy was controlled for or not. This could come from the consumption of small quantities of several foods, probably put as ingredients in sauces (e.g. groundnut paste, pepper, fish, sometimes altogether but all in small quantities so that women tended to get < 15g of each). This would then lead to increased FGI scores without an increase of the MPA by the same magnitude.

Correlations generally increased with the disaggregation of the FGI meaning they were higher for FGI-12 than for FGI-10E, FGI-9, then FGI-7, in that order. This pattern tended to be more visible when energy was

Figure 8. Correlation between FGIs and MPA, by study site

Figure 8 – A. Correlation between FGIs and MPA among NPNL women when not controlled for energy, by study site

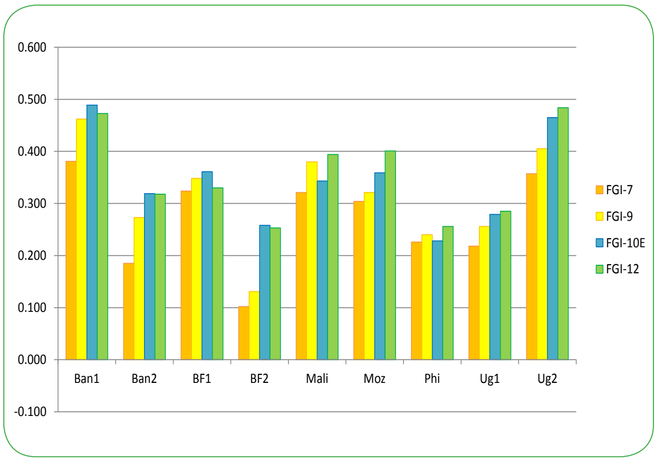


Figure 8 – B. Correlation between FGIs and MPA among NPNL women when controlled for energy, by study site

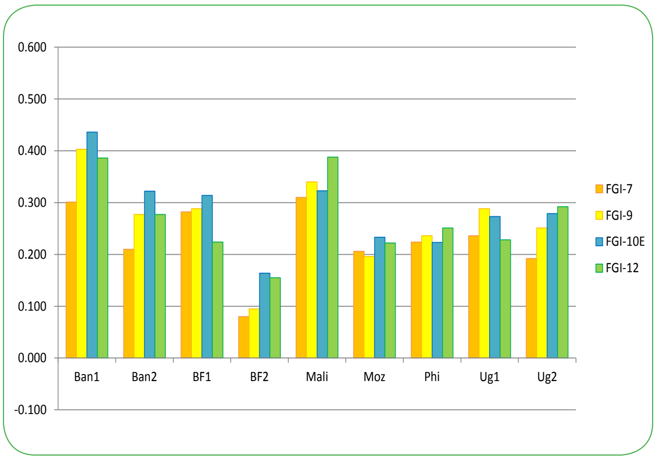


Figure 8 – C. Correlation between FGIs and MPA among lactating women when not controlled for energy, by study site

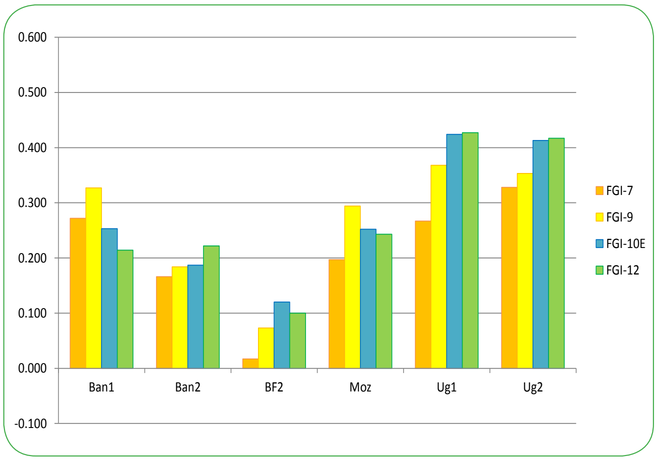
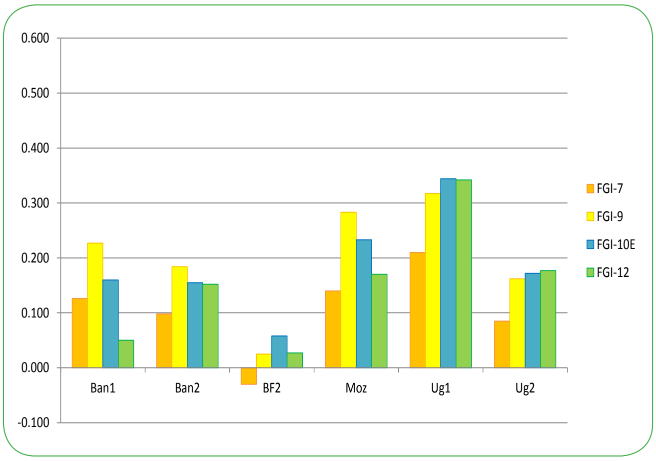


Figure 8 – D. Correlation between FGIs and MPA among lactating women when controlled for energy, by study site



not controlled for[16]. Otherwise, there was no consistent pattern across all sites (**Figures 7 – A** to **D** and **Figures 8 – A** to **D**).

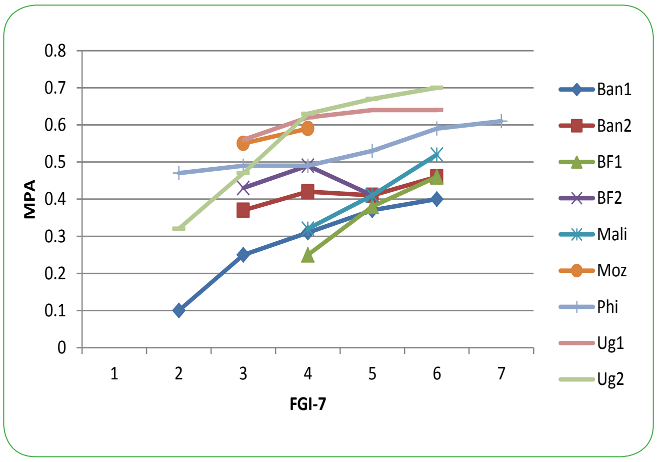
Figures 9 to **12** illustrate the general tendency of the relationship between FGIs, restricted and not, and MPA, for both NPNL women (**Figures A and B**) and lactating women (**Figures C and D**) by study site. All figures show fairly consistent patterns and positive slopes. However, there were quite uneven relationships in some datasets and for some FGI, sometimes for NPNL women, sometimes for lactating women.

These uneven relationships did not follow a clear pattern. It seems there is a tendency of more uneven relationships for FGI that are more disaggregated, and for some datasets (BF1, Ban1, Mozambique, principally; also Ban2, BF2, Philippines, but to a lesser extent; more rarely for Ug1, Ug2, Mali). This is probably an effect of the distribution of MPA values across different FGI levels and the fact that data points with fewer than ten observations are not shown. These uneven relationships do not appear

[16] A possible explanation would be that higher correlations for more highly disaggregated FGIs are mainly driven by the association of FGIs with quantity (overall, correlations with energy are also higher for higher disaggregation), and not so much by the association of FGIs with micronutrient density; consequently, when taking the energy/quantity component out, not so much difference would remain among correlations of MPA with FGIs of varying levels of disaggregation.

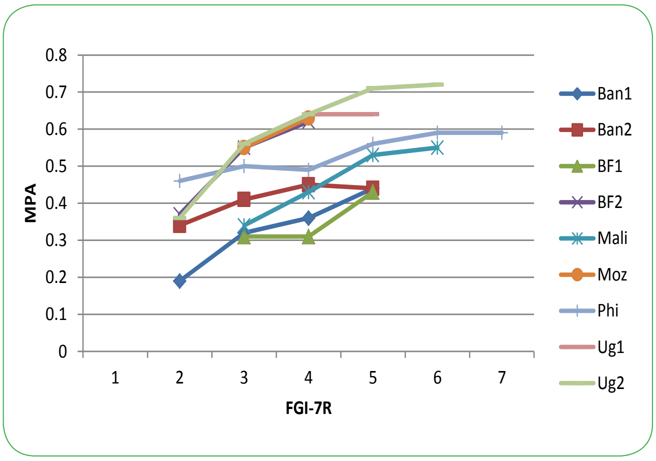
Figure 9. Relationship between FGI-7, restricted or not, and MPA, by study site [a]

Figure 9 – A. Relationship between FGI-7 and MPA for NPNL women, by study site [a]



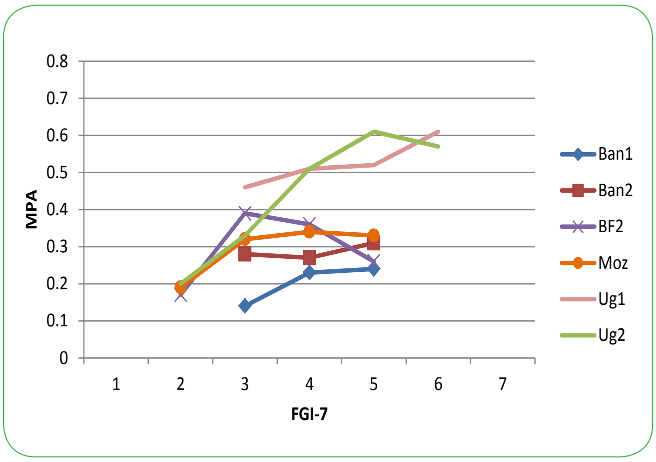
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 9 - B. Relationship between FGI-7R and MPA for NPNL women, by study site [a]



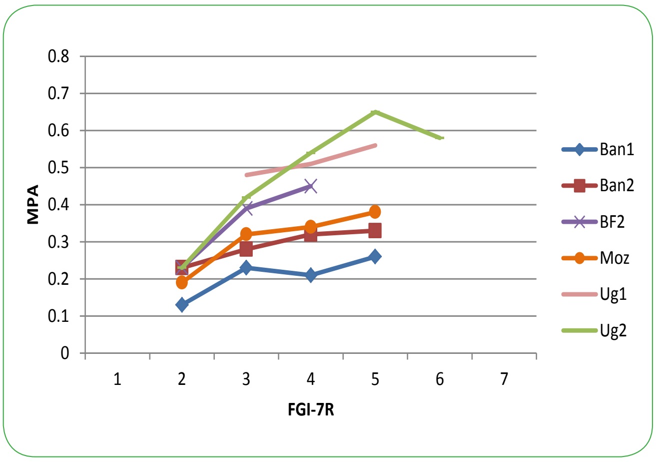
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 9 – C. Relationship between FGI-7 and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

Figure 9 - D. Relationship between FGI-7R and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

to be linked to the total sample size of the dataset nor to the strength of the correlation.

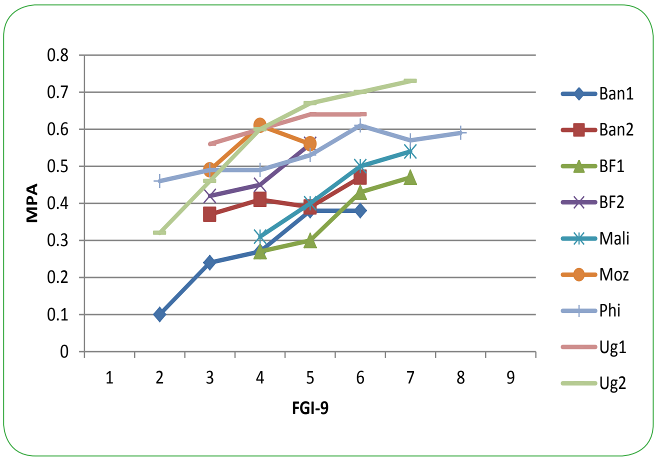
Overall, the relationship was rather similar for the eight FGIs considered.

Tables 21 – A and **B** and **Tables 22 – A** and **B** provide results from simple linear regressions on MPA for each site, from models including age, height (when available) and FGI, and both with or without energy intake in the model. When energy intake was not in the models, the coefficients for the FGIs were almost always significant (with the exception of most of the non-restricted FGIs in BF2, where coefficients were significant only for FGI-10E and FGI-12 among NPNL women). Coefficients represent the increase in MPA, or transformed MPA, associated with an increase of one point of the corresponding FGI. Those coefficients are therefore not readily comparable since depending on whether MPA was transformed (or not) it does not correspond to an increase of the same magnitude.

Correlation coefficients were attenuated when total energy intake was added in the model, but almost all coefficients remained significant for NPNL women (exceptions were in

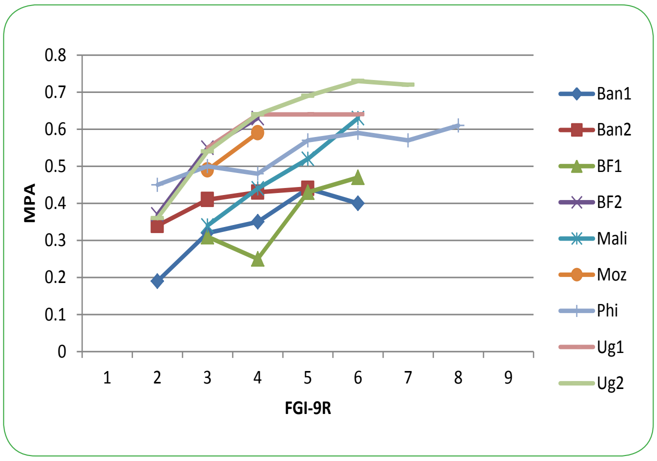
Figure 10. Relationship between FGI-9, restricted or not, and MPA, by study site [a]

Figure 10 – A. Relationship between FGI-9 and MPA for NPNL women, by study site [a]



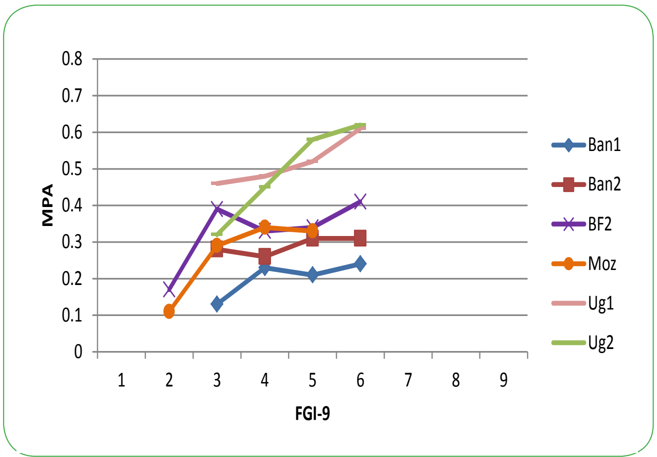
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 10 – B. Relationship between FGI-9R and MPA for NPNL women, by study site [a]



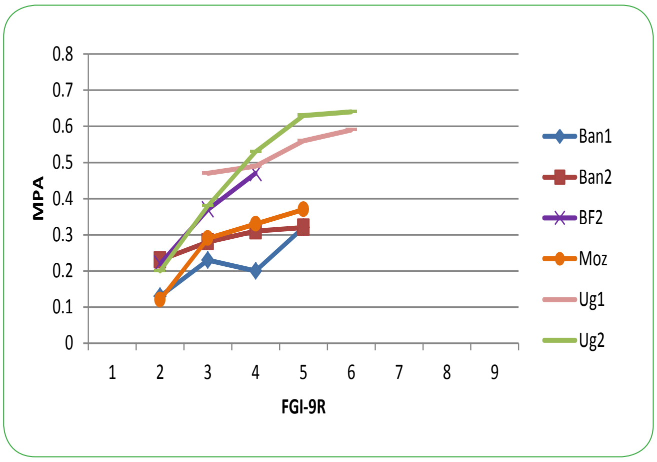
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 10 – C. Relationship between FGI-9 and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

Figure 10 - D. Relationship between FGI-9R and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

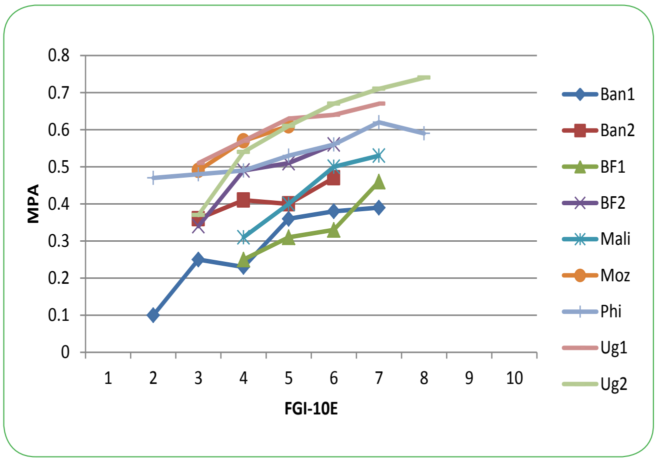
Mozambique for all FGIs, except FGI-10E, FGI-10ER and FGI-12R, and in BF2 for FGI-10E and FGI-12; **Table 21**). For lactating women, coefficients remained significant except for the FGI-7 in the Ban1, Ban2 and Mozambique datasets, for the FGI-10E in the Ban1 dataset, and for the FGI-12 in the Ban1 and Mozambique sites. The decrease in coefficients highlights that part of the positive relationship between diversity scores and MPA is in fact due to the increase in energy (i.e. quantity of foods consumed)[17].

All adjusted R^2 were significant except for the FGI-7 in the Mozambique site and for most of the non-restricted FGIs in BF2. For the coefficients of the FGI, R^2 was significant only for FGI-10E and FGI-12 among NPNL women **Table 22**. Generally speaking, the adjusted R^2 s were quite good. They were slightly higher for restricted than for non-restricted FGIs and largely higher when energy was in the model. For NPNL women, without energy in the model they ranged from 0.03 to 0.24 for

[17] It has to be noted that regression coefficients were attenuated without any exception when controlling for energy while there were quite a few exceptions to this for correlations (see Section 7.9). The fact that BLUP of energy was used for the correlation analysis, while simple day 1 energy intakes was used for the regression analysis might explain these somewhat divergent results.

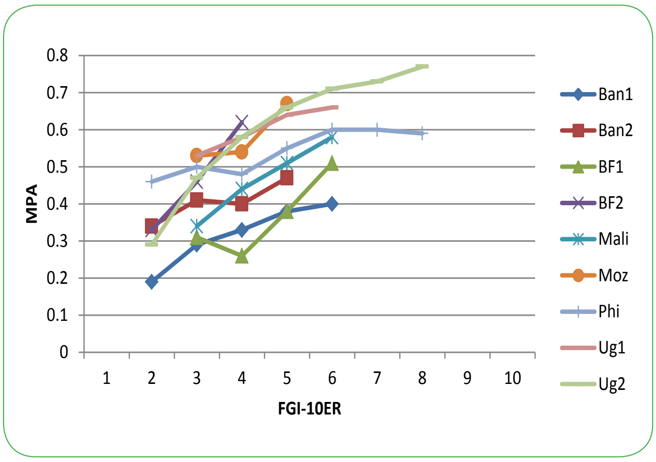
Figure 11. Relationship between FGI-10E, restricted or not, and MPA, by study site [a]

Figure 11 – A. Relationship between FGI-10E and MPA for NPNL women, by study site [a]



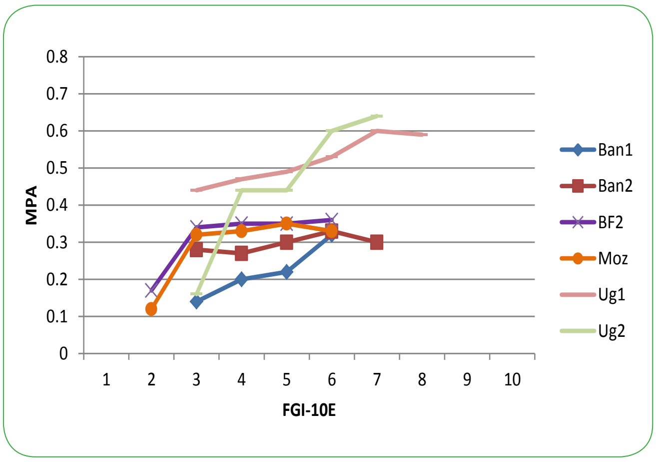
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 11 – B. Relationship between FGI-10ER and MPA for NPNL women, by study site [a]



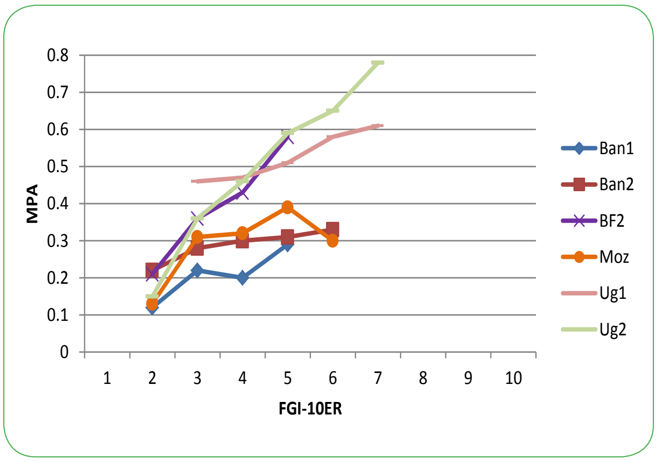
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 11 – C. Relationship between FGI-10E and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

Figure 11 - D. Relationship between FGI-10ER and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

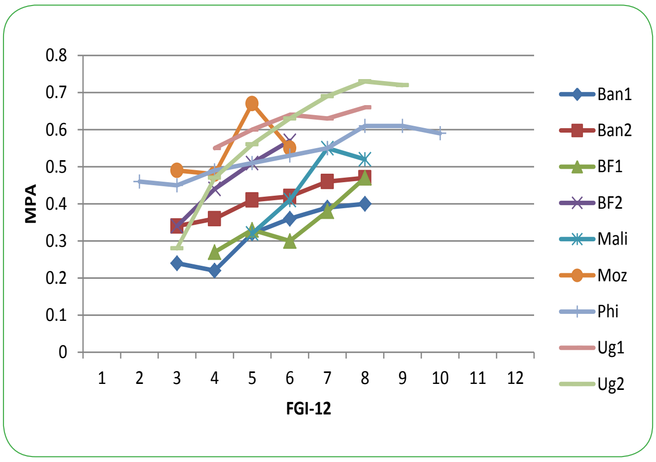
non-restricted FGIs, and from 0.08 to 0.33 for restricted FGIs. When energy was accounted for, they ranged from 0.32 to 0.66 for non-restricted FGIs, and from 0.36 to 0.67 for restricted FGIs. Corresponding values for lactating women were lower: from 0.00 to 0.17 (non-restricted FGIs) and from 0.03 to 0.28 (non-restricted FGIs) when energy was not in the model; and from 0.01 to 0.68 (non-restricted FGIs) and from 0.02 to 0.69 (non-restricted FGIs) when energy was controlled for.

7.10 Performance of food group diversity indicators according to AUCs

FGIs can be presented as quasi-continuous or as dichotomous indicators, yielding prevalence estimates for the proportion of the population below/above a specified cutoff of the FGI. For communication and advocacy purposes, dichotomous indicators may be preferred and necessary. In order to assess the performance of dichotomous indicators, cutoffs must be selected both for MPA and FGIs. Indicators can only be assessed for MPA cutoffs that are reached by a non-

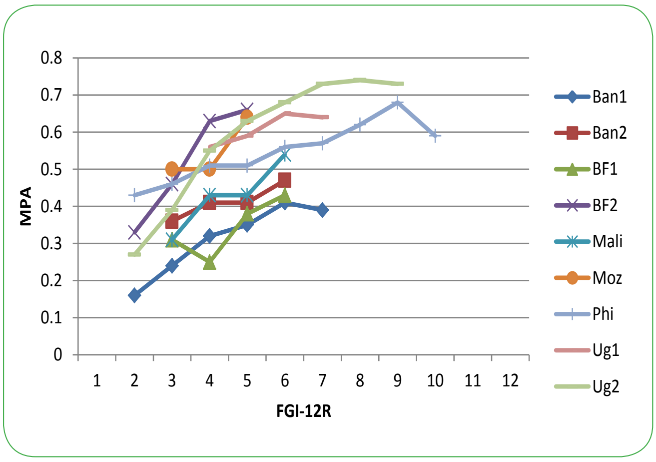
Figure 12. Relationship between FGI-12, restricted or not, and MPA, by study site [a]

Figure 12 – A. Relationship between FGI-12 and MPA for NPNL women, by study site [a]



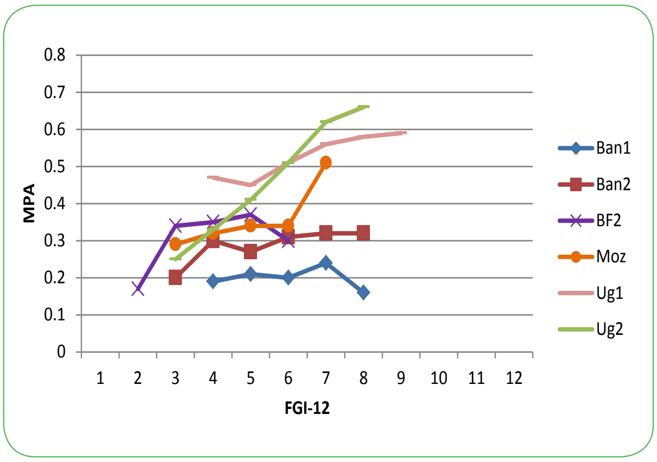
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 12 – B. Relationship between FGI-12R and MPA for NPNL women, by study site [a]



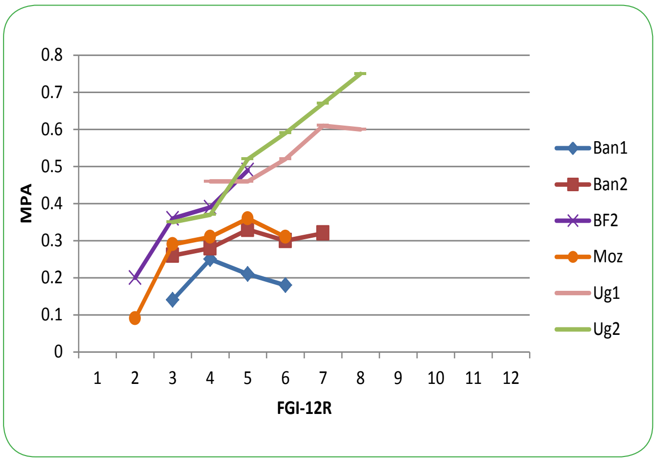
[a] Data points representing fewer than ten women are not presented on the graph.

Figure 12 – C. Relationship between FGI-12 and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

Figure 12 - D. Relationship between FGI-12R and MPA for lactating women, by study site [a]



[a] Data points representing fewer than ten women are not presented on the graph.

negligible proportion of women. **Table 23** summarizes the proportion of women above selected cutoffs of MPA in each site.

Table 24 shows the area under the receiver-operating curve (AUC) for each indicator, in each site and for each of the three MPA cutoffs for NPNL women. The AUC summarizes the predictive power of each indicator across all possible FGI cutoffs. An AUC of 0.50 represents a neutral value (no predictive power). A statistically significant AUC indicates predictive power, but AUC can be statistically significant even when predictive power is weak. As already stated, because of the various sample sizes across datasets, levels of significance should be interpreted cautiously. As a rule of thumb, we considered an AUC ≥ 0.70 to indicate some promise for the indicator.

Results were consistent with those for correlations and regressions. In 87 percent of the pairwise comparisons, they showed higher AUCs when the 15g restriction was applied. Divergent cases came mainly from Ban1, BF1 and Mozambique datasets. Because this result strongly favours restricted indicators, analyses regarding AUCs will be further presented (or commented) mainly for those restricted indicator.

Table 21. Simple linear regression on MPA: FGIs coefficients, with or without total energy in the model, by study site and physiological status

Table 21 – A. Simple linear regression on MPA [a]: FGIs coefficients, with or without total energy in the model, among NPNL women by study site [b]

		Ban1	Ban2	BF1	BF2	Mali	Moz	Phi	Ug1	Ug2
FGI-7	NC [c]	0.112 ***	0.030 **	0.118 ***	0.039	0.072 **	0.079 **	0.024 ***	0.033 **	0.037 ***
	C [c]	0.083 ***	0.022 **	0.077 **	0.015	0.043 *	0.035	0.018 ***	0.027 **	0.015 ***
FGI-7R	NC	0.129 ***	0.046 ***	0.094 ***	0.173 ***	0.091 ***	0.091 **	0.026 ***	0.036 **	0.040 ***
	C	0.099 ***	0.028 ***	0.071 ***	0.118 ***	0.061 ***	0.038	0.020 ***	0.031 ***	0.016 ***
FGI-9	NC	0.115 ***	0.036 ***	0.090 ***	0.041	0.066 ***	0.076 **	0.022 ***	0.033 ***	0.036 ***
	C	0.091 ***	0.025 ***	0.059 **	0.013	0.042 **	0.029	0.017 ***	0.030 ***	0.016 ***
FGI-9R	NC	0.125 ***	0.045 ***	0.095 ***	0.167 ***	0.076 ***	0.118 ***	0.024 ***	0.036 ***	0.040 ***
	C	0.098 ***	0.029 ***	0.068 ***	0.111 ***	0.050 ***	0.047	0.018 ***	0.033 ***	0.017 ***
FGI-10E	NC	0.106 ***	0.037 ***	0.079 ***	0.074 **	0.055 ***	0.081 ***	0.020 ***	0.027 ***	0.034 ***
	C	0.084 ***	0.026 ***	0.053 ***	0.030	0.034 *	0.040 *	0.015 ***	0.021 ***	0.015 ***
FGI-10ER	NC	0.107 ***	0.044 ***	0.088 ***	0.176 ***	0.067 ***	0.105 ***	0.022 ***	0.033 ***	0.038 ***
	C	0.084 ***	0.028 ***	0.062 ***	0.117 ***	0.044 ***	0.056 **	0.016 ***	0.024 ***	0.016 ***
FGI-12	NC	0.090 ***	0.035 ***	0.064 ***	0.066 **	0.048 ***	0.066 ***	0.020 ***	0.029 ***	0.031 ***
	C	0.067 ***	0.021 ***	0.034 *	0.026	0.031 **	0.030	0.015 ***	0.018 **	0.014 ***
FGI-12R	NC	0.097 ***	0.046 ***	0.081 ***	0.157 ***	0.052 ***	0.091 ***	0.022 ***	0.031 ***	0.036 ***
	C	0.072 ***	0.025 ***	0.058 ***	0.102 ***	0.033 **	0.046 *	0.015 ***	0.019 **	0.016 ***

[a] Models included age and height when available. MPA was transformed to approximate normality if necessary.
[b] Statistical significance of F-statistic for coefficients of FGIs: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake. Energy intake was not the BLUP but intakes from the first observation day.

Table 21 – B. Simple linear regression on MPA [a]: FGIs coefficients, with or without total energy in the model, among lactating women by study site [b]

		Ban1	Ban2	BF1 [d]	BF2	Mali [d]	Moz	Phi [d]	Ug1	Ug2
FGI-7	NC [c]	0.075 **	0.023 *		0.006		0.039 *		0.040 ***	0.040 ***
	C [c]	0.034	0.011		-0.011		0.014		0.027 **	0.010 *
FGI-7R	NC	0.085 ***	0.037 ***		0.161 ***		0.062 ***		0.044 ***	0.045 ***
	C	0.059 **	0.022 **		0.121 ***		0.031 *		0.026 **	0.011 **
FGI-9	NC	0.071 ***	0.026 **		0.025		0.059 ***		0.048 ***	0.037 ***
	C	0.044 *	0.018 **		0.006		0.036 **		0.033 ***	0.013 ***
FGI-9R	NC	0.086 ***	0.037 ***		0.169 ***		0.079 ***		0.053 ***	0.046 ***
	C	0.061 **	0.025 ***		0.124 ***		0.051 ***		0.035 ***	0.016 ***
FGI-10E	NC	0.051 **	0.038 **		0.038		0.042 **		0.042 ***	0.037 ***
	C	0.029	0.523 ***		0.016		0.025 *		0.028 ***	0.013 ***
FGI-10ER	NC	0.065 ***	0.068 ***		0.165 ***		0.058 ***		0.048 ***	0.044 ***
	C	0.046 **	0.536 ***		0.119 ***		0.037 ***		0.030 ***	0.016 ***
FGI-12	NC	0.042 **	0.024 **		0.030		0.036 **		0.038 ***	0.033 ***
	C	0.013	0.013 *		0.008		0.014		0.026 ***	0.011 ***
FGI-12R	NC	0.063 ***	0.033 ***		0.147 ***		0.049 ***		0.043 ***	0.041 ***
	C	0.034 *	0.018 **		0.101 ***		0.023 *		0.026 ***	0.016 ***

[a] Models included age and height when available. MPA was transformed to approximate normality if necessary.
[b] Statistical significance of F-statistic for coefficients of FGIs: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake. Energy intake was not the BLUP but intakes from the first observation day.
[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Table 22. Simple linear regression on MPA: Adjusted R^2, with or without total energy in the model, by study site and physiological status

Table 22 – A. Simple linear regression on MPA [a]: adjusted R2, with or without total energy in the model, among NPNL women by study site [b]

		Ban1	Ban2	BF1	BF2	Mali	Moz	Phi	Ug1	Ug2
FGI-7	NC [c]	0.149 ***	0.027 *	0.101 **	0.027	0.115 ***	0.080 *	0.066 ***	0.072 **	0.132 ***
	C [c]	0.318 ***	0.531 ***	0.449 ***	0.377 ***	0.389 ***	0.418 ***	0.372 ***	0.434 ***	0.638 ***
FGI-7R	NC	0.245 ***	0.097 ***	0.127 ***	0.222 ***	0.264 ***	0.104 *	0.077 ***	0.080 ***	0.202 ***
	C	0.370 ***	0.550 ***	0.477 ***	0.465 ***	0.454 ***	0.420 ***	0.377 ***	0.445 ***	0.645 ***
FGI-9	NC	0.220 ***	0.070 ***	0.116 ***	0.030	0.143 ***	0.079 *	0.073 ***	0.088 ***	0.167 ***
	C	0.370 ***	0.549 ***	0.456 ***	0.377 ***	0.403 ***	0.468 ***	0.375 ***	0.428 ***	0.649 ***
FGI-9R	NC	0.257 ***	0.112 ***	0.162 ***	0.214 ***	0.221 ***	0.170 ***	0.083 ***	0.096 ***	0.245 ***
	C	0.385 ***	0.563 ***	0.489 ***	0.457 ***	0.436 ***	0.480 ***	0.379 ***	0.437 ***	0.657 ***
FGI-10E	NC	0.244 ***	0.095 ***	0.130 ***	0.080 **	0.122 ***	0.153 **	0.066 ***	0.097 ***	0.220 ***
	C	0.386 ***	0.563 ***	0.463 ***	0.386 ***	0.392 ***	0.438 ***	0.372 ***	0.419 ***	0.654 ***
FGI-10ER	NC	0.251 ***	0.125 ***	0.179 ***	0.310 ***	0.203 ***	0.220 ***	0.077 ***	0.113 ***	0.315 ***
	C	0.381 ***	0.563 ***	0.493 ***	0.487 ***	0.428 ***	0.458 ***	0.376 ***	0.423 ***	0.662 ***
FGI-12	NC	0.226 ***	0.095 ***	0.117 ***	0.076 **	0.155 ***	0.164 **	0.081 ***	0.114 ***	0.238 ***
	C	0.353 ***	0.547 ***	0.440 ***	0.385 ***	0.407 ***	0.433 ***	0.378 ***	0.434 ***	0.659 ***
FGI-12R	NC	0.247 ***	0.154 ***	0.182 ***	0.281 ***	0.196 ***	0.247 ***	0.094 ***	0.115 ***	0.334 ***
	C	0.359 ***	0.558 ***	0.497 ***	0.472 ***	0.421 ***	0.455 ***	0.382 ***	0.432 ***	0.666 ***

[a] Models included age and height when available (yellow cells indicate datasets without height in the model)
[b] Statistical significance of F-statistic for coefficients of FGIs: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake.

Table 22 – B. Simple linear regression on MPA [a]: adjusted R2, with or without total energy in the model, among lactating women by study site [b]

		Ban1	Ban2	BF1 d	BF2	Mali d	Moz	Phi d	Ug1	Ug2
FGI-7	NC [c]	0.097 **	0.046 **		-0.009		0.047 *		0.040 ***	0.105 ***
	C [c]	0.283 ***	0.508 ***		0.208 ***		0.485 ***		0.027 **	0.663 ***
FGI-7R	NC	0.145 ***	0.075 ***		0.133 ***		0.092 ***		0.044 ***	0.167 ***
	C	0.328 ***	0.522 ***		0.283 ***		0.499 ***		0.026 **	0.667 ***
FGI-9	NC	0.129 ***	0.039 **		-0.004		0.090 ***		0.130 ***	0.121 ***
	C	0.309 ***	0.518 ***		0.207 ***		0.533 ***		0.411 ***	0.671 ***
FGI-9R	NC	0.160 ***	0.063 ***		0.153 ***		0.144 ***		0.156 ***	0.195 ***
	C	0.336 ***	0.533 ***		0.289 ***		0.559 ***		0.415 ***	0.678 ***
FGI-10E	NC	0.089 **	0.023 **		0.005		0.069 **		0.172 ***	0.169 ***
	C	0.291 ***	0.014 *		0.210 ***		0.500 ***		0.424 ***	0.676 ***
FGI-10ER	NC	0.130 ***	0.034 ***		0.172 ***		0.114 ***		0.198 ***	0.271 ***
	C	0.322 ***	0.023 ***		0.293 ***		0.519 ***		0.417 ***	0.689 ***
FGI-12	NC	0.080 **	0.066 ***		0.000		0.067 **		0.161 ***	0.173 ***
	C	0.274 ***	0.515 ***		0.208 ***		0.489 ***		0.453 ***	0.676 ***
FGI-12R	NC	0.134 ***	0.090 ***		0.147 ***		0.105 ***		0.181 ***	0.277 ***
	C	0.300 ***	0.524 ***		0.274 ***		0.500 ***		0.437 ***	0.691 ***

[a] Models included age and height when available (yellow cells indicate datasets without height in the model)
[b] Statistical significance of F-statistic for coefficients of FGIs: * indicates P < 0.05 ; ** P < 0.01 ; *** P < 0.001.
[c] NC = not controlled for energy intake; C = controlled for energy intake.
[d] There were too few lactating women for separate analysis in urban Burkina Faso and Philippines, and none in Mali.

Table 23. Percent (number) of women above selected MPA cutoffs values, by study site and physiological status

		MPA > 0.50		MPA > 0.60		MPA > 0.70		MPA > 0.80		MPA > 0.90	
		%	(number)	%	(number)	%	(number)	%	(number)	%	(number)
Ban1	All	10.9	(45)	4.9	(20)	2.7	(11)	0.5	(2)		
	Lactating	3.6	(4)	0.9	(1)						
	NPNL	13.7	(41)	6.4	(19)	3.7	(11)	0.7	(2)		
Ban2	All	11.8	(50)	1.2	(5)						
	Lactating	4.5	(10)	0.5	(1)						
	NPNL	19.9	(40)	2.0	(4)						
BF1	All	18.2	(33)	9.9	(18)	3.0	(5)				
	NPNL	22.2	(29)	12.2	(16)	3.3	(4)				
BF2	All	28.2	(113)	19.7	(79)	11.7	(47)	5.5	(23)	0.5	(2)
	Lactating	23.2	(52)	16.3	(37)	10.4	(23)	4.8	(11)		
	NPNL	44.0	(58)	31.3	(41)	17.9	(24)	8.6	(12)	1.5	(2)
Mali	All	41.2	(42)	20.6	(21)	8.8	(9)	2.0	(2)		
	NPNL	41.2	(42)	20.6	(21)	8.8	(9)	2.0	(2)		
Moz	All	28.1	(115)	16.6	(68)	4.6	(19)	0.2	(1)		
	Lactating	17.9	(45)	8.7	(22)	0.8	(2)				
	NPNL	59.2	(61)	40.8	(42)	16.5	(17)	1.0	(1)		
Phi	All	49.4	(419)	30.7	(260)	15.2	(129)	3.8	(32)	0.1	(1)
	NPNL	54.5	(394)	34.3	(248)	17.3	(125)	4.3	(31)	0.1	(1)
Ug1	All	60.2	(272)	36.9	(167)	16.4	(74)	4.6	(21)	0.7	(3)
	Lactating	51.0	(101)	24.7	(49)	10.1	(20)	3.5	(7)	0.5	(1)
	NPNL	78.7	(155)	56.9	(112)	25.9	(51)	6.6	(13)	1.0	(2)
Ug2	All	64.7	(617)	48.5	(463)	29.0	(277)	5.9	(56)	0.6	(6)
	Lactating	50.9	(175)	36.9	(127)	20.9	(72)	7.6	(26)	1.5	(5)
	NPNL	72.5	(442)	55.1	(336)	33.6	(205)	4.9	(30)	0.2	(1)

Figures 13 – A to C illustrates these results for the four restricted FGIs. They give a visual appreciation of the level and significance of AUCs for these restricted FGIs across all datasets and at various levels of the MPA threshold.

With the MPA > 0.50 threshold, all AUCs were significant. AUCs for FGI-10ER and FGI-12R tended to be higher than those for FGI-9R followed by those for FGI-7R.

With the MPA > 0.60 threshold, the AUCs were not significantly different from 0.50 for all indicators of the Ban2 dataset (noting that there was less than five women reaching this level of MPA in this particular dataset). The AUCs tended to be slightly higher for FGI-10ER than for FGI-12R, followed by FGI-9R and then by FGI-7R.

With the MPA>0.70 threshold, the Ban2 dataset had no woman reaching this level. Among the eight remaining datasets, AUC was not significant for the Mozambique except for FGI-12R. Otherwise AUCs values followed approximately the pattern described above.

The statistical paired-comparisons between AUCs from the different FGIs, within each country, are displayed in **Tables 25 – A** to **I** and a summary of differences that were found statistically significant is given in **Tables 26 – A** and **B.**

From **Table 26 – A** it can be seen that, with the MPA > 0.50 threshold, AUCs for FGI-7R were significantly lower than AUCs for FGI-9R, FGI-10ER and FGI-12R in 3, 2 and 3 datasets, respectively. Similarly, AUCs for FGI-9R were significantly lower than AUCs for FGI-7R, FGI-10ER and FGI-12R in 1, 3 and 1 datasets, respectively. AUCs for FGI-10ER were significantly lower than AUCs for FGI-7R

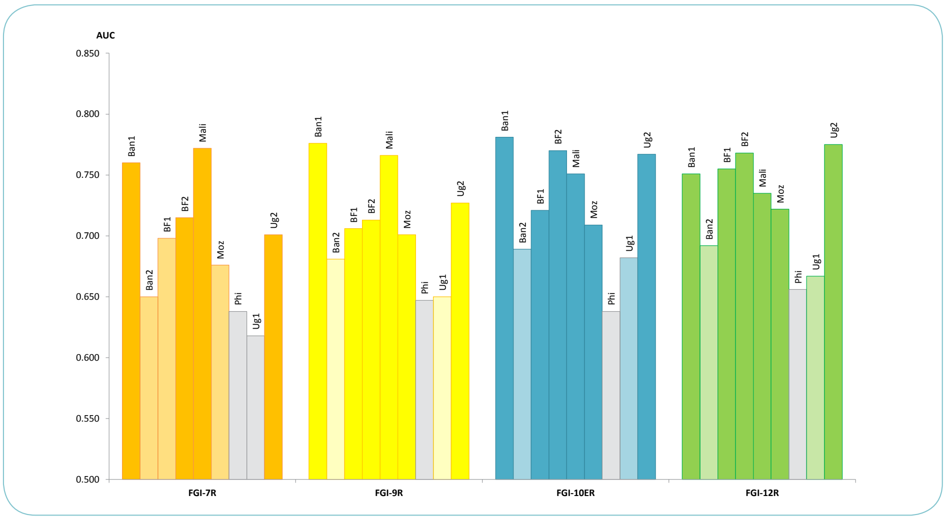
Table 24. Area under the curve (AUC) for all food group diversity indicators for NPNL women, by study site [a]

	Ban1		Ban2		BF1		BF2		Mali		Moz		Phi		Ug1		Ug2	
	AUC	p-value	AUC	p-value	AUC	p-value	AUC	p-value	AUC	p-value	AUC	p-value	AUC	p-value	AUC	p-value	AUC	p-value
MPA > 0.50																		
FGI-7	0.635	0.001	0.552	0.209	0.656	0.004	0.564	0.172	0.684	<0.001	0.670	0.020	0.630	<0.001	0.577	0.018	0.651	<0.001
FGI-7R	0.760	<0.001	0.650	0.001	0.698	<0.001	0.715	<0.001	0.772	<0.001	0.676	0.004	0.638	<0.001	0.618	0.001	0.701	<0.001
FGI-9	0.700	<0.001	0.623	0.003	0.707	0.001	0.577	0.347	0.703	<0.001	0.679	0.009	0.639	<0.001	0.604	0.003	0.669	<0.001
FGI-9R	0.776	<0.001	0.681	<0.001	0.706	<0.001	0.713	0.001	0.766	<0.001	0.701	0.001	0.647	<0.001	0.650	<0.001	0.727	<0.001
FGI-10E	0.752	<0.001	0.639	0.002	0.703	<0.001	0.646	0.014	0.684	<0.001	0.697	0.002	0.629	<0.001	0.633	<0.001	0.709	<0.001
FGI-10ER	0.781	<0.001	0.689	<0.001	0.721	<0.001	0.770	<0.001	0.751	<0.001	0.709	<0.001	0.638	<0.001	0.682	<0.001	0.767	<0.001
FGI-12	0.722	<0.001	0.628	0.007	0.712	<0.001	0.652	0.020	0.720	<0.001	0.714	0.001	0.638	<0.001	0.626	0.001	0.721	<0.001
FGI-12R	0.751	<0.001	0.692	<0.001	0.755	<0.001	0.768	<0.001	0.735	<0.001	0.722	<0.001	0.656	<0.001	0.667	<0.001	0.775	<0.001
MPA > 0.60																		
FGI-7	0.654	0.010	0.457	0.610	0.700	0.001	0.528	0.485	0.641	0.001	0.556	0.538	0.604	<0.001	0.626	<0.001	0.656	<0.001
FGI-7R	0.769	<0.001	0.614	0.396	0.679	<0.001	0.746	<0.001	0.714	<0.001	0.611	0.037	0.610	<0.001	0.627	<0.001	0.708	<0.001
FGI-9	0.792	<0.001	0.641	0.456	0.727	0.002	0.577	0.330	0.677	<0.001	0.591	0.185	0.618	<0.001	0.631	<0.001	0.676	<0.001
FGI-9R	0.818	<0.001	0.673	0.117	0.709	<0.001	0.713	<0.001	0.710	<0.001	0.659	0.006	0.624	<0.001	0.620	<0.001	0.729	<0.001
FGI-10E	0.800	<0.001	0.711	0.276	0.698	0.002	0.631	0.015	0.669	<0.001	0.631	0.019	0.609	<0.001	0.653	<0.001	0.715	<0.001
FGI-10ER	0.811	<0.001	0.695	0.139	0.702	<0.001	0.794	<0.001	0.700	<0.001	0.679	0.000	0.617	<0.001	0.669	<0.001	0.768	<0.001
FGI-12	0.761	<0.001	0.670	0.323	0.670	0.002	0.626	0.037	0.658	0.001	0.646	0.033	0.622	<0.001	0.647	<0.001	0.725	<0.001
FGI-12R	0.781	<0.001	0.690	0.113	0.709	<0.001	0.778	<0.001	0.665	<0.001	0.690	0.001	0.636	<0.001	0.659	<0.001	0.772	<0.001
MPA > 0.70																		
FGI-7	0.713	0.005	-	-	0.657	0.052	0.534	0.387	0.649	0.034	0.565	0.670	0.638	<0.001	0.591	0.010	0.650	<0.001
FGI-7R	0.787	<0.001	-	-	0.662	0.025	0.767	<0.001	0.781	<0.001	0.561	0.458	0.647	<0.001	0.604	0.001	0.694	<0.001
FGI-9	0.836	<0.001	-	-	0.659	0.038	0.561	0.338	0.700	0.007	0.549	0.314	0.652	<0.001	0.596	0.002	0.689	<0.001
FGI-9R	0.797	<0.001	-	-	0.619	0.038	0.765	<0.001	0.765	0.001	0.557	0.169	0.663	<0.001	0.607	0.001	0.727	<0.001
FGI-10E	0.863	<0.001	-	-	0.625	0.100	0.631	0.050	0.659	0.028	0.543	0.192	0.643	<0.001	0.632	<0.001	0.725	<0.001
FGI-10ER	0.810	<0.001	-	-	0.635	0.028	0.822	<0.001	0.737	0.005	0.539	0.106	0.656	<0.001	0.633	<0.001	0.767	<0.001
FGI-12	0.838	<0.001	-	-	0.628	0.093	0.627	0.083	0.653	0.043	0.619	0.114	0.661	<0.001	0.628	<0.001	0.740	<0.001
FGI-12R	0.787	<0.001	-	-	0.683	0.019	0.805	<0.001	0.737	0.015	0.613	0.046	0.676	<0.001	0.623	<0.001	0.780	<0.001

[a] Cells for non-significant tests are all shaded in pink.
p-values between 0.05-0.10 have light pink shading and p-value > 0.10 have dark pink shading.
AUC ≥ 0.70 cells are shaded in orange.

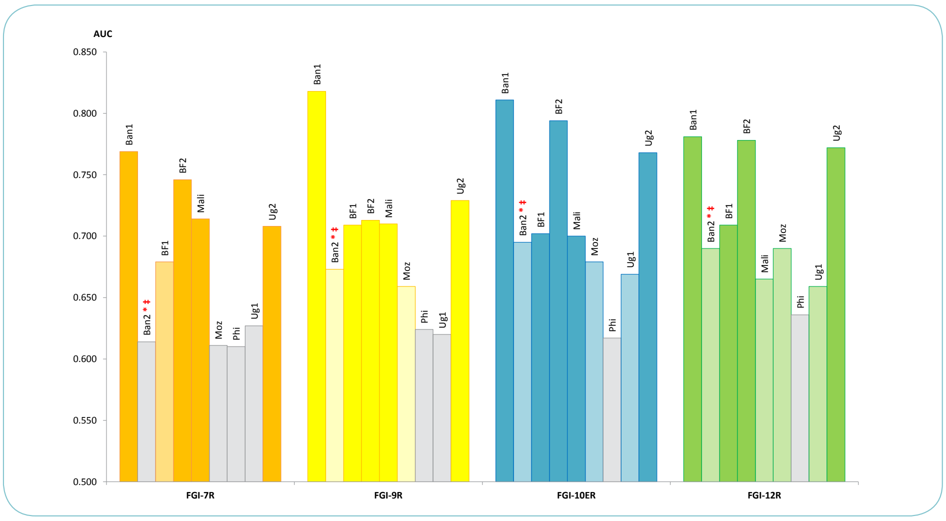
Figure 13. AUC for restricted FGIs among NPNL women, by study site

Figure 13 – A. AUC for MPA > 0.50 among NPNL women, by study site



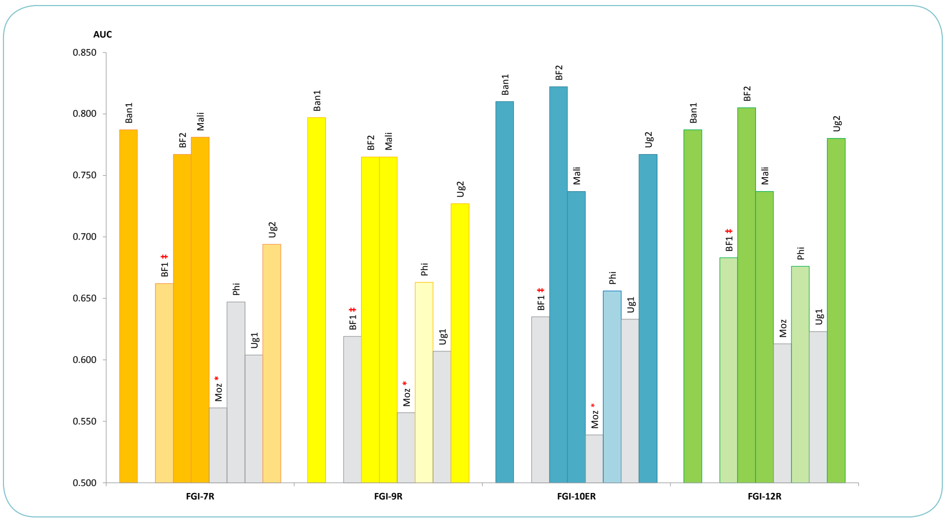
Dark coloured bars: AUC: ≥ 0.700
Light coloured bars: AUC ≥ 0.650
Country *: AUC non significant
Country ‡: N < 5

Figure 13 – B. AUC for MPA > 0.60 among NPNL women, by study site



Dark coloured bars: AUC: ≥ 0.700
Light coloured bars: AUC ≥ 0.650
Country *: AUC non significant
Country ‡: N < 5

Figure 13 – C. AUC for MPA > 0.70 among NPNL women, by study site



Dark coloured bars: AUC: ≥ 0.700
Light coloured bars: AUC ≥ 0.650
Country *: AUC non significant
Country ‡: N < 5

Table 25. Comparisons of AUC from each FGI among NPNL women, by MPA level

Table 25 – A. Bangladesh, rural (Ban1) [a]

MPA > 0.50

	AUC	FGI-7	FGI-7R	FGI-9	FGI-9R	FGI-10E	FGI-10ER	FGI-12	FGI-12R
		0.635	0.760	0.700	0.776	0.752	0.781	0.722	0.751
P-values									
FGI-7	0.635								
FGI-7R	0.760	<0.001							
FGI-9	0.700	0.008	0.051						
FGI-9R	0.776	<0.001	0.229	0.011					
FGI-10E	0.752	<0.001	0.753	0.035	0.383				
FGI-10ER	0.781	<0.001	0.262	0.023	0.712	0.263			
FGI-12	0.722	0.003	0.186	0.427	0.082	0.133	0.055		
FGI-12R	0.751	0.001	0.691	0.179	0.236	0.985	0.072	0.291	

MPA > 0.60

	AUC	FGI-7	FGI-7R	FGI-9	FGI-9R	FGI-10E	FGI-10ER	FGI-12	FGI-12R
		0.654	0.769	0.792	0.818	0.800	0.811	0.761	0.781
P-values									
FGI-7	0.654								
FGI-7R	0.769	0.001							
FGI-9	0.792	<0.001	0.462						
FGI-9R	0.818	0.001	0.046	0.500					
FGI-10E	0.800	0.001	0.335	0.751	0.641				
FGI-10ER	0.811	0.005	0.191	0.653	0.701	0.754			
FGI-12	0.761	0.015	0.803	0.385	0.184	0.116	0.224		
FGI-12R	0.781	0.034	0.742	0.814	0.169	0.615	0.152	0.557	

MPA > 0.70

	AUC	FGI-7	FGI-7R	FGI-9	FGI-9R	FGI-10E	FGI-10ER	FGI-12	FGI-12R
		0.713	0.787	0.836	0.797	0.863	0.810	0.838	0.787
P-values									
FGI-7	0.713								
FGI-7R	0.787	0.076							
FGI-9	0.836	0.002	0.283						
FGI-9R	0.797	0.122	0.656	0.460					
FGI-10E	0.863	0.004	0.066	0.390	0.158				
FGI-10ER	0.810	0.126	0.540	0.656	0.665	0.214			
FGI-12	0.838	0.009	0.139	0.954	0.366	0.401	0.528		
FGI-12R	0.787	0.282	0.997	0.461	0.790	0.132	0.386	0.186	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – B. Bangladesh, rural (Ban2) [a]									
MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.552	0.650	0.623	0.681	0.639	0.689	0.628	0.692
P-values									
FGI-7	0.552								
FGI-7R	0.650	0.002							
FGI-9	0.623	0.001	0.470						
FGI-9R	0.681	<0.001	0.038	0.081					
FGI-10E	0.639	0.004	0.784	0.420	0.206				
FGI-10ER	0.689	<0.001	0.121	0.084	0.662	0.159			
FGI-12	0.628	0.005	0.539	0.819	0.109	0.556	0.104		
FGI-12R	0.692	<0.001	0.072	0.082	0.572	0.165	0.825	0.052	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.457	0.614	0.641	0.673	0.711	0.695	0.670	0.690
P-values									
FGI-7	0.457								
FGI-7R	0.614	0.068							
FGI-9	0.641	0.034	0.210						
FGI-9R	0.673	0.108	0.488	0.695					
FGI-10E	0.711	0.007	0.260	0.377	0.505				
FGI-10ER	0.695	0.183	0.555	0.682	0.673	0.864			
FGI-12	0.670	<0.001	0.234	0.523	0.978	0.526	0.858		
FGI-12R	0.690	0.082	0.371	0.541	0.208	0.723	0.926	0.827	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		-	-	-	-	-	-	-	-
P-values									
FGI-7	-								
FGI-7R	-	-							
FGI-9	-	-	-						
FGI-9R	-	-	-	-					
FGI-10E	-	-	-	-	-				
FGI-10ER	-	-	-	-	-	-			
FGI-12	-	-	-	-	-	-	-		
FGI-12R	-	-	-	-	-	-	-	-	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – C. Burkina Faso, urban (BF1) [a]									
MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.656	0.698	0.707	0.706	0.703	0.721	0.712	0.755
P-values									
FGI-7	0.656								
FGI-7R	0.698	0.337							
FGI-9	0.707	0.090	0.851						
FGI-9R	0.706	0.261	0.740	0.981					
FGI-10E	0.703	0.168	0.917	0.883	0.950				
FGI-10ER	0.721	0.156	0.370	0.786	0.403	0.682			
FGI-12	0.712	0.272	0.787	0.906	0.909	0.782	0.862		
FGI-12R	0.755	0.063	0.102	0.385	0.129	0.297	0.189	0.346	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.700	0.679	0.727	0.709	0.698	0.702	0.670	0.709
P-values									
FGI-7	0.700								
FGI-7R	0.679	0.672							
FGI-9	0.727	0.478	0.452						
FGI-9R	0.709	0.865	0.324	0.755					
FGI-10E	0.698	0.965	0.741	0.424	0.848				
FGI-10ER	0.702	0.969	0.523	0.715	0.730	0.944			
FGI-12	0.670	0.632	0.904	0.222	0.568	0.528	0.660		
FGI-12R	0.709	0.873	0.466	0.780	0.979	0.852	0.811	0.533	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.657	0.662	0.659	0.619	0.625	0.635	0.628	0.683
P-values									
FGI-7	0.657								
FGI-7R	0.662	0.951							
FGI-9	0.659	0.982	0.986						
FGI-9R	0.619	0.608	0.003	0.799					
FGI-10E	0.625	0.324	0.682	0.711	0.942				
FGI-10ER	0.635	0.850	0.541	0.905	0.745	0.932			
FGI-12	0.628	0.830	0.865	0.770	0.963	0.980	0.975		
FGI-12R	0.683	0.755	0.773	0.877	0.340	0.413	0.514	0.723	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – D. Burkina Faso, rural (BF2) [a]

MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.564	0.715	0.577	0.713	0.646	0.770	0.652	0.768
P-values									
FGI-7	0.564								
FGI-7R	0.715	0.003							
FGI-9	0.577	0.460	0.006						
FGI-9R	0.713	0.003	0.747	0.008					
FGI-10E	0.646	0.002	0.170	0.002	0.186				
FGI-10ER	0.770	<0.001	0.005	<0.001	0.002	0.004			
FGI-12	0.652	0.001	0.205	0.002	0.223	0.579	0.006		
FGI-12R	0.768	<0.001	0.010	<0.001	0.005	0.005	0.885	0.004	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.528	0.746	0.560	0.743	0.631	0.794	0.626	0.778
P-values									
FGI-7	0.528								
FGI-7R	0.746	<0.001							
FGI-9	0.560	0.134	0.001						
FGI-9R	0.743	<0.001	0.657	0.001					
FGI-10E	0.631	0.001	0.034	0.009	0.038				
FGI-10ER	0.794	<0.001	0.037	<0.001	0.026	<0.001			
FGI-12	0.626	0.003	0.023	0.031	0.026	0.681	<0.001		
FGI-12R	0.778	<0.001	0.185	<0.001	0.149	0.002	0.047	<0.001	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.534	0.767	0.561	0.765	0.631	0.822	0.627	0.805
P-values									
FGI-7	0.534								
FGI-7R	0.767	<0.001							
FGI-9	0.561	0.306	0.001						
FGI-9R	0.765	<0.001	0.568	0.001					
FGI-10E	0.631	0.029	0.038	0.056	0.041				
FGI-10ER	0.822	<0.001	0.077	<0.001	0.063	<0.001			
FGI-12	0.627	0.044	0.033	0.103	0.035	0.803	<0.001		
FGI-12R	0.805	<0.001	0.256	<0.001	0.223	0.001	0.058	<0.001	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – E. Mali, urban (Mali) [a]									
MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.684	0.772	0.703	0.766	0.684	0.751	0.720	0.735
P-values									
FGI-7	0.684								
FGI-7R	0.772	0.027							
FGI-9	0.703	0.527	0.066						
FGI-9R	0.766	0.041	0.393	0.089					
FGI-10E	0.684	1.000	0.022	0.213	0.031				
FGI-10ER	0.751	0.101	0.101	0.224	0.180	0.070			
FGI-12	0.720	0.386	0.251	0.519	0.309	0.173	0.499		
FGI-12R	0.735	0.242	0.210	0.427	0.280	0.193	0.570	0.663	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.641	0.714	0.677	0.710	0.669	0.700	0.658	0.665
P-values									
FGI-7	0.641								
FGI-7R	0.714	0.123							
FGI-9	0.677	0.349	0.427						
FGI-9R	0.710	0.143	0.670	0.467					
FGI-10E	0.669	0.443	0.332	0.679	0.368				
FGI-10ER	0.700	0.205	0.342	0.625	0.402	0.476			
FGI-12	0.658	0.747	0.327	0.520	0.365	0.698	0.457		
FGI-12R	0.665	0.617	0.117	0.787	0.145	0.911	0.222	0.886	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.649	0.781	0.700	0.765	0.659	0.737	0.653	0.737
P-values									
FGI-7	0.649								
FGI-7R	0.781	0.028							
FGI-9	0.700	0.427	0.221						
FGI-9R	0.765	0.055	0.036	0.318					
FGI-10E	0.659	0.874	0.064	0.003	0.103				
FGI-10ER	0.737	0.145	0.001	0.566	0.010	0.217			
FGI-12	0.653	0.961	0.124	0.204	0.177	0.872	0.305		
FGI-12R	0.737	0.217	0.320	0.475	0.523	0.129	1.000	0.097	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – F. Mozambique, rural (Moz) [a]

MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.654	0.679	0.665	0.687	0.703	0.722	0.734	0.747
P-values									
FGI-7	0.654								
FGI-7R	0.679	0.426							
FGI-9	0.665	0.728	0.767						
FGI-9R	0.687	0.423	0.823	0.421					
FGI-10E	0.703	0.151	0.600	0.039	0.578				
FGI-10ER	0.722	0.123	0.245	0.092	0.036	0.466			
FGI-12	0.734	0.046	0.260	0.028	0.210	0.183	0.723		
FGI-12R	0.747	0.045	0.106	0.041	0.060	0.173	0.328	0.518	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.549	0.613	0.573	0.636	0.627	0.680	0.639	0.685
P-values									
FGI-7	0.549								
FGI-7R	0.613	0.035							
FGI-9	0.573	0.484	0.401						
FGI-9R	0.636	0.041	0.534	0.019					
FGI-10E	0.627	0.044	0.771	0.018	0.744				
FGI-10ER	0.680	0.006	0.093	0.003	0.028	0.030			
FGI-12	0.639	0.025	0.585	0.032	0.935	0.621	0.256		
FGI-12R	0.685	0.003	0.083	0.004	0.113	0.064	0.843	0.014	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.531	0.578	0.501	0.539	0.538	0.565	0.611	0.634
P-values									
FGI-7	0.531								
FGI-7R	0.578	0.238							
FGI-9	0.501	0.519	0.202						
FGI-9R	0.539	0.894	0.431	0.305					
FGI-10E	0.538	0.905	0.522	0.303	0.975				
FGI-10ER	0.565	0.614	0.815	0.218	0.393	0.400			
FGI-12	0.611	0.045	0.520	0.004	0.164	0.071	0.401		
FGI-12R	0.634	0.032	0.136	0.006	0.017	0.034	0.090	0.380	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – G. Philippines, peri-urban (Phi) [a]									
MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.630	0.638	0.639	0.647	0.629	0.638	0.638	0.656
P-values									
FGI-7	0.630								
FGI-7R	0.638	0.328							
FGI-9	0.639	0.038	0.889						
FGI-9R	0.647	0.063	0.026	0.314					
FGI-10E	0.629	0.776	0.298	0.035	0.049				
FGI-10ER	0.638	0.362	0.964	0.906	0.048	0.233			
FGI-12	0.638	0.394	0.973	0.860	0.419	0.234	0.957		
FGI-12R	0.656	0.035	0.050	0.180	0.372	0.017	0.026	0.048	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.604	0.610	0.618	0.624	0.609	0.617	0.622	0.636
P-values									
FGI-7	0.604								
FGI-7R	0.610	0.498							
FGI-9	0.618	0.010	0.396						
FGI-9R	0.624	0.049	0.006	0.472					
FGI-10E	0.609	0.380	0.896	0.100	0.130				
FGI-10ER	0.617	0.172	0.115	0.919	0.192	0.311			
FGI-12	0.622	0.064	0.332	0.703	0.878	0.104	0.669		
FGI-12R	0.636	0.012	0.005	0.162	0.225	0.021	0.022	0.126	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.638	0.647	0.652	0.663	0.643	0.656	0.661	0.676
P-values									
FGI-7	0.638								
FGI-7R	0.647	0.367							
FGI-9	0.652	0.083	0.658						
FGI-9R	0.663	0.046	0.030	0.210					
FGI-10E	0.643	0.503	0.713	0.252	0.095				
FGI-10ER	0.656	0.112	0.170	0.731	0.322	0.141			
FGI-12	0.661	0.066	0.355	0.527	0.846	0.089	0.726		
FGI-12R	0.676	0.015	0.014	0.132	0.326	0.021	0.050	0.131	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – H. Uganda, rural (Ug1) [a]									
MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.577	0.618	0.604	0.650	0.633	0.682	0.626	0.667
P-values									
FGI-7	0.577								
FGI-7R	0.618	0.117							
FGI-9	0.604	0.119	0.665						
FGI-9R	0.650	0.011	0.018	0.148					
FGI-10E	0.633	0.066	0.705	0.288	0.698				
FGI-10ER	0.682	0.006	0.039	0.052	0.261	0.147			
FGI-12	0.626	0.118	0.839	0.423	0.577	0.631	0.124		
FGI-12R	0.667	0.019	0.127	0.109	0.568	0.337	0.358	0.191	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.626	0.627	0.631	0.620	0.653	0.669	0.647	0.659
P-values									
FGI-7	0.626								
FGI-7R	0.627	0.971							
FGI-9	0.631	0.765	0.867						
FGI-9R	0.620	0.778	0.595	0.601					
FGI-10E	0.653	0.319	0.431	0.328	0.289				
FGI-10ER	0.669	0.181	0.104	0.203	0.029	0.505			
FGI-12	0.647	0.469	0.555	0.523	0.405	0.674	0.420		
FGI-12R	0.659	0.327	0.252	0.374	0.127	0.817	0.495	0.590	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.591	0.604	0.596	0.607	0.632	0.633	0.628	0.623
P-values									
FGI-7	0.591								
FGI-7R	0.604	0.553							
FGI-9	0.596	0.778	0.773						
FGI-9R	0.607	0.539	0.833	0.644					
FGI-10E	0.632	0.244	0.470	0.217	0.509				
FGI-10ER	0.633	0.285	0.366	0.295	0.385	0.967			
FGI-12	0.628	0.327	0.551	0.332	0.600	0.854	0.884		
FGI-12R	0.623	0.448	0.594	0.491	0.653	0.765	0.555	0.816	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 25 – I. Uganda, urban and rural (Ug2) [a]									
MPA > 0.50									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.651	0.701	0.669	0.727	0.709	0.767	0.721	0.775
P-values									
FGI-7	0.651								
FGI-7R	0.701	0.001							
FGI-9	0.669	0.083	0.062						
FGI-9R	0.727	<0.001	0.001	<0.001					
FGI-10E	0.709	<0.001	0.626	<0.001	0.204				
FGI-10ER	0.767	<0.001	<0.001	<0.001	<0.001	<0.001			
FGI-12	0.721	<0.001	0.272	<0.001	0.700	0.153	0.005		
FGI-12R	0.775	<0.001	<0.001	<0.001	<0.001	<0.001	0.334	<0.001	
MPA > 0.60									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.656	0.708	0.676	0.729	0.715	0.768	0.725	0.772
P-values									
FGI-7	0.656								
FGI-7R	0.708	<0.001							
FGI-9	0.676	0.039	0.046						
FGI-9R	0.729	<0.001	0.005	<0.001					
FGI-10E	0.715	<0.001	0.649	<0.001	0.263				
FGI-10ER	0.768	<0.001	<0.001	<0.001	<0.001	<0.001			
FGI-12	0.725	<0.001	0.310	<0.001	0.767	0.191	0.003		
FGI-12R	0.772	<0.001	<0.001	<0.001	<0.001	<0.001	0.550	<0.001	
MPA > 0.70									
	AUC	**FGI-7**	**FGI-7R**	**FGI-9**	**FGI-9R**	**FGI-10E**	**FGI-10ER**	**FGI-12**	**FGI-12R**
		0.650	0.694	0.689	0.727	0.725	0.767	0.740	0.780
P-values									
FGI-7	0.650								
FGI-7R	0.694	0.001							
FGI-9	0.689	<0.001	0.765						
FGI-9R	0.727	<0.001	<0.001	0.006					
FGI-10E	0.725	<0.001	0.061	0.001	0.877				
FGI-10ER	0.767	<0.001	<0.001	<0.001	<0.001	0.001			
FGI-12	0.740	<0.001	0.011	<0.001	0.411	0.062	0.070		
FGI-12R	0.780	<0.001	<0.001	<0.001	<0.001	<0.001	0.090	0.001	

[a] P-value for test of null hypothesis area under the curve is equal for the two indicators. P-values < 0.05 cells are shaded in pale blue.

Table 26. Summary results from AUCs comparisons at various MPA level, by study site

Table 26 – A. Summary results from AUCs comparisons at various MPA level, by study site, for restricted FGIs [a]

	is significantly < than			
	FGI-7R	**FGI-9R**	**FGI-10ER**	**FGI-12R**
AUC for	**at MPA > 0.50**			
FGI-7R		Ban2, Phi, Ug2	BF2, Ug2	BF2, Phi, Ug2
FGI-9R	Mali		BF2, Moz, Ug2	Ug2
FGI-10ER	Mali	Mali		-
FGI-12R	-	BF2	-	
	at MPA > 0.60			
FGI-7R		Ban1, Phi, Ug1, Ug2	Ug1, Ug2	Ug2
FGI-9R	-		Moz, Ug2	Ug2
FGI-10ER	Mali	Mali, Phi		Phi
FGI-12R	-	-	-	
	at MPA > 0.70			
FGI-7R		Ug2	Ug2	Ug2
FGI-9R	BF1		Ug2	Moz, Ug2
FGI-10ER	-	-		Phi
FGI-12R	-	-	BF2	

Table 26 – B. Summary results from AUCs comparisons at various MPA level, by study site, for non-restricted FGIs [a]

	is significantly < than			
	FGI-7	**FGI-9**	**FGI-10E**	**FGI-12**
AUC for	**at MPA > 0.50**			
FGI-7		Ban1, Ban2, Phi	Ban1, Ban2, BF2, Ug2	Ban1, Ban2, BF2, Moz, Ug2
FGI-9	-		Ban1, BF2, Moz, Ug2	BF2, Moz, Ug2
FGI-10E	-	Phi		-
FGI-12	-	-	-	
	at MPA > 0.60			
FGI-7		Ban1, Ban2, Phi, Ug2	Ban1, Ban2, BF2, Moz, Ug2	Ban1, Ban2, BF2, Moz, Ug2
FGI-9	-		BF2, Moz, Ug2	BF2, Moz, Ug2
FGI-10E	-	-		-
FGI-12	-	-	-	
	at MPA > 0.70			
FGI-7		Ban1, Ug2	Ban1, BF2, Ug2	Ban1, BF2, Moz, Ug2
FGI-9	-		Ug2	Moz, Ug2
FGI-10E	-	Mali		-
FGI-12	-	-	-	

[a] Names in cells indicate the datasets for which the AUC for the FGI indicated in row heading is statistically lower than the AUC for the FGI indicated in column heading.

and FGI-9R for the Mali dataset only. The AUC for FGI-12R was significantly lower than the AUC for FGI-9R in the BF2 dataset only.

With the MPA > 0.60 threshold, AUCs for FGI-7R were significantly lower than AUCs for FGI-9R, FGI-10ER and FGI-12R in 4, 2 and 1 datasets, respectively. AUCs for FGI-9R were significantly lower than AUCs for FGI-10ER and FGI-12R in 2 and 1 datasets, respectively. AUCs for FGI-10ER were significantly lower than AUCs for FGI-7R, FGI-9R and FGI-12R in 1, 2 and 1 datasets, respectively. The AUCs for FGI-12R were not significantly lower than AUCs for any other dataset.

With the MPA > 0.70 threshold, AUCs for FGI-7R were significantly lower than AUCs for FGI-9R, FGI-10ER and FGI-12R in the Ug2 dataset only. AUCs for FGI-9R were significantly lower than AUCs for FGI-7R, FGI-10ER and FGI-12R in 1, 1 and 2 datasets, respectively. The AUC for FGI-10ER was significantly lower than the AUC for FGI-12R in the Philippines dataset only and the AUC for FGI-12R was significantly lower than the AUC for FGI-10ER in the BF2 dataset only.

Overall, comparisons of AUCs across restricted FGIs and the various thresholds of MPA were clearly at the disadvantage of FGI-7R and, but to a lesser extent, also at the disadvantage of FGI-9R. AUCs values were less distinguishable between FGI-10ER and FGI-12R although FGI-12R performed slightly better against FGI-7R and FGI-9R.

For non-restricted FGIs (**Table 26 – B**) this overall picture is deeply accentuated, with FGI-10E and FGI-12 performing almost the same, clearly above FGI-9 and even more clearly above FGI-7.

7.11 Performance of food group indicators: sensitivity – specificity analysis

The performance of food group indicators can be assessed through a sensitivity – specificity analysis, examining error rates of classification across a range of FGI cutoffs and for various MPA cutoffs (**Table 28**). **Box 1** provides an explanation of indicator characteristics, specifically as used in this context.

Table 27 summarizes all combinations of MPA threshold/FGI cutoff that met the criteria used to define a "best" cutoff. **Tables 28** to **31** show a summary of the results of the sensitivity – specificity analyses for the restricted and non-restricted indicators, respectively, among NPNL women in all countries. **Appendix 7** to **14** provide details for each study site. There was a relationship between the range of FGI values observed in the datasets and their "best" FGI cutoff. For example, Mali, exhibiting high diversity scores, had higher "best" FGI cutoffs. As a rule of thumb, the "best" FGI cutoff was determined for each MPA threshold by considering the following characteristics:

- Rate of misclassification: should be ≤ 30 percent; still considered if ≤ 40 percent;
- Sensitivity and specificity: should be ≥ 60 percent; still considered if one of the two only is ≥ 50 percent;
- At least ten women should have reached the MPA threshold to give some robustness to the analysis; still considered if at least one woman did so.

We observed that the higher the MPA threshold, the lower the proportion of misclassification and the higher the sensitivity.

Across all sites, FGI-12R and FGI-10ER were those presenting more combinations of MPA threshold/ FGI cutoff that fully met all the above criteria (i.e. misclassification ≤ 30 percent, sensitivity and specificity ≥ 60 percent, and at least ten women reaching the MPA threshold). Indeed, there were five of these combinations for FGI-12R (from 3 different datasets: Ban1, BF2, Ug2) and FGI-10ER (but from two different datasets only: Ban1, BF2) while there were only three of them for FGI-9R (from two different datasets: Ban1, Mali) and one for FGI-7R (from Mali), see **Table 27**.

In six cases (from five different datasets) for the FGI-12R, the rate of misclassification was at or below 30 percent but either sensitivity or specificity was < 60 percent (though still ≥ 50 percent). Such combinations occurred in four cases for FGI-10ER (from three datasets), in three cases for FGI-9R (from three datasets) and in two cases for FGI-7R (two datasets).

Box 1.

Predicting Higher Diet Quality: Indicator Characteristics

*(Box from WDDP-I report)**

Because we are trying to "predict" higher (better) MPA (above the cutoff), indicator characteristics have different interpretations than they do when the aim is to assess risk, which is the more standard use in epidemiology.

In this case, sensitivity assesses the proportion of all those who truly have better MPA who are identified by the indicator. Specificity assesses the proportion of those who truly have lower MPA who are identified by the indicator.

There are always trade-offs between sensitivity and specificity; which one should be "favoured" depends on the intended uses of the indicator and sometimes on other factors, such as level of resources available for helping those identified as in need. For our purposes – the development of indicators to assess and compare diet quality for women and to track change across time – it is reasonable to aim for a balance between sensitivity and specificity, but to favour specificity when trade-offs must be made.

This means that we prefer to be certain to identify all those with low MPA and are willing to accept that some women with better MPA are classified incorrectly. The alternative would be to accept more women with low MPA but classified as "better."

There are no fixed criteria for determining what absolute levels of sensitivity, specificity and misclassification may be acceptable. The costs and risks of misclassification depend on the use of the indicator. In general, yardsticks for population-level assessment may have lower requirements (i.e. more misclassification could be tolerated) than would indicators used to differentially allocate resources or to trigger action. Indicators used at the individual level (e.g., in screening) may have even higher requirements.

For the purposes of the WDDP-I, and then WDDP-II, we aimed to minimize misclassification but considered levels of misclassification at or below 30 percent to be acceptable.

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When assuming that the rate of misclassification could be > 30 percent but still ≤ 40 percent with both sensitivity and specificity above 60 percent, the FGI-10ER presented nine such combinations of MPA threshold/FGI cutoff (from five datasets) while the FGI-12R had six (from five datasets), the FGI-9R had three (from three datasets) and the FGI-7R had three (from three datasets).

The rate of misclassification was > 30 percent but still ≤ 40 percent with either sensitivity or specificity below 60 percent but still above 50 percent for 11 combinations based on the FGI-12R (from seven datasets), for five combinations based on the FGI-10ER (from four datasets), for ten combinations based on the FGI-9R (from six datasets) and for six combinations based on the FGI-7R (from five datasets).

In sum, there was no restricted FGI with a cutoff that met acceptable criteria for any MPA threshold across all

Table 27. Summary of combinations of MPA cutoff / FGI cutoff identified with the sensitivity analysis [a]

	«Best» cutoff [b]	«Best» cutoff [c]	«Best» cutoff [d]	«Best» cutoff [e]	«Best» cutoff [f]	«Best» cutoff [g]
FGI-7				MPA > 0.50 / FGI ≥ 4 - Moz	MPA > 0.50 / FGI ≥ 6 - Mali	
				MPA > 0.70 / FGI ≥ 5 - Ban1	MPA > 0.60 / FGI ≥ 5 - Ban1	
					MPA > 0.60 / FGI ≥ 6 - Mali	
					MPA > 0.70 / FGI ≥ 5 - Ug2	
					MPA > 0.70 / FGI ≥ 6 - Mali	
FGI-7R	MPA > 0.50 / FGI ≥ 5 - Mali	MPA > 0.70 / FGI ≥ 4 - BF2		MPA > 0.50 / FGI ≥ 4 - Ug2	MPA > 0.50 / FGI ≥ 5 - BF1	MPA > 0.50 / FGI ≥ 3 - BF2
		MPA > 0.70 / FGI ≥ 5 - Ban1		MPA > 0.60 / FGI ≥ 5 - Mali	MPA > 0.60 / FGI ≥ 5 - BF1	MPA > 0.60 / FGI ≥ 4 - Ug2
				MPA > 0.70 / FGI ≥ 5 - Phi	MPA > 0.60 / FGI ≥ 5 - Phi	
				MPA > 0.70 / FGI ≥ 5 - Mali	MPA > 0.70 / FGI ≥ 4 - Moz	
					MPA > 0.70 / FGI ≥ 5 - BF1	
FGI-9		MPA > 0.70 / FGI ≥ 6 - Ban1		MPA > 0.50 / FGI ≥ 5 - Phi	MPA > 0.50 / FGI ≥ 5 - Ban2	MPA > 0.50 / FGI ≥ 4 - Moz
				MPA > 0.50 / FGI ≥ 5 - Ug2		MPA > 0.50 / FGI ≥ 6 - BF1
				MPA > 0.50 / FGI ≥ 6 - Mali		MPA > 0.70 / FGI ≥ 5 - Ug2
				MPA > 0.60 / FGI ≥ 5 - Ug2		
FGI-9R	MPA > 0.50 / FGI ≥ 5 - Mali	MPA > 0.50 / FGI ≥ 5 - Ban1	MPA > 0.50 / FGI ≥ 4 - Ug2	MPA > 0.50 / FGI ≥ 5 - BF1	MPA > 0.50 / FGI ≥ 5 - Phi	MPA > 0.50 / FGI ≥ 3 - BF2
	MPA > 0.60 / FGI ≥ 5 - Ban1	MPA > 0.70 / FGI ≥ 4 - BF2		MPA > 0.60 / FGI ≥ 5 - Mali	MPA > 0.60 / FGI ≥ 5 - Phi	MPA > 0.50 / FGI ≥ 4 - Ban2
	MPA > 0.70 / FGI ≥ 5 - Ban1			MPA > 0.70 / FGI ≥ 5 - Phi	MPA > 0.60 / FGI ≥ 5 - Ug2	MPA > 0.50 / FGI ≥ 4 - Moz
				MPA > 0.70 / FGI ≥ 5 - Mali	MPA > 0.70 / FGI ≥ 5 - Ug2	MPA > 0.60 / FGI ≥ 4 - Moz
						MPA > 0.60 / FGI ≥ 4 - Ug2
						MPA > 0.60 / FGI ≥ 5 - BF1
FGI-10E	MPA > 0.60 / FGI ≥ 6 - Ban1	MPA > 0.50 / FGI ≥ 6 - Ban1		MPA > 0.60 / FGI ≥ 6 - Ug2	MPA > 0.50 / FGI ≥ 6 - Ug2	MPA > 0.50 / FGI ≥ 5 - Phi
	MPA > 0.70 / FGI ≥ 6 - Ban1			MPA > 0.70 / FGI ≥ 6 - Ug2	MPA > 0.70 / FGI ≥ 5 - BF2	MPA > 0.50 / FGI ≥ 6 - Mali
					MPA > 0.70 / FGI ≥ 6 - Ug1	

[a] Shaded cells indicate that less than ten women reached the MPA level.
[b] Misclassification ≤ 30%; both sensitivity and specificity ≥ 60%.
[c] Misclassification ≤ 30%; specificity ≥ 0.60 and sensitivity < 60% but still ≥ 50%.
[d] Misclassification ≤ 30%; sensitivity ≥ 0.60 and specificity < 60% but still ≥ 50%.
[e] Misclassification > 30% but still ≤ 40%; both sensitivity and specificity ≥ 60%.
[f] Misclassification > 30% but still ≤ 40%; specificity ≥ 60% and sensitivity < 60% but still ≥ 50%.
[g] Misclassification > 30% but still ≤ 40%; sensitivity ≥ 60% and specificity < 60% but still ≥ 50%.

Table 27. (continued) Summary of combinations of MPA cutoff / FGI cutoff identified with the sensitivity analysis [a]

	«Best» cutoff [b]	«Best» cutoff [c]	«Best» cutoff [d]	«Best» cutoff [e]	«Best» cutoff [f]	«Best» cutoff [g]
FGI-10ER	MPA > 0.50 / FGI ≥ 5 - Ban1	MPA > 0.50 / FGI ≥ 4 - BF2	MPA > 0.50 / FGI ≥ 4 - Ug2	MPA > 0.50 / FGI ≥ 5 - BF1	MPA > 0.50 / FGI ≥ 5 - Phi	MPA > 0.50 / FGI ≥ 3 - BF2
	MPA > 0.60 / FGI ≥ 4 - BF2	MPA > 0.60 / FGI ≥ 6 - BF1		MPA > 0.50 / FGI ≥ 5 - Mali	MPA > 0.60 / FGI ≥ 5 - Phi	MPA > 0.50 / FGI ≥ 4 - Moz
	MPA > 0.60 / FGI ≥ 5 - Ban1	MPA > 0.70 / FGI ≥ 6 - Ug2		MPA > 0.50 / FGI ≥ 5 - Ug1		MPA > 0.70 / FGI ≥ 5 - Ug1
	MPA > 0.70 / FGI ≥ 4 - BF2	MPA > 0.70 / FGI ≥ 6 - BF1		MPA > 0.50 / FGI ≥ 5 - Ug2		
	MPA > 0.70 / FGI ≥ 5 - Ban1			MPA > 0.60 / FGI ≥ 5 - Mali		
				MPA > 0.60 / FGI ≥ 5 - Ug1		
				MPA > 0.60 / FGI ≥ 5 - Ug2		
				MPA > 0.70 / FGI ≥ 5 - Phi		
				MPA > 0.70 / FGI ≥ 5 - Ug2		
				MPA > 0.70 / FGI ≥ 5 - Mali		
FGI-12	MPA > 0.50 / FGI ≥ 7 - Mali		MPA > 0.50 / FGI ≥ 6 - Ug2	MPA > 0.50 / FGI ≥ 5 - Moz	MPA > 0.50 / FGI ≥ 5 - BF2	MPA > 0.50 / FGI ≥ 6 - Ug1
	MPA > 0.70 / FGI ≥ 7 - Ban1			MPA > 0.50 / FGI ≥ 6 - Ban1	MPA > 0.60 / FGI ≥ 5 - BF2	MPA > 0.50 / FGI ≥ 7 - BF1
				MPA > 0.60 / FGI ≥ 5 - Moz	MPA > 0.60 / FGI ≥ 7 - Ug2	MPA > 0.60 / FGI ≥ 6 - Ban1
				MPA > 0.60 / FGI ≥ 7 - Mali	MPA > 0.70 / FGI ≥ 7 - Phi	MPA > 0.60 / FGI ≥ 6 - Ug2
				MPA > 0.70 / FGI ≥ 5 - BF2		
				MPA > 0.70 / FGI ≥ 5 - Moz		
				MPA > 0.70 / FGI ≥ 7 - Ug2		
FGI-12R	MPA > 0.50 / FGI ≥ 5 - Ug2	MPA > 0.50 / FGI ≥ 6 - Ban1	MPA > 0.50 / FGI ≥ 3 - BF2	MPA > 0.50 / FGI ≥ 5 - Ban1	MPA > 0.50 / FGI ≥ 4 - BF2	MPA > 0.50 / FGI ≥ 5 - BF1
	MPA > 0.60 / FGI ≥ 4 - BF2	MPA > 0.50 / FGI ≥ 6 - BF1	MPA > 0.60 / FGI ≥ 5 - Ug2	MPA > 0.50 / FGI ≥ 5 - Ban2	MPA > 0.50 / FGI ≥ 5 - Moz	MPA > 0.50 / FGI ≥ 5 - Phi
	MPA > 0.70 / FGI ≥ 4 - BF2	MPA > 0.50 / FGI ≥ 6 - Mali		MPA > 0.60 / FGI ≥ 5 - Ban1	MPA > 0.50 / FGI ≥ 6 - Ug2	MPA > 0.70 / FGI ≥ 5 - Ban1
	MPA > 0.70 / FGI ≥ 6 - Ban1	MPA > 0.60 / FGI ≥ 6 - Ban1		MPA > 0.60 / FGI ≥ 6 - Ug1	MPA > 0.60 / FGI ≥ 5 - Moz	
	MPA > 0.70 / FGI ≥ 6 - Ug2			MPA > 0.60 / FGI ≥ 6 - Ug2	MPA > 0.60 / FGI ≥ 6 - BF1	
				MPA > 0.70 / FGI ≥ 6 - Phi	MPA > 0.60 / FGI ≥ 6 - Mali	
				MPA > 0.70 / FGI ≥ 6 - Mali	MPA > 0.60 / FGI ≥ 6 - Phi	
					MPA > 0.70 / FGI ≥ 5 - Moz	
					MPA > 0.70 / FGI ≥ 6 - BF1	

Table 28. Summary of indicator characteristics for FGI-7, restricted and non-restricted, for NPNL women, across all sites [a]

Table 28 – A. Summary of indicator characteristics for FGI-7R, for NPNL women, across all sites [a]							
Food group cutoffs	**Sensitivity [b]**	**Specificity [b]**	**Total proportion of misclassified**	**«Best» cutoff [c]**			
			MPA > 0.50				
≥ 1	100 - 100	0 - 0	21.3 - 86.4				
≥ 2	100 - 100	0 - 9.2	21.3 - 85.7				
≥ 3	84.5 - 100	3.3 - 53.9	21.8 - 73.1	*BF2 (33)*			
≥ 4	32.8 - 100	30 - 85.5	31 - 51.5	*Ug2 (32)*			
≥ 5	1.7 - 66.7	66.3 - 100	19.9 - 60.4	*BF1 (35)*	***Mali (28)***		
≥ 6	3.9 - 25.9	88.8 - 100	15 - 75.6				
≥ 7	0.9 - 6.6	97.3 - 100	52.1 - 71.8				
			MPA > 0.60				
≥ 1	100 - 100	0 - 0	43.1 - 98				
≥ 2	100 - 100	0 - 7.5	43.1 - 96.5				
≥ 3	90.2 - 100	2.5 - 49.5	38.1 - 83.1				
≥ 4	41.5 - 100	22.2 - 86	27.6 - 61.8	*Ug2 (33)*			
≥ 5	0 - 66.7	62.3 - 100	16.4 - 45.7	*BF1 (39)*	*Mali (34)*	*Phi (38)*	
≥ 6	0 - 28.6	84.8 - 98.8	4.5 - 54.8				
≥ 7	1.2 - 6.9	96.2 - 100	34.4 - 54.4				
			MPA > 0.70				
≥ 1	100 - 100	0 - 0	66.4 - 100				
≥ 2	100 - 100	0 - 6.4	66.2 - 98.5				
≥ 3	88.2 - 100	2.2 - 44.5	46.3 - 92.3				
≥ 4	50 - 100	19.4 - 83.6	22.4 - 73.5	***BF2 (22)***	*Moz (36)*		
≥ 5	0 - 88.9	61.1 - 100	14.4 - 39.2	***Ban1 (17)***	BF1 (39)	Mali (34)	*Phi (36)*
≥ 6	3.9 - 33.3	83.6 - 97.9	2.5 - 33				
≥ 7	1 - 8.8	96 - 99.5	19.1 - 33.6				

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).
[b] Range of values observed across all sites
[c] **Bold font indicates rate of misclassification ≤ 30%;**
Italic font indicates ≥ 10 women reaching the MPA level;
Pink highlighting indicates both sensitivity and specificity ≥ 60%;
Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table 28. Summary of indicator characteristics for FGI-7, restricted and non-restricted, for NPNL women, across all sites [a]

Table 28 – B. Summary of indicator characteristics for FGI-7, for NPNL women, across all sites [a]					
Food group cutoffs	**Sensitivity [b]**	**Specificity [b]**	**Total proportion of misclassified**	**«Best» cutoff [c]**	
MPA > 0.50					
≥ 1	100 - 100	0 - 0	21.3 - 86.4		
≥ 2	100 - 100	0 - 0	21.3 - 86.4		
≥ 3	93.1 - 100	0 - 15.8	20.3 - 82.4		
≥ 4	62.7 - 100	3.3 - 65.8	26.1 - 73.8	*Moz (36)*	
≥ 5	10.2 - 96.6	21.7 - 97.4	35.2 - 55.7		
≥ 6	5 - 52.4	78.3 - 94.4	16.9 - 72.6	*Mali (32)*	
≥ 7	0 - 8.1	96.7 - 100	14 - 71.8		
MPA > 0.60					
≥ 1	100 - 100	0 - 0	43.1 - 98		
≥ 2	100 - 100	0 - 0	43.1 - 98		
≥ 3	92.7 - 100	0 - 12.2	42.1 - 94.5		
≥ 4	57.1 - 100	2.5 - 52.7	34.9 - 83.8		
≥ 5	7.1 - 100	17.3 - 92.7	34.6 - 67.6	*Ban1 (35)*	
≥ 6	0 - 57.1	71.6 - 95.3	7.5 - 51.8	*Mali (31)*	
≥ 7	0 - 8.9	95.6 - 100	6.6 - 54.4		
MPA > 0.70					
≥ 1	100 - 100	0 - 0	66.4 - 100		
≥ 2	100 - 100	0 - 0	66.4 - 100		
≥ 3	88.2 - 100	0 - 11.7	63.6 - 96.9		
≥ 4	62.5 - 100	2.2 - 52.5	44.3 - 93.1		
≥ 5	0 - 100	17.2 - 91.3	24.7 - 75.5	*Ban1 (34)*	*Ug2 (39)*
≥ 6	9.8 - 55.6	67.7 - 94.5	5.5 - 33.8	Mali (33)	
≥ 7	0 - 12	95.3 - 99.7	4 - 33.6		

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).
[b] Range of values observed across all sites
[c] **Bold font indicates rate of misclassification ≤ 30%;**
Italic font indicates ≥ 10 women reaching the MPA level;
Pink highlighting indicates both sensitivity and specificity ≥ 60%;
Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table 29. Summary of indicator characteristics for FGI-9, restricted and non-restricted, for NPNL women, across all sites [a]

Table 29 – A. Summary of indicator characteristics for FGI-9R, for NPNL women, across all sites [a]								
Food group cutoffs	Sensitivity [b]	Specificity [b]	Total proportion of misclassified	«Best» cutoff [c]				
				MPA > 0.50				
≥ 1	100 - 100	0 - 0	21.3 - 86.4					
≥ 2	100 - 100	0 - 9.2	21.3 - 85.7					
≥ 3	84.5 - 100	3.3 - 53.9	21.8 - 73.8	*BF2 (33)*				
≥ 4	32.8 - 100	30 - 85.5	27 - 53.1	*Ban2 (40)*	*Moz (34)*	***Ug2 (27)***		
≥ 5	1.7 - 66.7	63.4 - 100	19.9 - 55.3	***Ban1 (20)***	*BF1 (36)*	***Mali (28)***	*Phi (38)*	
≥ 6	1.6 - 31.7	86 - 100	15.3 - 73.1					
≥ 7	0 - 14	93.9 - 99.6	14 - 70.5					
≥ 8	0.9 - 5.1	98.5 - 100	52.4 - 71.8					
≥ 9	0.2 - 0.3	99.7 - 100	54.5 - 72.3					
				MPA > 0.60				
≥ 1	100 - 100	0 - 0	43.1 - 98					
≥ 2	100 - 100	0 - 7.5	43.1 - 96.5					
≥ 3	90.2 - 100	2.5 - 49.5	38.1 - 83.8					
≥ 4	41.5 - 100	22.2 - 86	27.6 - 61.8	*Moz (39)*	*Ug2 (31)* [d]			
≥ 5	0 - 68.4	59.6 - 98.9	18.6 - 45.7	***Ban1 (19)***	*BF1 (40)*	*Mali (35)*	*Phi (37)*	*Ug2 (37)* [d]
≥ 6	0 - 37.5	81.5 - 98.4	6 - 54.3					
≥ 7	0 - 14.5	91.8 - 99.6	2.5 - 53.1					
≥ 8	1.2 - 5.2	97.5 - 100	34.2 - 54.4					
≥ 9	0.3 - 0.4	99.8 - 100	34.3 - 54.9					
				MPA > 0.70				
≥ 1	100 - 100	0 - 0	66.4 - 100					
≥ 2	100 - 100	0 - 6.4	66.1 - 98.5					
≥ 3	95.8 - 100	2.2 - 44.5	46.3 - 93.1					
≥ 4	50 - 100	19.4 - 83.6	22.4 - 73.5	***BF2 (22)***				
≥ 5	4.2 - 88.9	57.1 - 99.1	17.9 - 43.1	***Ban1 (20)***	Mali (35)	*Phi (37)*	*Ug2 (32)*	
≥ 6	0 - 39.2	79.6 - 98.8	4 - 30.7					
≥ 7	0 - 16.8	91 - 99.7	0.5 - 33					
≥ 8	1.5 - 6.4	97.2 - 99.8	18.5 - 33.3					
≥ 9	0.5 - 0.8	99.8 - 100	17.3 - 33.4					

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).

[b] Range of values observed across all sites

[c] **Bold font indicates rate of misclassification ≤ 30%;**

Italic font indicates ≥ 10 women reaching the MPA level;

Pink highlighting indicates both sensitivity and specificity ≥ 60%;

Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;

Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;

When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table 29. Summary of indicator characteristics for FGI-9, restricted and non-restricted, for NPNL women, across all sites [a]

Table 29 – B. Summary of indicator characteristics for FGI-9, for NPNL women, across all sites [a]						
Food group cutoffs	Sensitivity [b]	Specificity [b]	Total proportion of misclassified	«Best» cutoff [c]		
			MPA > 0.50			
≥ 1	100 - 100	0 - 0	21.3 - 86.4			
≥ 2	100 - 100	0 - 0	21.3 - 86.4			
≥ 3	94.2 - 100	0 - 14.3	20.3 - 82.4			
≥ 4	72.4 - 100	3.3 - 50	25.4 - 73.8	*Moz (34)*		
≥ 5	26.2 - 100	16.7 - 90.5	36.6 - 60.8	*Ban2 (40)*	*Phi (39)*	*Ug2 (37)*
≥ 6	1.6 - 82.8	54.5 - 100	21.3 - 67.5	*BF1 (39)*	*Mali (33)*	
≥ 7	1.3 - 26.2	91.1 - 100	14.3 - 77.7			
≥ 8	0.9 - 5.6	98.2 - 100	40.2 - 71.8			
≥ 9	0.2 - 0.8	99.7 - 100	54.2 - 72.3			
			MPA > 0.60			
≥ 1	100 - 100	0 - 0	43.1 - 98			
≥ 2	100 - 100	0 - 0	43.1 - 98			
≥ 3	94.4 - 100	0 - 11.8	42.1 - 94.5			
≥ 4	68.3 - 100	2.5 - 42.6	35.9 - 83.8			
≥ 5	19 - 100	13.6 - 80.3	35.1 - 70.8	*Ug2 (37)*		
≥ 6	0 - 87.5	50.9 - 98.4	15.9 - 49.7			
≥ 7	0 - 28.6	87.7 - 100	4 - 55.8			
≥ 8	0 - 5.6	97.1 - 100	21.6 - 54.4			
≥ 9	0.3 - 1.2	99.8 - 100	34 - 54.9			
			MPA > 0.70			
≥ 1	100 - 100	0 - 0	66.4 - 100			
≥ 2	100 - 100	0 - 0	66.4 - 100			
≥ 3	96.8 - 100	0 - 11	63.9 - 96.9			
≥ 4	70.8 - 100	2.2 - 36	52.5 - 93.1			
≥ 5	17.6 - 100	12.9 - 80.2	30.1 - 80	*Ug2 (39)*		
≥ 6	0 - 88.9	46.8 - 98.8	13.9 - 52.3	***Ban1 (16)***		
≥ 7	3.9 - 27.3	84.9 - 100	2 - 32.6			
≥ 8	0 - 6.4	96.7 - 99.8	9.8 - 33.3			
≥ 9	0.5 - 2.4	99.8 - 100	17 - 33.4			

[a] In selecting the “best” cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site’s “best” cutoff).

[b] Range of values observed across all sites

[c] **Bold font indicates rate of misclassification ≤ 30%;**

Italic font indicates ≥ 10 women reaching the MPA level;

Pink highlighting indicates both sensitivity and specificity ≥ 60%;

Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;

Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;

When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table 30. Summary of indicator characteristics for FGI-10E, restricted and non-restricted, for NPNL women, across all sites [a]

Table 30 – A. Summary of indicator characteristics for FGI-10ER, for NPNL women, across all sites [a]									
Food group cutoffs	**Sensitivity [b]**	**Specificity [b]**	**Total proportion of mis-classified**	**«Best» cutoff [c]**					
MPA > 0.50									
≥ 1	100 - 100	0 - 0	21.3 - 86.4						
≥ 2	100 - 100	0 - 9.2	21.3 - 85.7						
≥ 3	89.7 - 100	3.3 - 51.3	20.8 - 73.1	*BF2 (32)* [d]					
≥ 4	53.4 - 100	26.2 - 82.9	22.8 - 53.8	***BF2 (30)*** [d]	*Moz (36)*	***Ug2 (23)*** [d]			
≥ 5	12.1 - 72.4	60.4 - 100	22.9 - 42.3	***Ban1 (23)***	*BF1 (37)*	*Mali (30)*	*Phi (39)*	*Ug1 (36)*	*Ug2 (33)* [d]
≥ 6	8.5 - 41.4	84.2 - 100	16.3 - 59.9						
≥ 7	1.7 - 16.2	92.4 - 100	14 - 75.1						
MPA > 0.60									
≥ 1	100 - 100	0 - 0	43.1 - 98						
≥ 2	100 - 100	0 - 7.5	43.1 - 96.5						
≥ 3	91.1 - 100	2.5 - 46.2	38.8 - 83.1						
≥ 4	63.4 - 100	21.2 - 80.6	24.6 - 62.3	***BF2 (25)***					
≥ 5	14.6 - 78.9	55.3 - 97.8	23.9 - 43.8	***Ban1 (24)***	*Mali (37)*	*Phi (38)*	*Ug1 (36)*	*Ug2 (30)*	
≥ 6	0 - 50	81.1 - 98.2	8 - 45.2	***BF1 (21)***					
≥ 7	0 - 17.7	90.5 - 100	3.5 - 54.3						
MPA > 0.70									
≥ 1	100 - 100	0 - 0	66.4 - 100						
≥ 2	100 - 100	0 - 6.4	66.2 - 98.5						
≥ 3	94.4 - 100	2.2 - 40.9	48.5 - 92.3						
≥ 4	64.7 - 100	15.1 - 76.4	23.9 - 73.5	***BF2 (24)***					
≥ 5	20.8 - 88.9	50.7 - 97.3	16.4 - 46.9	***Ban1 (26)***	Mali (37)	*Phi (37)*	*Ug2 (33)* [a]		
≥ 6	11.8 - 50.2	78.6 - 96.3	6 - 31.5	**BF1 (21)**	***Ug2 (27)*** [d]				
≥ 7	0 - 22.9	89.8 - 98.8	1.5 - 28.7						

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).
[b] Range of values observed across all sites
[c] **Bold font indicates rate of misclassification ≤ 30%;**
Italic font indicates ≥ 10 women reaching the MPA level;
Pink highlighting indicates both sensitivity and specificity ≥ 60%;
Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table 30. Summary of indicator characteristics for FGI-10E, restricted and non-restricted, for NPNL women, across all sites [a]

Table 30 – B. Summary of indicator characteristics for FGI-10E, for NPNL women, across all sites [a]						
Food group cutoffs	**Sensitivity [b]**	**Specificity [b]**	**Total proportion of misclassified**	**«Best» cutoff [c]**		
			MPA > 0.50			
≥ 1	100 - 100	0 - 0	21.3 - 86.4			
≥ 2	100 - 100	0 - 0	21.3 - 86.4			
≥ 3	93.1 - 100	0 - 14.9	20.8 - 83.1			
≥ 4	79.7 - 100	3 - 47.4	20.8 - 75.4			
≥ 5	40.7 - 100	16.7 - 84.2	26.6 - 62.3	*Phi (40)*		
≥ 6	8.5 - 89.7	45.5 - 100	26.2 - 55.7	***Ban1 (26)***	*Mali (37)*	*Ug2 (39)*
≥ 7	5.1 - 44.8	77.2 - 100	16.3 - 66			
			MPA > 0.60			
≥ 1	100 - 100	0 - 0	43.1 - 98			
≥ 2	100 - 100	0 - 0	43.1 - 98			
≥ 3	92.7 - 100	0 - 12.2	42.6 - 95			
≥ 4	78.6 - 100	2.5 - 38.2	38.6 - 85.4			
≥ 5	40.5 - 100	13.6 - 76.4	33.8 - 72.3			
≥ 6	9.5 - 93.8	42.1 - 98.2	21.4 - 51.5	***Ban1 (26)***	*Ug2 (36)*	
≥ 7	0 - 43.8	74.6 - 100	7.5 - 49.2			
			MPA > 0.70			
≥ 1	100 - 100	0 - 0	66.4 - 100			
≥ 2	100 - 100	0 - 0	66.4 - 100			
≥ 3	95.2 - 100	0 - 11.7	65.7 - 97			
≥ 4	76.5 - 100	2.2 - 32.5	58.7 - 94.6			
≥ 5	29.4 - 100	12.9 - 68.8	35.8 - 81.5	*BF2 (36)*		
≥ 6	11.8 - 100	38.9 - 96.3	18.6 - 59.2	***Ban1 (26)***	*Ug1 (38)*	*Ug2 (35)*
≥ 7	5.9 - 38.5	72.2 - 99.1	5.5 - 30.2			

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).
[b] Range of values observed across all sites
[c] **Bold font indicates rate of misclassification ≤ 30%;**
Italic font indicates ≥ 10 women reaching the MPA level;
Pink highlighting indicates both sensitivity and specificity ≥ 60%;
Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table 31. Summary of indicator characteristics for FGI-12, restricted and non-restricted, for NPNL women, across all sites [a]

Table 31 – A. Summary of indicator characteristics for FGI-12R, for NPNL women, across all sites [a]									
Food group cutoffs	**Sensitivity [b]**	**Specificity [b]**	**Total proportion of misclassified**	**«Best» cutoff [c]**					
				MPA > 0.50					
≥ 1	100 - 100	0 - 0	21.3 - 86.4						
≥ 2	100 - 100	0 - 9.2	21.3 - 86.4						
≥ 3	91.4 - 100	2.4 - 50	21.3 - 77.1	***BF2 (32)*** [d]					
≥ 4	53.4 - 100	11.9 - 82.9	21.3 - 60.8	*BF2 (30)* [d]					
≥ 5	19 - 89.7	38.1 - 94.7	25.6 - 40.2	*Ban1 (35)* [d]	*Ban2 (38)*	*BF1 (39)* [d]	*Moz (35)*	*Phi (39)*	***Ug2 (26)*** [d]
≥ 6	16.9 - 58.6	71.4 - 100	19.9 - 50.5	***Ban1 (20)*** [d]	***BF1 (28)*** [d]	***Mali (29)***	*Ug2 (40)* [d]		
≥ 7	5.1 - 33	83.6 - 100	15.3 - 61.4						
				MPA > 0.60					
≥ 1	100 - 100	0 - 0	43.1 - 98						
≥ 2	100 - 100	0 - 7.5	43.1 - 97.5						
≥ 3	95.1 - 100	1.2 - 44.1	40.3 - 94.5						
≥ 4	63.4 - 100	9.4 - 80.6	24.6 - 70.1	***BF2 (25)***					
≥ 5	19.5 - 100	31.8 - 92.5	28.9 - 54.9	*Ban1 (38)* [d]	*Moz (32)*	***Ug2 (29)*** [d]			
≥ 6	0 - 61.6	65.9 - 94.5	19.3 - 39.2	***Ban1 (19)*** [d]	*BF1 (32)*	*Mali (32)*	*Phi (37)*	*Ug1 (37)*	*Ug2 (32)* [d]
≥ 7	0 - 37.1	80.6 - 100	7 - 46.7						
				MPA > 0.70					
≥ 1	100 - 100	0 - 0	66.4 - 100						
≥ 2	100 - 100	0 - 6.4	66.2 - 99.5						
≥ 3	98.4 - 100	1.4 - 39.1	50 - 96.5						
≥ 4	75 - 100	6.8 - 76.4	23.9 - 78.4	***BF2 (24)***					
≥ 5	25 - 100	26 - 91.8	20.1 - 58.8	*Ban1 (40)* [d]	*Moz (37)*				
≥ 6	17.6 - 70.2	55.5 - 91.3	17.9 - 42.1	***Ban1 (19)*** [d]	BF1 (32)	Mali (32)	*Phi (35)*	***Ug2 (29)***	
≥ 7	0 - 44	78.4 - 97.5	5 - 31						

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).

[b] Range of values observed across all sites

[c] **Bold font indicates rate of misclassification ≤ 30%;**

Italic font indicates ≥ 10 women reaching the MPA level;

Pink highlighting indicates both sensitivity and specificity ≥ 60%;

Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;

Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;

When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table 31. Summary of indicator characteristics for FGI-12, restricted and non-restricted, for NPNL women, across all sites [a]

Table 31 – B. Summary of indicator characteristics for FGI-12, for NPNL women, across all sites [a]

Food group cutoffs	Sensitivity [b]	Specificity [b]	Total proportion of misclassified	«Best» cutoff [c]		
MPA > 0.50						
≥ 1	100 - 100	0 - 0	21.3 - 86.4			
≥ 2	100 - 100	0 - 0	21.3 - 86.4			
≥ 3	96.6 - 100	0 - 7.9	21.3 - 83.4			
≥ 4	84.5 - 100	1 - 36.8	20.8 - 78.1			
≥ 5	51.7 - 100	11.7 - 78.9	23.4 - 66.9	*BF2 (38)*	*Moz (32)*	
≥ 6	22 - 96.6	29.7 - 90.8	28.5 - 55.4	*Ban1 (38)*	*Ug1 (35)*	***Ug2 (29)***
≥ 7	6.9 - 79.3	59.4 - 100	22.3 - 54.6	*BF1 (36)*	***Mali (29)***	
MPA > 0.60						
≥ 1	100 - 100	0 - 0	43.1 - 98			
≥ 2	100 - 100	0 - 0	43.1 - 98			
≥ 3	95.1 - 100	0 - 5.5	43.1 - 98			
≥ 4	83.3 - 100	0.9 - 33.3	41.3 - 93			
≥ 5	53.7 - 100	9.9 - 69.1	33 - 76.9	*BF2 (37)*	*Moz (33)*	
≥ 6	19 - 93.8	26.3 - 87.1	31.1 - 65.4	*Ban1 (40)*	*Ug2 (31)*	
≥ 7	7.3 - 81.3	55.3 - 97.8	19.4 - 42.6	*Mali (36)*	*Ug2 (38)*	
MPA > 0.70						
≥ 1	100 - 100	0 - 0	66.4 - 100			
≥ 2	100 - 100	0 - 0	66.4 - 100			
≥ 3	98.4 - 100	0 - 6.4	65.7 - 100			
≥ 4	82.4 - 100	0.8 - 30.9	59 - 96.2			
≥ 5	54.2 - 100	9.7 - 63.6	38.1 - 86.2	*BF2 (38)*	*Moz (38)*	
≥ 6	17.6 - 100	24.6 - 86.4	25.4 - 73.1			
≥ 7	8.3 - 77.8	51.6 - 97.3	18.4 - 47.7	***Ban1 (19)***	*Phi (31)*	*Ug2 (31)*

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).

[b] Range of values observed across all sites

[c] **Bold font indicates rate of misclassification ≤ 30%;**

Italic font indicates ≥ 10 women reaching the MPA level;

Pink highlighting indicates both sensitivity and specificity ≥ 60%;

Green highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;

Brown highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;

When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

sites. FGI-7R definitely performed worse than the others. For FGI-9R, a cutoff of five groups or more seemed to perform "best" more frequently, whatever the MPA threshold. In total, assuming original strict criteria could be relaxed (as described above), eight "best" cutoffs were identified for an MPA threshold > 0.50; seven for MPA > 0.60; five for MPA > 0.70. Considering FGI-10ER and FGI-12R, results seemed more consistent across datasets. A cutoff of five groups or more for the FGI-10ER and six groups or more for the FGI-12R performed "best" for an MPA level either > 0.60 or > 0.70. Generally speaking, the higher the MPA threshold, the less acceptable indicators were identified (whatever the MPA threshold and FGI cutoffs). Indeed, there were 10 and 12 such "best" cutoffs for FGI-10ER and FGI-12R at MPA > 0.50, respectively; corresponding figures were seven and ten at MPA > 0.60, and eight for both at MPA > 0.70 (see **Tables 28 – A** to **31 – A**).

Finally, it was possible to define a "best" dichotomous indicator for the following cases:

- FGI-9R with a cutoff point of minimum five food groups: in four out of nine datasets with an MPA>0.50, five datasets with an MPA>0.60, four datasets with an MPA>0.70.
- FGI-10ER with a cutoff point of minimum five food groups: in six out of nine datasets with a MPA>0.50, five datasets with an MPA>0.60, five datasets with an MPA>0.70.
- FGI-12R with a cutoff point of minimum six food groups: in four out of nine datasets with a MPA>0.50, six datasets with an MPA>0.60, five datasets with an MPA>0.70.

It should be noted that the above "best cutoffs" did not work at all for the Ban2, BF2 and Mozambique datasets, whatever the MPA threshold. For the two latter datasets, however, a cutoff point of four groups, or sometimes three groups (BF2) or five groups (Mozambique), worked for the three indicators, at various levels of MPA. For the Ban2 dataset, there was only a cutoff point of four groups that worked only with the FGI-9R for an MPA>0.50.

The same analysis was performed for the non-restricted indicators (FGI-7, FGI-9, FGI-10E and FGI-12). As expected given the results of correlations and regression analyses and the AUC values, performances in terms of sensitivity – specificity analysis for the FGI-7, FGI-9, FGI-10E and FGI-12 were lower than those for FGI-7R, FGI-9R, FGI-10ER and FGI-12R, respectively. The results for the non-restricted indicators are summarized in **Tables 28 – B** to **31 – B**.

7.12 Matching of prevalence rates above various combinations of restricted-FGI cutoffs and MPA thresholds

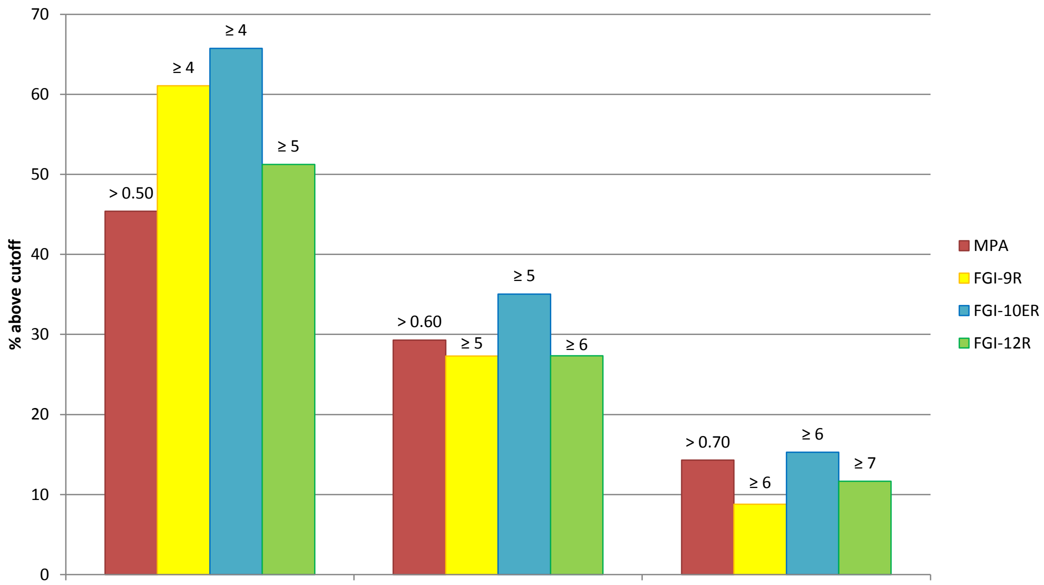
In addition to the analysis of the performance of FGIs at the individual level, we looked at how well the prevalence at/above certain FGI cutoffs matched the prevalence above mean probability of adequacy (MPA) of 0.50, 0.60 and 0.70.

The rationale for this analysis is that any dichotomous proxy indicator will be mainly used for deriving a prevalence rate at the population level (percentage of women consuming at least a given number of food groups), for monitoring trends and for comparing prevalence rates between regions or countries. It is very clear from the results presented above, as it was already clear from results of WDDP-I, that FGIs should not be used for screening and targeting at the individual level as this would require much better performance in terms of sensitivity and specificity. Thus, we concluded that emphasis should not be put exclusively on the ROC and sensitivity – specificity analysis for choosing the best indicator and cutoff.

Correlation analysis, ROC analysis and sensitivity – specificity analysis described above identified promising FGIs (FGI-9R, FGI-10ER and FGI-12R) and the "best" cutoff for each FGI across sites (five or more food groups for FGI-9R and FGI-10ER, and six or more for FGI-12R). Ideally, for each site, we would then like the prevalence at/above the FGI cutoff ("FGI prevalence") to equal the prevalence above anMPA threshold indicating acceptable micronutrient adequacy ("MPA prevalence"). In practice, we would already be content if sites with higher FGI prevalence were also found to have higher MPA prevalence, and if low FGI prevalence corresponded to low MPA prevalence. This would be important for the intended uses of the indicator.

Therefore, still for NPNL women only, we calculated "MPA prevalence" at the thresholds of 0.50, 0.60 and 0.70,

Figure 14. Average prevalence rates at various MPA thresholds and restricted-FGI cutoffs



and the "FGI prevalence" for the three FGIs-R for their "best" cutoffs, and for the cutoffs right above and below the "best" cutoff. Results are displayed in **Table 32**. The average MPA prevalence at each MPA threshold was then graphically compared to the closest average FGI prevalence for each of the three indicators (**Figure 14**). The best matching of the average MPA prevalence and the average FGI prevalence at/above the "best" cutoff was found for MPA > 0.60, then for MPA > 0.70, then for MPA > 0.50.

To further explore the relationships between MPA prevalence and FGI prevalence, they were plotted against each other for each FGI/cutoff combination and each MPA threshold across all sites. Direct scatter plots of prevalence rates and side-by-side histograms displaying prevalence rates for each site are presented in **Figures 15 – A** to **17 – C.**

Two sites with relatively high MPA prevalence and, in contrast, relatively low FGI prevalence clearly appeared as outliers: the Mozambique and BF2 datasets. For Mozambique, the survey was performed at the peak of the mango season when large amounts of mangoes were consumed. For rural Burkina Faso, the rather high MPA is partly explained by the consumption of large quantities of grains, mainly sorghum, quite rich in minerals (iron and zinc), and of some condiments made out of sorrel seeds. Therefore, in both cases, the MPA was driven by quantities rather than by diversity[18].

When considering the other seven sites, we found that the FGI-10ER (**Figures 15 – B, 16 – B and 17 – B**) and especially the FGI-12R (**Figures 15 – C, 16 – C and 17 – C**) aligned the sites with more complex diets and a higher mean number of food groups much better than the FGI-9R (**Figures 15 – A, 16 – A and 17 – A**); but there was not much difference for the two outliers and for the two Bangladesh sites with simpler diets and lower mean FGIs.

The relationships between MPA prevalence and FGI prevalence were further examined through Spearman rank correlation analyses, with each site considered as one observation[19]. When all nine sites were used, no significant correlation was found. However, correlation coefficients tended to be higher for FGI-10ER and FGI-12R (**Table 33 – A**). When excluding the two outliers

[18] These two sites were already recognized as outliers in other parts of the analysis. However, the remaining question is to what extent situations similar to these are frequently encountered – or not, in resource-poor settings, globally speaking.

[19] We must acknowledge that such an analysis on a limited number of data points raises caution about robustness. Statistical advice is being sought on whether methods such as bootstrapping can be used to put confidence intervals around the correlation coefficients.

Table 32. Prevalence rate at various MPA thresholds and restricted-FGI cutoffs [a]

	MPA						FGI-9R						FGI-10ER						FGI-12R					
	> 0.50		> 0.60		> 0.70		≥4		≥5		≥6		≥4		≥5		≥6		≥5		≥6		≥7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Ban1	41	13.7	19	6.4	11	3.7	160	53.5	63	21.1	11	3.7	176	58.9	84	28.1	30	10.0	127	42.5	60	20.1	19	6.4
Ban2	40	19.9	4	2.0	0	0.0	96	47.8	37	18.4	8	4.0	100	49.8	46	22.9	12	6.0	90	44.8	36	17.9	10	5.0
BF1	29	22.2	16	12.2	4	3.3	96	73.4	56	42.6	19	14.6	97	74.0	61	46.6	27	20.9	74	56.3	41	31.3	12	8.9
BF2	58	44.0	41	31.3	24	17.9	30	22.6	2	1.3	0	0.0	44	33.0	8	5.8	0	0.0	15	11.4	0	0.0	0	0.0
Mali	42	41.2	21	20.6	9	8.8	84	82.4	43	42.2	15	14.7	84	82.4	45	44.1	19	18.6	69	67.6	36	35.3	15	14.7
Moz	59	60.8	42	43.3	17	17.5	60	61.9	9	9.3	1	1.0	62	63.9	18	18.6	5	5.2	37	38.1	10	10.3	3	3.1
Phi	394	54.5	248	34.3	125	17.3	478	66.1	307	42.5	171	23.7	474	65.6	308	42.6	179	24.8	408	56.4	282	39.0	184	25.4
Ug1	155	78.7	112	56.9	51	25.9	145	73.6	62	31.5	11	5.6	172	87.3	108	54.8	49	24.9	152	77.2	98	49.7	42	21.3
Ug2	449	73.6	347	56.9	209	34.3	417	68.4	226	37.0	72	11.8	470	77.0	317	52.0	166	27.2	408	66.9	258	42.3	123	20.2
Average		**45.4**		**29.3**		**14.3**		**61.1**		**27.3**		**8.8**		**65.8**		**35.0**		**15.3**		**51.3**		**27.3**		**11.7**

[a] Using sampling weights when available.

(Moz and BF2), we observed significant correlations for FGI-10ER and FGI-12R, with coefficients ranging from 0.82 to 0.96 for the "best" cutoffs and MPA > 0.60 as well as MPA > 0.50, and from 0.71 to 0.93 for the "best" cutoffs and MPA > 0.70 (**Table 33 - B**).

7.13 Mean MPA and percentages of women having consumed some food groups of nutritional interest according to their classification at-or-above versus below FGI cutoffs

Given the intended use of the indicator, we explored in this last analysis how the quality of women's diet would be reflected by the various FGI prevalence rates. Before doing so, it is useful to recall the percentages of women reaching the various FGI cutoffs (i.e. what these FGI prevalence rates were) in each dataset (**Table 34**). Over all sites, there were 28 percent, 37 percent and 30 percent of women reaching the "best" cutoff of five groups for FGI-9R, five groups for FGI-10ER and six groups for FGI-12R, respectively. For FGI-9R this percentage varied from 1 percent to 43 percent depending on the site (from 18 percent to 43 percent without the two outliers, BF2 and Mozambique). For FGI-10ER the percentage varied from 5 percent to 58 percent depending on the site (from 23 percent to 58 percent without the outliers). For FGI-12R it varied from <1 percent to 51 percent depending on the site (from 18 percent to 51 percent without the outliers).

We compared first the mean MPA among women reaching or not reaching the various FGI cutoffs, for all sites (**Table 35** and **Figure 18**). Mean MPAs calculated over all sites were weighted according to sample sizes. For the "best" FGI-9R cutoff, over all sites, the mean MPA was on average 0.13 points[20] higher among women reaching the cutoff than among others. Depending on the site, this difference varied from 0.04 (BF2) to 0.15 points (Mali, Ug2). For both the "best" FGI-10ER and FG-12R cutoffs, over all sites, the mean MPA was on average 0.16 points higher among women reaching the cutoff than among others. Depending on

[20] The values of 0.41 and 0.55 in **Table 35** are rounded; the exact difference is 0.13 and not 0.14.

Figure 15. Prevalence above MPA > 0.50 against prevalence above "best" cutoff for FGI-9R, FGI-10ER and FGI-12R, by study site

Figure 15 – A. Prevalence above MPA > 0.50 against prevalence above FGI-9R ≥ 5, by study site

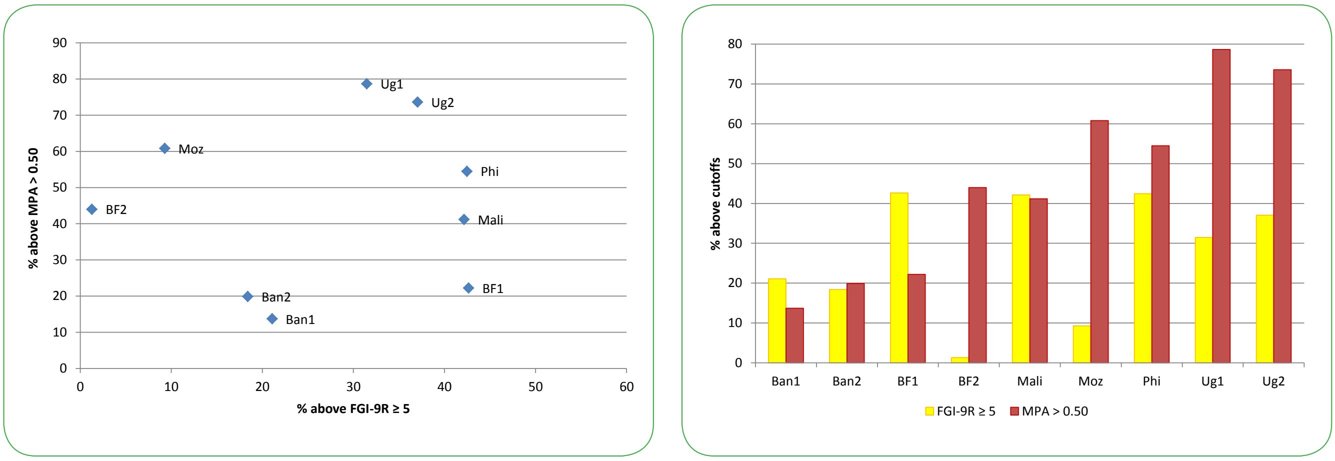


Figure 15 – B. Prevalence above MPA > 0.50 against prevalence above FGI-10ER ≥ 5, by study site

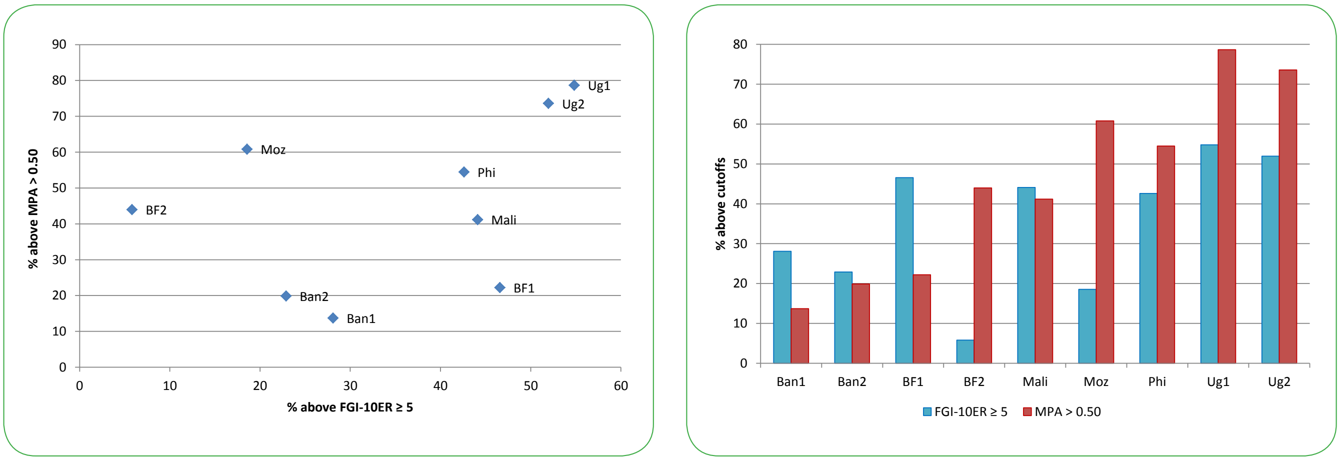


Figure 15 – C. Prevalence above MPA > 0.50 against prevalence above FGI-12R ≥ 6, by study site

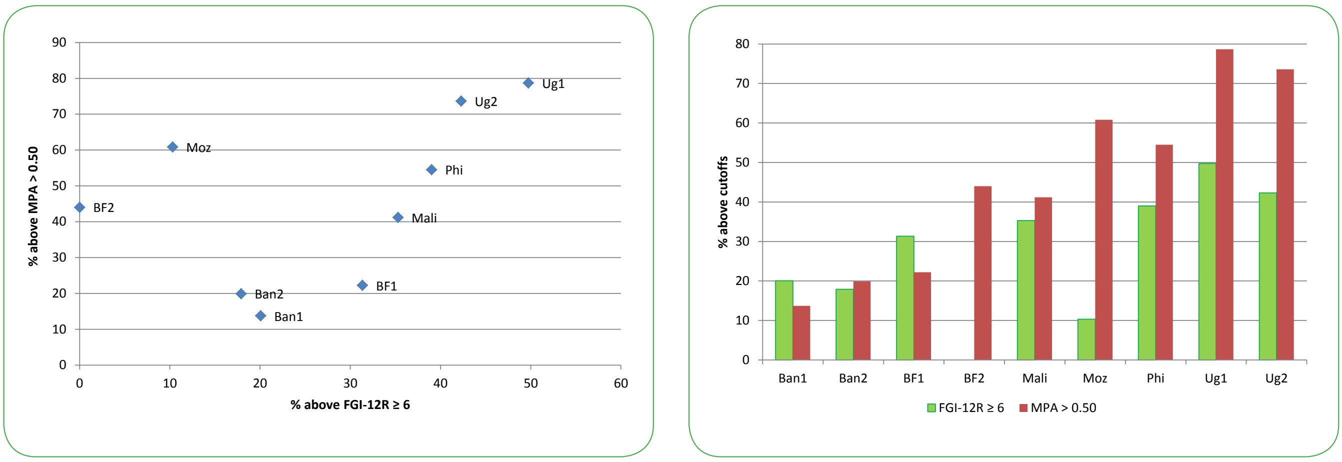
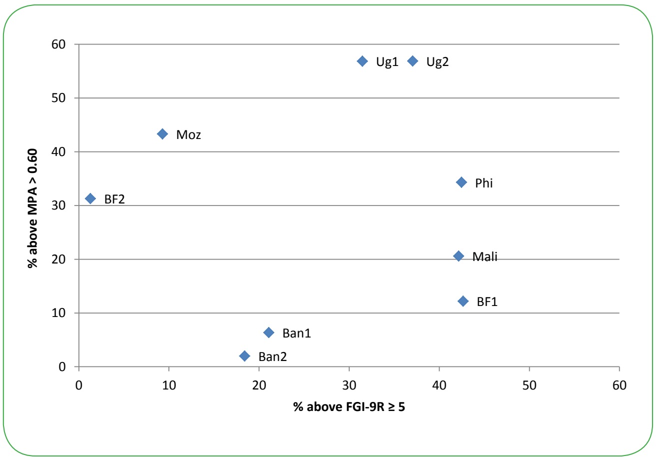


Figure 16. Prevalence above MPA > 0.60 against prevalence above "best" cutoff for FGI-9R, FGI-10ER and FGI-12R, by study site

Figure 16 – A. Prevalence above MPA > 0.60 against prevalence above FGI-9R ≥ 5, by study site



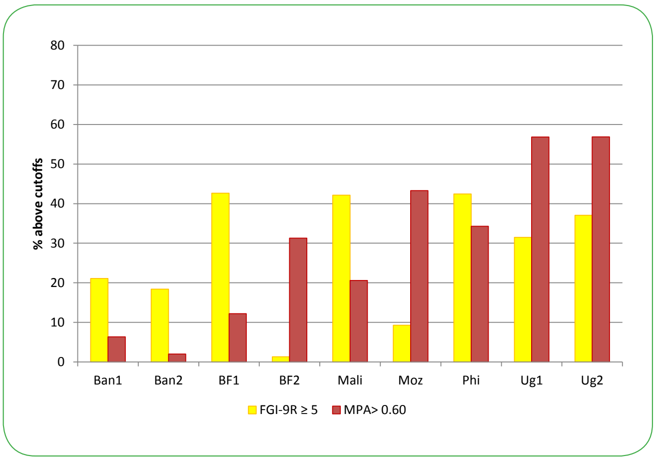
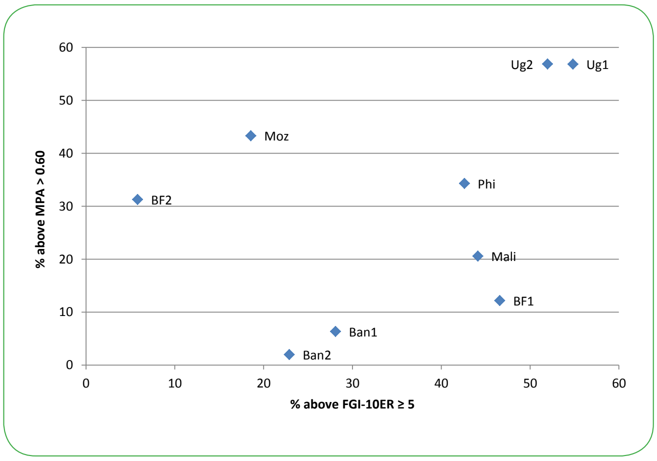


Figure 16 – B. Prevalence above MPA > 0.60 against prevalence above FGI-10ER ≥ 5, by study site



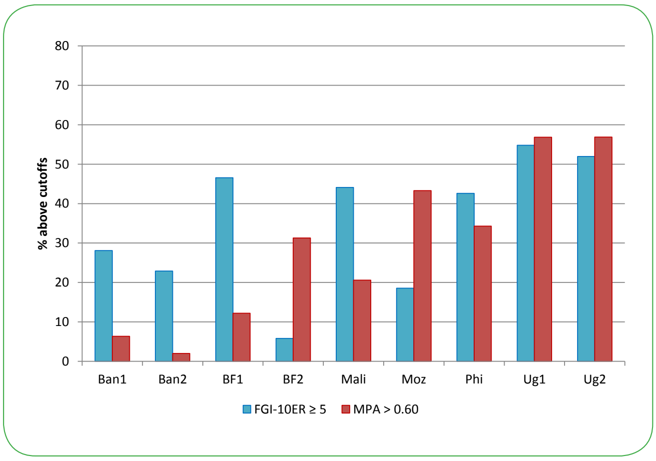
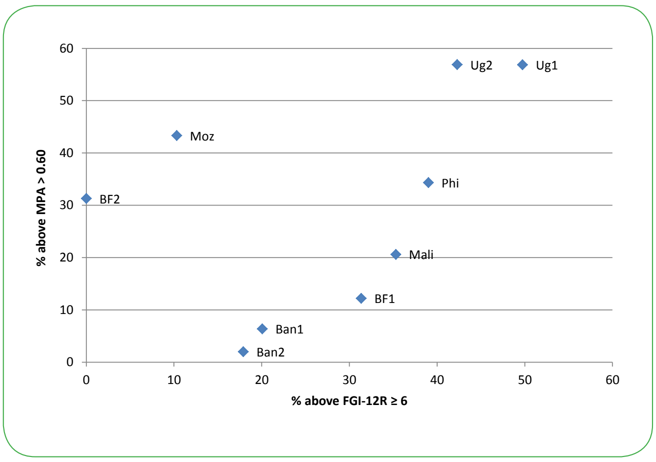


Figure 16 – C. Prevalence above MPA > 0.60 against prevalence above FGI-12R ≥ 6, by study site



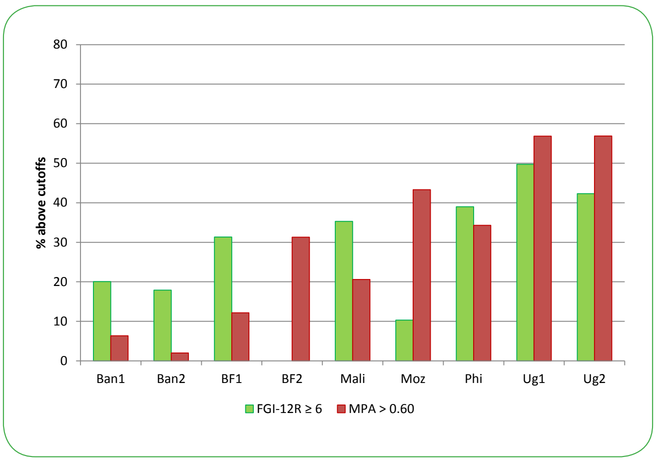


Figure 17. Prevalence above MPA > 0.70 against prevalence above "best" cutoff for FGI-9R, FGI-10ER and FGI-12R, by study site

Figure 17 – A. Prevalence above MPA > 0.70 against prevalence above FGI-9R ≥ 5, by study site

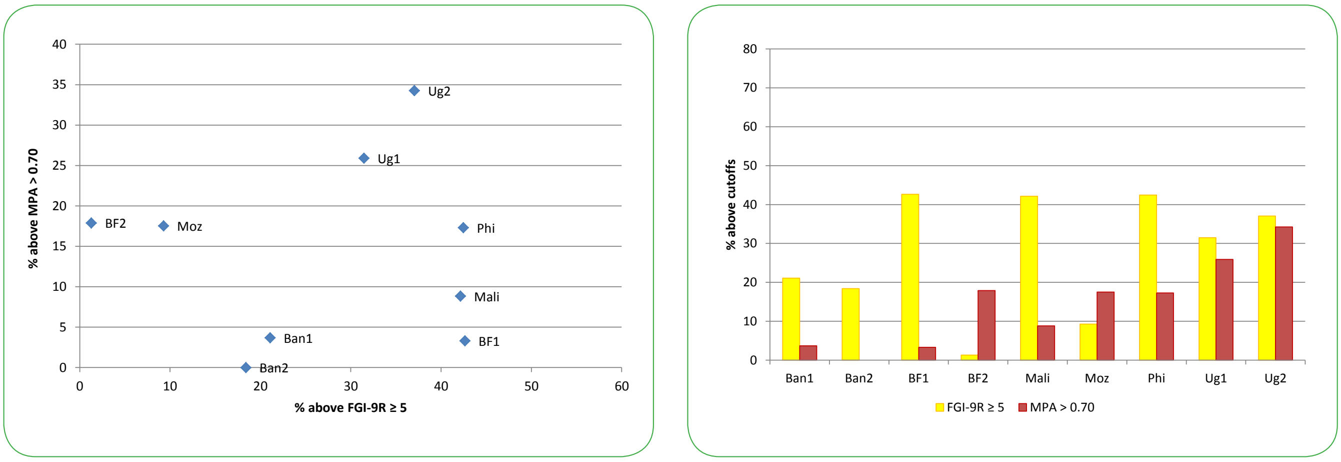


Figure 17 – B. Prevalence above MPA > 0.70 against prevalence above FGI-10ER ≥ 5, by study site

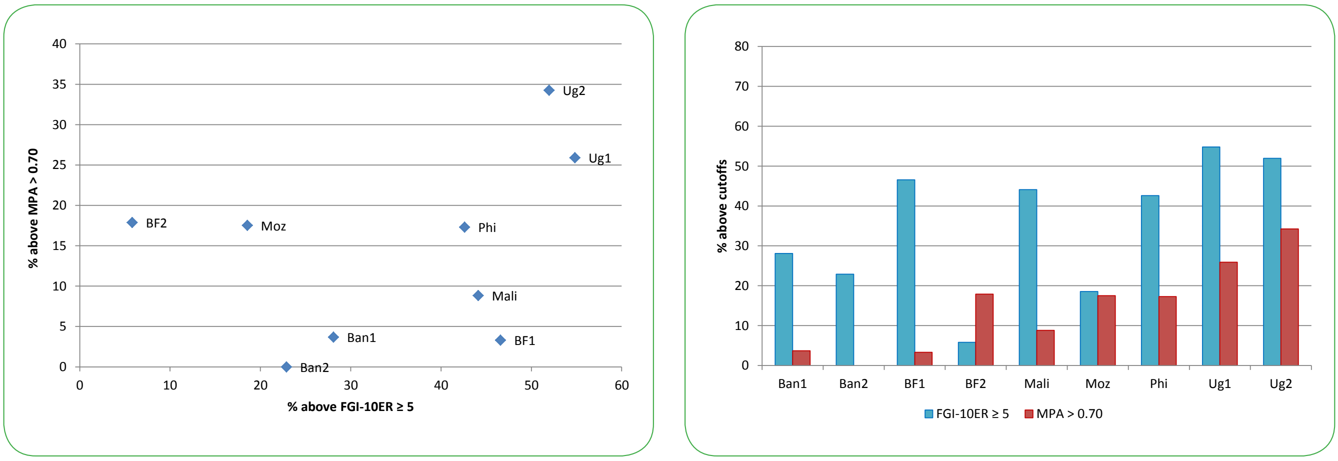


Figure 17 – C. Prevalence above MPA > 0.70 against prevalence above FGI-12R ≥ 6, by study site

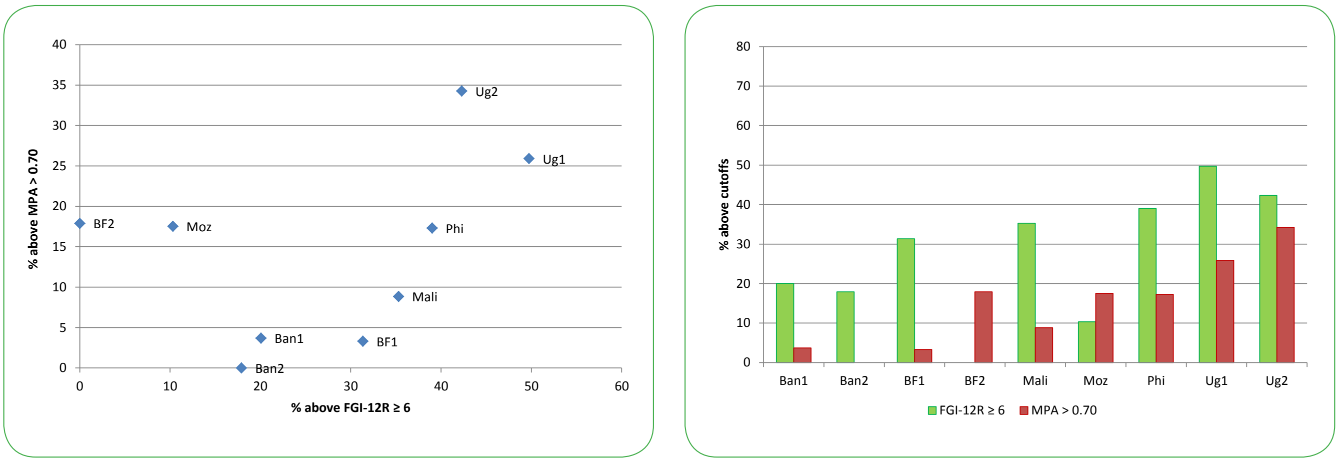


Table 33. Spearman rank correlations of prevalence rates above restricted-FGI cutoffs and MPA thresholds

Table 33 – A. Spearman rank correlation of prevalence rates above restricted-FGI cutoffs and MPA thresholds for all datasets (9 sites) [a]

	MPA > 0.50		MPA > 0.60		MPA > 0.70	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
FGI-9R ≥ 4	0.37	0.332	0.35	0.356	0.17	0.668
FGI-9R ≥ 5	0.00	1.000	0.03	0.932	-0.18	0.637
FGI-9R ≥ 6	0.08	0.831	0.08	0.831	-0.13	0.732
FGI-10ER ≥ 4	0.53	0.139	0.52	0.154	0.35	0.356
FGI-10ER ≥ 5	0.40	0.286	0.40	0.286	0.27	0.488
FGI-10ER ≥ 6	0.47	0.205	0.50	0.170	0.35	0.356
FGI-12R ≥ 5	0.42	0.265	0.37	0.332	0.23	0.546
FGI-12R ≥ 6	0.50	0.170	0.50	0.170	0.37	0.332
FGI-12R ≥ 7	0.42	0.265	0.42	0.265	0.25	0.516

[a] "Best" cutoffs are highlighted in yellow, blue or green depending on the FGI considered.

Table 33 – B. Spearman rank correlation of prevalence rates above restricted-FGI cutoffs and MPA thresholds excluding Mozambique and rural Burkina Faso (7 sites) [a]

	MPA > 0.50		MPA > 0.60		MPA > 0.70	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
FGI-9R ≥ 4	0.57	0.180	0.54	0.215	0.43	0.337
FGI-9R ≥ 5	0.29	0.535	0.36	0.432	0.18	0.702
FGI-9R ≥ 6	0.43	0.337	0.43	0.337	0.29	0.535
FGI-10ER ≥ 4	0.79	0.036	0.75	0.052	0.68	0.094
FGI-10ER ≥ 5	0.82	0.023	0.82	0.023	0.71	0.071
FGI-10ER ≥ 6	0.89	0.007	0.96	0.000	0.89	0.007
FGI-12R ≥ 5	0.89	0.007	0.79	0.036	0.71	0.071
FGI-12R ≥ 6	0.96	0.000	0.96	0.000	0.93	0.003
FGI-12R ≥ 7	0.86	0.014	0.86	0.014	0.82	0.023

[a] "Best" cutoffs are highlighted in yellow, blue or green depending on the FGI considered.

Table 34. Number and percentage of women reaching or not various restricted-FGI cutoffs, by study sites [a]

		Ban1		Ban2		BF1		BF2		Mali		Moz		Phi		Ug1		Ug2		All sites	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
FGI-9R	< 4	200	49	211	50	41	23	317	78	18	18	149	38	299	35	115	25	307	32	1657	40
	≥ 4	212	51	211	50	137	77	90	22	84	82	242	62	549	65	337	75	647	68	2509	60
	< 5	330	80	344	82	102	57	401	99	59	58	332	85	497	59	311	69	615	64	2991	72
	≥ 5	82	20	78	18	76	43	6	1	43	42	59	15	351	41	141	31	339	36	1175	28
	< 6	397	96	405	96	153	86	407	100	87	85	388	99	657	77	421	93	854	90	3769	90
	≥ 6	15	4	17	4	25	14	0	0	15	15	3	1	191	23	31	7	100	10	397	10
FGI-10ER	< 4	177	43	192	45	39	22	291	71	18	18	140	36	305	36	59	13	219	23	1440	35
	≥ 4	235	57	230	55	139	78	116	29	84	82	251	64	543	64	393	87	735	77	2726	65
	< 5	303	74	326	77	94	53	386	95	57	56	299	76	498	59	192	42	460	48	2615	63
	≥ 5	109	26	96	23	84	47	21	5	45	44	92	24	350	41	260	58	494	52	1551	37
	< 6	372	90	394	93	145	81	406	100	83	81	368	94	647	76	329	73	705	74	3449	83
	≥ 6	40	10	28	7	33	19	1	0	19	19	23	6	201	24	123	27	249	26	717	17
FGI-12R	< 5	247	60	224	53	75	42	376	92	33	32	230	59	381	45	101	22	316	33	1983	48
	≥ 5	165	40	198	47	103	58	31	8	69	68	161	41	467	55	351	78	638	67	2183	52
	< 6	335	81	346	82	125	70	405	100	66	65	345	88	530	63	222	49	551	58	2925	70
	≥ 6	77	19	76	18	53	30	2	0	36	35	46	12	318	38	230	51	403	42	1241	30
	< 7	387	94	399	95	162	91	407	100	87	85	378	97	646	76	350	77	774	81	3590	86
	≥ 7	25	6	23	5	16	9	0	0	15	15	13	3	202	24	102	23	180	19	576	14

[a] "Best" cutoffs are highlighted in yellow, blue or green depending on the FGI considered.

Table 35. Mean MPA at-or-above and below various restricted-FGI cutoffs, by study sites [a]

		Ban1		Ban2		BF1		BF2		Mali		Moz		Phi		Ug1		Ug2		All sites	
		N	Mean MPA	N	Mean MPA	N	Mean MPA	N	Mean MPA	N	Mean MPA	N	Mean MPA	N	Mean MPA	N	Mean MPA	N	Mean MPA	N	Mean MPA [b]
FGI-9R	< 4	200	0.25	211	0.33	41	0.25	317	0.37	18	0.31	149	0.32	299	0.45	115	0.47	307	0.42	1657	0.37
	≥ 4	212	0.37	211	0.38	137	0.36	90	0.49	84	0.48	242	0.42	549	0.52	337	0.56	647	0.61	2509	0.50
	< 5	330	0.28	344	0.34	102	0.29	401	0.39	59	0.39	332	0.38	497	0.45	311	0.51	615	0.49	2991	0.41
	≥ 5	82	0.42	78	0.39	76	0.40	6	0.43	43	0.54	59	0.44	351	0.55	141	0.60	339	0.64	1175	0.55
	< 6	397	0.30	405	0.35	153	0.31	407	0.39	87	0.43	388	0.39	657	0.47	421	0.53	854	0.53	3769	0.44
	≥ 6	15	0.42	17	0.40	25	0.45	0	-	15	0.59	3	0.47	191	0.56	31	0.62	100	0.68	397	0.58
FGI-10ER	< 4	177	0.24	192	0.33	39	0.25	291	0.35	18	0.31	140	0.33	305	0.45	59	0.44	219	0.38	1440	0.36
	≥ 4	235	0.36	230	0.37	139	0.36	116	0.51	84	0.48	251	0.42	543	0.52	393	0.55	735	0.60	2726	0.50
	< 5	303	0.27	326	0.34	94	0.28	386	0.38	57	0.38	299	0.36	498	0.45	192	0.48	460	0.45	2615	0.39
	≥ 5	109	0.41	96	0.39	84	0.39	21	0.58	45	0.53	92	0.46	350	0.55	260	0.58	494	0.64	1551	0.55
	< 6	372	0.30	394	0.35	145	0.30	406	0.39	83	0.42	368	0.38	647	0.47	329	0.51	705	0.50	3449	0.42
	≥ 6	40	0.42	28	0.39	33	0.46	1	0.38	19	0.56	23	0.45	201	0.55	123	0.61	249	0.68	717	0.58
FGI-12R	< 5	247	0.26	224	0.32	75	0.26	376	0.38	33	0.36	230	0.35	381	0.45	101	0.46	316	0.41	1983	0.37
	≥ 5	165	0.38	198	0.38	103	0.39	31	0.54	69	0.49	161	0.44	467	0.53	351	0.56	638	0.62	2183	0.52
	< 6	335	0.28	346	0.34	125	0.30	405	0.39	66	0.40	345	0.38	530	0.46	222	0.48	551	0.47	2925	0.40
	≥ 6	77	0.41	76	0.40	53	0.42	2	0.40	36	0.54	46	0.45	318	0.55	230	0.59	403	0.65	1241	0.56
	< 7	387	0.30	399	0.35	162	0.32	407	0.39	87	0.43	378	0.38	646	0.47	350	0.52	774	0.51	3590	0.43
	≥ 7	25	0.43	23	0.41	16	0.47	0	-	15	0.57	13	0.52	202	0.56	102	0.60	180	0.70	576	0.60

[a] "Best" cutoffs are highlighted in yellow, blue or green depending on the FGI considered.
[b] Mean MPAs calculated over all sites are weighted according to sample sizes.

Figure 18. Mean MPA at-or-above and below the "best" cutoff for FGI-9R, FGI-10ER and FGI-12R, averaged across all study sites

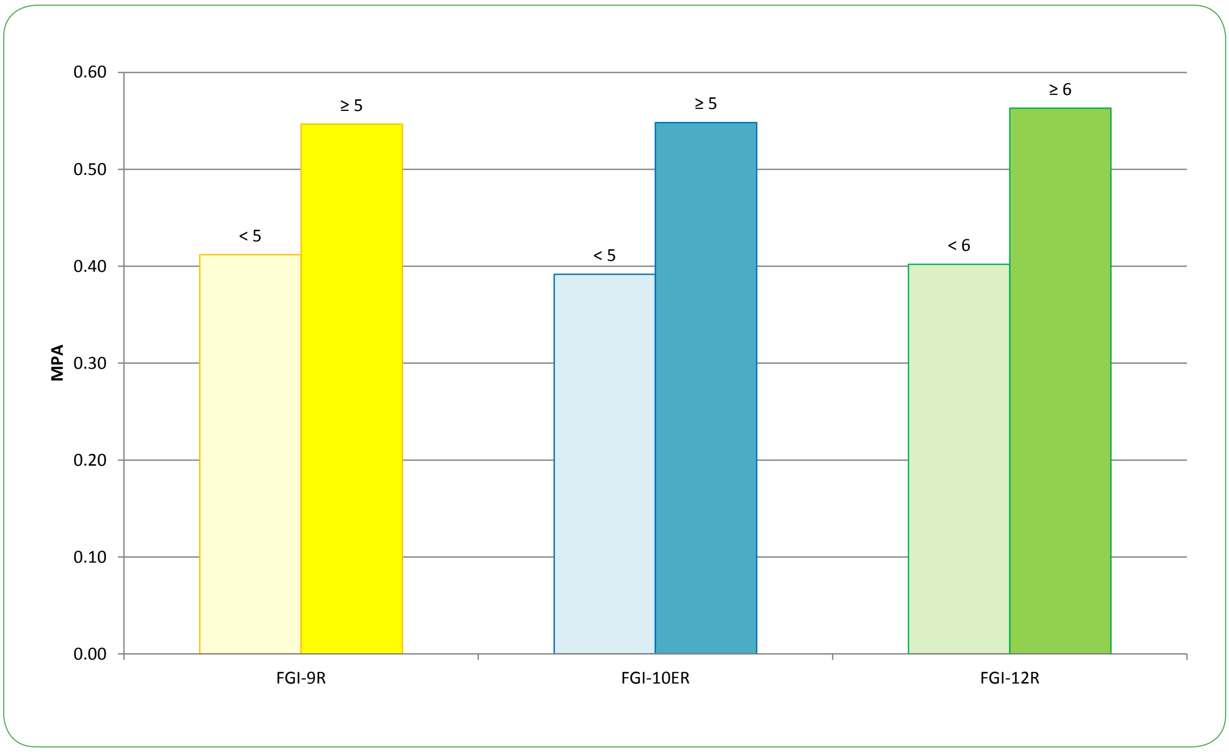
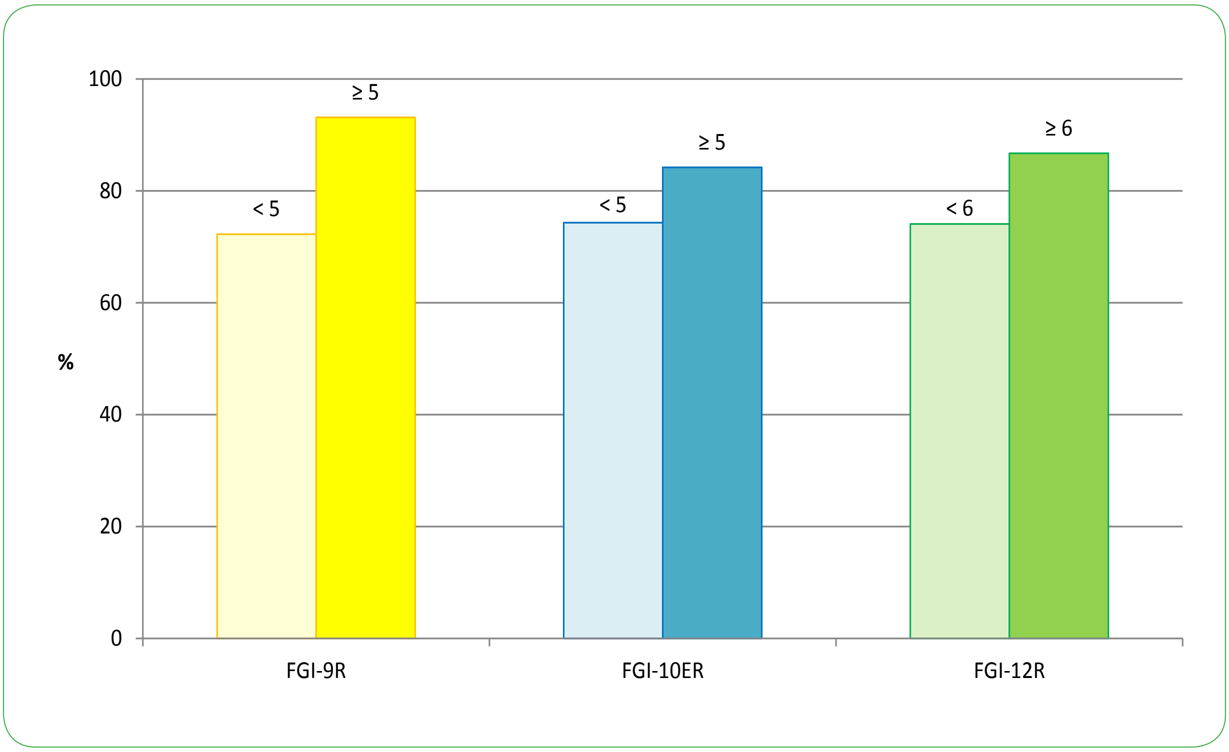


Figure 19. Percent of women having consumed at least one portion (minimum 15g) of animal-source food at-or-above and below the "best" cutoff for FGI-9R, FGI-10ER and FGI-12R, averaged across all study sites



the site, this difference varied from 0.05 points (Ban2) to 0.20 (BF2) for FGI-10ER and from 0.01 (BF2) to 0.18 (Ug2) for FGI-12R.

Then, to further gauge how the quality of women's diet would be reflected by the various FGI prevalence rates, we compared the percentages of women having consumed some nutrient-dense food groups between those reaching or not the various FGI cutoffs, for all sites. We decided to compare women having consumed at least 15g from:

(i) at least one of the animal-source food groups from the list of 21 groups in Table 2 (**Table 36** and **Figure 19**);

(ii) at least two of the fruit and vegetable food groups (**Table 37** and **Figure 20**);

(iii) at least one of the legumes, nuts and seeds food groups (**Table 38** and **Figure 21**).

The mean percentages calculated over all sites were weighted according to sample sizes.

As expected, in all datasets and whatever the FGI and the cutoff considered, there was a higher percentage of women having consumed the required number of all these nutrient-dense food groups among those women who reached the FGI cutoff than among those who did not. The very few exceptions to that were found for animal-source foods (ASF) in Mali for a FGI cutoff of four (both for FGI-9R and FGI-10ER) and for ASF in Mozambique for a cutoff of five or six for FGI-10ER. In those cases the difference and/or the sample size of one of the two groups were small. Another exception was that all women in the Ban2 dataset had consumed at least two of the fruits and vegetables food groups, whatever their FGI value.

Over all datasets, the average percentage of women having consumed at least one ASF group was 20.9, 9.9 and 12.6 percentage points higher among women reaching the best FGI cutoff than among others, for FGI-9R, FGI-10ER and FGI-12R, respectively. These differences varied considerably between datasets: from 0.2 percentage points (Philippines) to 55.3 percentage points (Ug2) for FGI-9R; from -0.3 percentage points (Mozambique) to 38.9 percentage points (Ug2) for FGI-10ER; and from 0.2 percentage points (Philippines) to 43.9 percentage points (BF2) for FGI-12R.

Over all sites, the mean percent of women having consumed at least two of the fruit or vegetable food groups was 14.4, 17.4 and 15.6 percentage points higher among women reaching the best FGI cutoff than among others, for FGI-9R, FGI-10ER and FGI-12R, respectively. These differences ranged from zero (Ban2) or <1 percentage point (Ban1) to 59.0, 59.8 and 55.8 percentage points (Philippines) for FGI-9R, FGI-10ER and FGI-12R

Finally, over all datasets, the mean percent of women having consumed at least one of the legumes, nuts and seeds food groups was 13.8, 17.8 and 15.5 percentage points higher among women reaching the best FGI cutoff than among others, for FGI-9R, FGI-10ER and FGI-12R, respectively. These differences varied from 4.2 percentage points (Ug2) to 50.2 percentage points (Ban1) for FGI-9R; from 7.3 percentage points (BF1) to 49.1 percentage points (Ban1) for FGI-10ER; and from 2.6 percentage points (BF1) to 41.1 percentage points (Ban1) for FGI-12R.

Overall, the differences were not negligible; they were more marked for ASF with the FGI-9R, and for fruits and vegetables and for legumes, nuts and seeds with the FGI-10ER. Together with the differences in mean MPA, they gave a sense of the nutritional meaning of dichotomous indicators.

In terms of nutritional meaning, however, it should be noted that the FGI-12R includes the disaggregation of all starchy staples into grains and other starchy staples, which is not meaningful from a nutritional point of view. It includes also the disaggregation of flesh foods into meat and fish. However, promotion of consumption of these two food groups on the same day is not recommended because of environmental concerns. It was therefore suggested that despite slightly better results for FGI-12R in most of the analyses, only FGI-9R and FGI-10ER should be considered for recommendation at the global level.

Table 36. Number and percent of women at-or-above and below the restricted-FGI cutoff having consumed at least one portion (minimum 15g) of animal-source food, by study site [a]

		Ban1		Ban2		BF1		BF2		Mali		Moz		Phi		Ug1		Ug2		All sites	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	% [b]
FGI-9R	< 4	137	68.5	149	70.6	36	83.4	170	53.5	18	100.0	63	42.3	298	99.7	29	25.2	69	22.5	969	70.6
	≥ 4	189	89.2	196	92.9	136	97.1	59	66.2	83	98.8	142	58.7	549	100.0	230	68.2	424	65.5	2008	83.2
	< 5	251	76.1	267	77.6	95	89.5	225	55.7	58	98.3	165	49.7	496	99.8	139	44.7	197	32.0	1893	72.3
	≥ 5	75	91.5	78	100.0	76	100.0	5	100.0	43	100.0	40	67.8	351	100.0	120	85.1	296	87.3	1084	93.1
	< 6	311	78.3	328	81.0	146	92.9	230	56.3	86	98.9	202	52.1	656	99.8	228	54.2	393	46.0	2580	74.6
	≥ 6	15	100.0	17	100.0	26	100.0	0	-	15	100.0	3	100.0	191	100.0	31	100.0	100	100.0	398	100.0
FGI-10ER	< 4	122	68.9	133	69.3	34	82.6	157	53.6	18	100.0	60	42.9	304	99.7	16	27.1	52	23.7	896	72.8
	≥ 4	204	86.8	212	92.2	138	97.2	73	63.0	83	98.8	145	57.8	543	100.0	243	61.8	441	60.0	2081	80.5
	< 5	230	75.9	250	76.7	87	88.6	218	56.2	56	98.2	157	52.5	497	99.8	80	41.7	145	31.5	1720	74.3
	≥ 5	96	88.1	95	99.0	85	100.0	11	58.0	45	100.0	48	52.2	350	100.0	179	68.8	348	70.4	1257	84.2
	< 6	289	77.7	317	80.5	138	92.5	229	56.2	82	98.8	194	52.7	646	99.8	165	50.2	285	40.4	2345	75.1
	≥ 6	37	92.5	28	100.0	34	100.0	1	100.0	19	100.0	11	47.8	201	100.0	94	76.4	208	83.5	633	89.7
FGI-12R	< 5	179	72.5	162	72.3	67	85.8	211	55.9	32	97.0	114	49.6	380	99.7	33	32.7	83	26.3	1262	73.1
	≥ 5	147	89.1	183	92.4	104	100.0	19	61.3	69	100.0	91	56.5	467	100.0	226	64.4	410	64.3	1716	82.3
	< 6	254	75.8	269	77.7	118	91.4	228	56.1	65	98.5	179	51.9	529	99.8	90	40.5	197	35.8	1929	74.1
	≥ 6	72	93.5	76	100.0	54	100.0	2	100.0	36	100.0	26	56.5	318	100.0	169	73.5	296	73.4	1048	86.7
	< 7	301	77.8	322	80.7	156	93.3	230	56.3	86	98.9	197	52.1	645	99.8	183	52.3	339	43.8	2459	75.0
	≥ 7	25	100.0	23	100.0	16	100.0	0	-	15	100.0	8	61.5	202	100.0	76	74.5	154	85.6	519	91.4

[a] "Best" cutoffs are highlighted in yellow, blue or green depending on the FGI considered.
[b] Percentages calculated over all sites are weighted according to sample sizes.

Figure 20. Percent of women having consumed at least two portions (minimum 15g) of fruits or vegetables at-or-above and below the "best" cutoff for FGI-9R, FGI-10ER and FGI-12R, averaged across all study sites

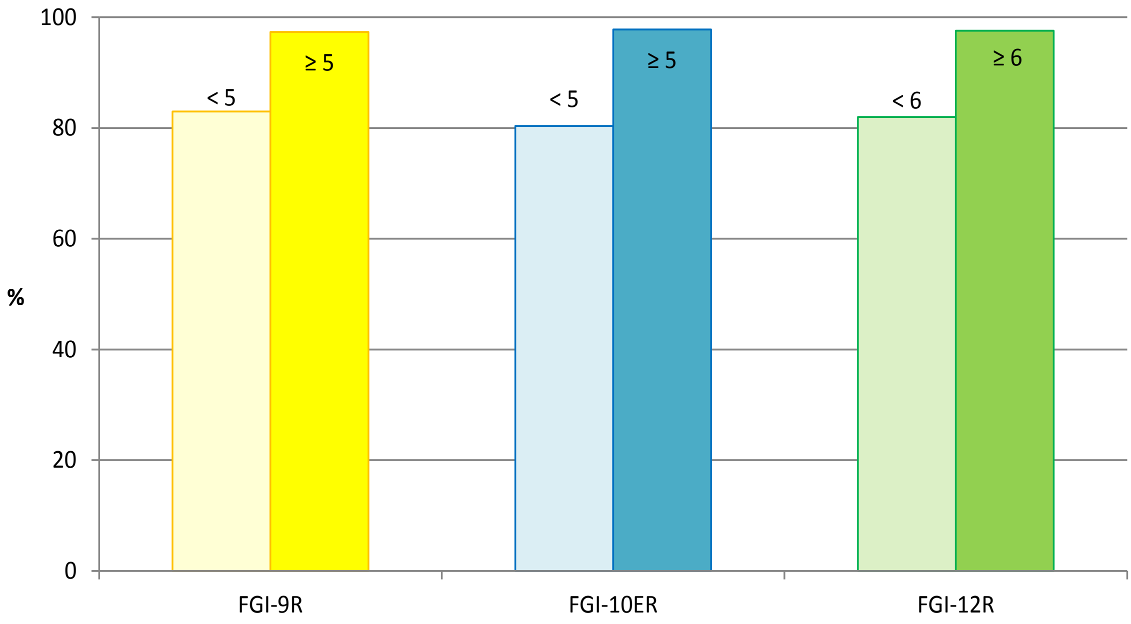


Figure 21. Percent of women having consumed at least one portion (minimum 15g) of legume or nuts/seeds at-or-above and below the "best" cutoff for FGI-9R, FGI-10ER and FGI-12R, averaged across all study sites

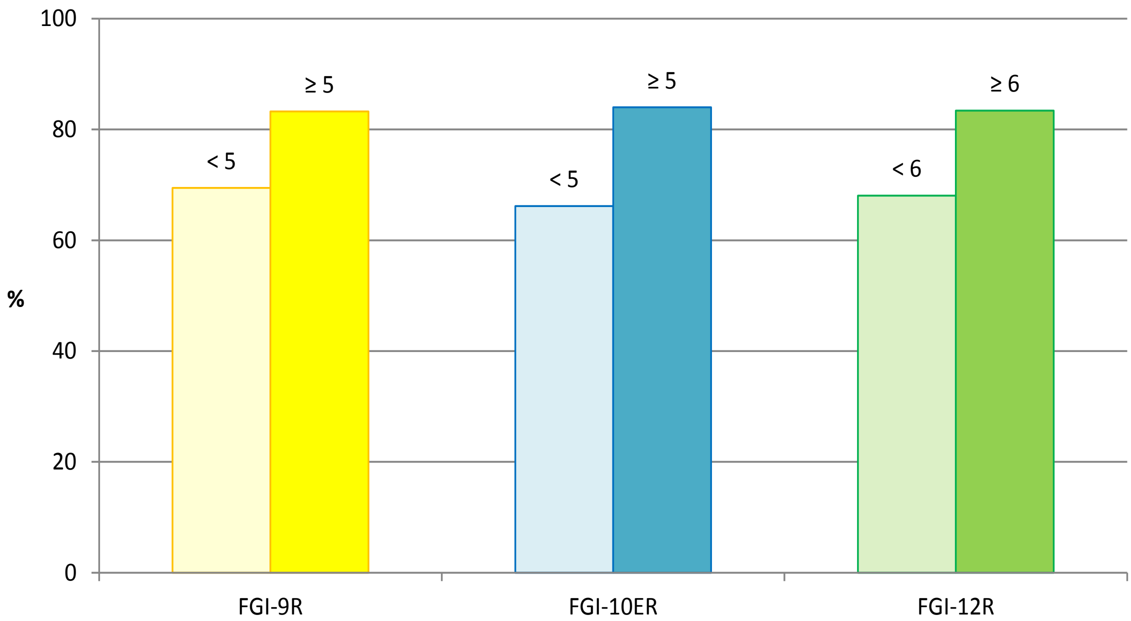


Table 37. Number and percent of women at-or-above and below the restricted-FGI cutoff having consumed at least two portions (minimum 15g) of fruits or vegetables, by study site [a]

		Ban1		Ban2		BF1		BF2		Mali		Moz		Phi		Ug1		Ug2		All sites	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	% [b]
FGI-9R	< 4	198	99.0	211	100.0	35	79.9	155	48.6	16	88.9	74	49.7	41	13.7	105	91.3	223	72.6	1057	78.0
	≥ 4	212	100.0	211	100.0	137	98.3	73	81.9	82	97.6	224	92.6	439	80.0	327	97.0	641	99.1	2347	94.1
	< 5	328	99.4	344	100.0	95	89.7	223	55.3	56	94.9	240	72.3	160	32.2	291	93.6	525	85.4	2262	83.0
	≥ 5	82	100.0	78	100.0	76	100.0	5	100.0	42	97.7	58	98.3	320	91.2	141	100.0	339	100.0	1141	97.4
	< 6	395	99.5	405	100.0	146	93.0	228	55.9	83	95.4	295	76.0	296	45.1	401	95.2	764	89.5	3013	85.1
	≥ 6	15	100.0	17	100.0	26	100.0	0	-	15	100.0	3	100.0	184	96.3	31	100.0	100	100.0	391	98.3
FGI-10ER	< 4	175	98.9	192	100.0	33	78.9	144	49.4	16	88.9	67	47.9	42	13.8	50	84.7	150	68.5	869	75.9
	≥ 4	235	100.0	230	100.0	139	98.4	84	72.4	82	97.6	231	92.0	438	80.7	382	97.2	714	97.1	2535	93.6
	< 5	301	99.3	326	100.0	87	88.8	211	54.2	54	94.7	207	69.2	159	31.9	174	90.6	371	80.7	1890	80.4
	≥ 5	109	100.0	96	100.0	85	100.0	17	88.3	44	97.8	91	98.9	321	91.7	258	99.2	493	99.8	1514	97.8
	< 6	370	99.5	394	100.0	138	92.6	227	55.8	79	95.2	275	74.7	284	43.9	309	93.9	615	87.2	2691	83.6
	≥ 6	40	100.0	28	100.0	34	100.0	1	100.0	19	100.0	23	100.0	196	97.5	123	100.0	249	100.0	713	99.3
FGI-12R	< 5	245	99.2	224	100.0	69	87.5	205	54.3	30	90.9	146	63.5	92	24.1	92	91.1	241	76.3	1344	78.0
	≥ 5	165	100.0	198	100.0	103	98.9	23	75.4	68	98.6	152	94.4	388	83.1	340	96.9	623	97.6	2060	94.8
	< 6	333	99.4	346	100.0	118	91.5	226	55.7	62	93.9	253	73.3	189	35.7	205	92.3	462	83.8	2195	82.0
	≥ 6	77	100.0	76	100.0	54	100.0	2	100.0	36	100.0	45	97.8	291	91.5	227	98.7	402	99.8	1209	97.5
	< 7	385	99.5	399	100.0	156	93.4	228	55.9	83	95.4	285	75.4	283	43.8	330	94.3	684	88.4	2833	84.3
	≥ 7	25	100.0	23	100.0	16	100.0	0	-	15	100.0	13	100.0	197	97.5	102	100.0	180	100.0	571	99.1

[a] "Best" cutoffs are highlighted in yellow, blue or green depending on the FGI considered. b Percentages calculated over all sites are weighted according to sample sizes.

Table 38. Number and percent of women at-or-above and below the restricted-FGI cutoff having consumed at least one portion (minimum 15g) of legumes or nuts and seeds, by study site [a]

		Ban1		Ban2		BF1		BF2		Mali		Moz		Phi		Ug1		Ug2		All sites	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	% [b]
FGI-9R	< 4	26	13.0	74	35.1	34	77.6	252	79.1	11	61.1	70	47.0	69	23.1	80	69.6	246	80.1	861	65.3
	≥ 4	120	56.6	140	66.4	124	88.6	87	97.2	63	75.0	167	69.0	349	63.6	296	87.8	575	88.9	1921	78.6
	< 5	84	25.5	157	45.6	89	83.2	334	82.8	40	67.8	185	55.7	157	31.6	247	79.4	520	84.6	1812	69.5
	≥ 5	62	75.6	57	73.1	69	90.0	5	100.0	34	79.1	52	88.1	261	74.4	129	91.5	301	88.8	970	83.3
	< 6	134	33.8	201	49.6	133	84.5	339	83.0	62	71.3	234	60.3	260	39.6	348	82.7	731	85.6	2442	71.3
	≥ 6	12	80.0	13	76.5	24	95.4	0	-	12	80.0	3	100.0	158	82.7	28	90.3	90	90.0	340	85.9
FGI-10ER	< 4	20	11.3	65	33.9	32	76.5	227	77.5	11	61.1	65	46.4	72	23.6	37	62.7	168	76.7	696	61.8
	≥ 4	126	53.6	149	64.8	126	88.8	112	97.1	63	75.0	172	68.5	346	63.7	339	86.3	653	88.8	2086	78.8
	< 5	68	22.4	147	45.1	81	82.7	319	82.2	38	66.7	158	52.8	162	32.5	142	74.0	378	82.2	1493	66.2
	≥ 5	78	71.6	67	69.8	76	90.0	20	100.0	36	80.0	79	85.9	256	73.1	234	90.0	443	89.7	1289	84.0
	< 6	112	30.1	193	49.0	126	84.4	338	83.0	59	71.1	214	58.2	255	39.4	261	79.3	594	84.3	2152	69.2
	≥ 6	34	85.0	21	75.0	32	93.1	1	100.0	15	78.9	23	100.0	163	81.1	115	93.5	227	91.2	630	88.3
FGI-12R	< 5	49	19.8	84	37.5	67	85.1	309	81.7	20	60.6	117	50.9	111	29.1	68	67.3	254	80.4	1079	65.3
	≥ 5	97	58.8	130	65.7	90	86.7	30	100.0	54	78.3	120	74.5	307	65.7	308	87.7	567	88.9	1704	79.8
	< 6	93	27.8	162	46.8	110	85.3	337	83.0	45	68.2	197	57.1	183	34.5	170	76.6	460	83.5	1758	68.1
	≥ 6	53	68.8	52	68.4	47	87.9	2	100.0	29	80.6	40	87.0	235	73.9	206	89.6	361	89.6	1025	83.4
	< 7	124	32.0	197	49.4	142	84.7	339	83.0	63	72.4	224	59.3	256	39.6	282	80.6	657	84.9	2284	70.2
	≥ 7	22	88.0	17	73.9	16	100.0	0	-	11	73.3	13	100.0	162	80.2	94	92.2	164	91.1	499	87.2

[a] "Best" cutoffs are highlighted in yellow, blue or green depending on the FGI considered.
[b] Percentages calculated over all sites are weighted according to sample sizes.

CHAPTER 8

CONCLUSIONS

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This report presents the results of a large set of analyses performed on nine datasets over six countries with the aim of identifying a standard operational indicator of women's dietary diversity that could be recommended for global use. The results described above are purely technical. However, any recommendation must take into account many other, more practical considerations. This chapter will give first a summary of technical results which then will be weighed against other criteria to provide some recommendations. As envisaged from the beginning of the project these recommendations will then be brought up to a wide group of stakeholders to look for a consensus on final choice and decision.

8.1 Summary of main results

The search for a standard operational indicator of women's dietary diversity presented in this report has proven to be difficult. First, the analysis could be performed for only nine out of the 11 datasets that were gathered. The main reason was that the food composition tables were incomplete for the Indian dataset and for the second dataset from the Philippines. Thus the analysis finally involved nine datasets over six countries, among which five (from five countries) were included in WDDP-I. A further concern is that a large rate of exclusion had to be consented for the first Philippines dataset since it was decided to apply Goldberg criteria to all datasets. However results from this reduced dataset did not show any unexpected pattern.

The initial objective of this work was to look for a cutoff to define a standard dichotomous indicator based on the nine-group indicator currently recommended by FAO and FANTA and used in several USAID programmes. Somewhat mixed results regarding this objective triggered the search for alternate food group indicators. Through an analysis of the contribution of food groups and sub-groups to the MPA, two new food group indicators were selected as the most promising (FGI-10E and FGI-12). A seven-group indicator similar to the one currently recommended for assessing IYCF practices was also considered.

Overall, key results from WDDP-I were confirmed. There were low levels of MPA in almost all settings, revealing rather poor diets. Among NPNL women the highest mean MPA were 0.58 and 0.60 in the Ug2 and Ug1 datasets, respectively; the lowest MPA were 0.34 and 0.36 in the Ban1 and BF1 datasets, respectively. Correlations between FGIs and MPA were almost always significant but only moderately strong. Better results were almost systematically observed when the 15g restriction was applied.

The performance of FGI-Rs in predicting MPA, as assessed through the ROC analysis, remained modest; however an AUC value of 0.70 was reached in a non-negligible number of cases. The sensitivity – specificity analysis allowed identification of a best cutoff of the various FGIs that performed correctly in a sufficient number of datasets and at different MPA levels. There were slight differences between the candidate indicators, with a tendency of higher performance for the more disaggregated FGIs (i.e. FGI-12R > FGI-10ER > FGI-9R > FGI-7R). However, only few differences were statistically significant, with the only strong result that the FGI-7R performed significantly lower than the others. This indicator was therefore excluded from the rest of the analysis.

In the end, at various MPA levels a cutoff point of five groups was defined a "best" dichotomous indicator for FGI-9R and FGI-10ER and a cutoff point of six groups was defined a "best" dichotomous indicator for FGI-12R. However, these "best cutoffs" did not work for the Ban2, BF2 and Mozambique datasets, whatever the MPA threshold.

While the above results apply at the individual level, the main intended use of any dichotomous proxy indicator of dietary diversity would be at the population level. Therefore we looked at the matching between the prevalence of women at or above FGI cutoffs and the prevalence of women above the various MPA thresholds. The best matching of the average (over all sites) MPA prevalence and the average FGI prevalence at/above the "best" cutoff was found for MPA > 0.60. Graphically, as well as through use of non-parametric tests, the relationships between both types of prevalence estimates was stronger for FGI-12R, followed by FGI-10ER, then FGI-9R, admitting that two datasets (BF2 and Mozambique) can be considered as outliers.

Finally, non-negligible differences in the mean MPA and in the frequency of consumption of nutrient-dense food groups were found between women at-or-above the FGI best cutoff and women below that cutoff, for the three indicators. This highlights the nutritional meaning of the dichotomous food group indicators at the best cutoff we determined.

8.2 Recommendations

All the above results were carefully and extensively reviewed and discussed against other than technical criteria, notably the nutritional meaning of the dichotomous indicators, their possible use/misuse at the global or programmatic level and their practical advantages/drawbacks in terms of operationalization or communication.

Considering both technical and other considerations described above, the WDDP-II group makes the following recommendations:

(v) While acknowledging somewhat mixed conclusions from the sensitivity – specificity analysis, at the individual level, results are consistent enough to recommend the use of a dichotomous food group indicator for global uses.

(vi) FGI cutoffs of five groups for FGI-9R, five groups for FGI-10ER and six groups for FGI-12R can be recommended as reasonable predictors of an MPA>0.60. However, since disaggregations required for constructing the FGI-12 entail nutritional or environmental drawbacks, only FGI-9R and FGI-10ER are proposed for further consideration.

(vii) Reaching an MPA level of 0.60 is not optimal but can be considered as a "minimum dietary diversity" (final denomination to be discussed), notably given the yardstick of a mean MPA of 0.83 estimated among a sample of German women with no food access restriction.

(viii) The suggested dichotomous FGIs would work well enough to be able to track changes in dietary diversity across countries and regions, thus contributing to monitoring progress at the global level. They are on the other hand strongly not recommended for individual screening. Whether FGIs can be recommended for programmatic uses still needs to be debated and would likely depend on the scale of programmes.

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APPENDIX 1

Characteristics of each dataset

Table A1. Characteristics of each dataset

Continent		Asia	Asia	Africa	Africa	Africa	Africa	Asia	Africa	Africa
Country		**Bangladesh**	**Bangladesh**	**Burkina Faso**	**Burkina Faso**	**Mali**	**Mozambique**	**Philippines**	**Uganda**	**Uganda**
Milieu		Rural	Rural	Urban	Rural	Urban	Rural	(Peri-)urban	Rural	Urban + Rural
Used in WDDP-I	(Y/N)	Y	N	Y	N	Y	Y	Y	N	N
Date of investigation		1996	2007-2008	2006	2010	2007	2006	2005	2007	2008
Season of investigation		Jun-Sept (R1) Oct-Dec (R2)	Oct 07-Jun 08	Feb-May	Juil-Aug	Feb-Mar-Apr	Nov-Dec	Jan to Aug		May to Sep
Survey report available	(Y/N)	Y	Y	Y	Y	Y	Y	Y	N	Y
Bioavailability chosen	Iron (5% / 10%)	10%	10%	5%	5%	10%	5%	10%	5%	5%
	Zinc (25% / 34%)	34%	34%	25%	25%	34%	25%	34%	25%	25%
FCT available	(Y/N)	Y	Y	Y	Y	Y	Y		Y	Y
Repeat 24-hour recalls/direct observations?		R24hR	Dir. Obs./R24hR	R24hR	R24hR	R24hR	R24hR	R24hR	R24hR	R24hR
Number of rounds		2	2	3	4	2	2	2	2	2
Sample size [a]	**Total R1**	412	422	172	407	102	391	848	452	954
	NPNL R1	299	201	124	134	102	97	723	197	610
	Pregnant R1	0	0	13	45	0	52	37	57	0
	Lactating R1	111	221	35	228	0	242	88	198	344
	Total R2	147	397	178	140	96	88	848	121	95
	NPNL R2	99	189	130	40	96	28	723	54	59
	Pregnant R2	0	0	13	10	0	12	37	14	0
	Lactating R2	48	208	35	90	0	48	88	53	36
	Total R3			169						
	NPNL R1			122						
	Pregnant R1			12						
	Lactating R1			35						
Reasons for exclusions		Under or over reporter (according to Goldberg method); missing values	No exclusions made by the PI; exclusions for the purpose of WDDP-II based on Goldberg method and ages	Over aged; under or over reporter (according to Goldberg method); R2 incomplete	Under or over reporter (according to Goldberg method); over aged	R1 incomplete; confusing relationship between WDDI and MPA	Over aged; over reporter (according to Goldberg method); implausibly high intakes; missing or inadequate conversion factor	Pregnant; under or over reporter (according to Goldberg method ajusted)	No exclusions made by the PI; exclusions for the purpose of WDDP-II based Goldberg method and ages	Implausible values, adjustment of amount of food consume by cost; exclusions for WDDP-II based on ages

[a] Sample sizes specified here correspond to the size of the sample as considered for the analyses, i.e. after exclusions according to Goldberg method and other reasons described in the last row of this table.

APPENDIX 2

Selection of nutrients and source for nutrient requirements in WDDP-I

The following sections are derived from the WDDP-I protocol and present the parameters of the analysis that have not been modified for the purpose of this second project.

A2.1. Energy and macronutrients

The objective of reporting intakes of energy and macronutrients is to provide a general, qualitative description of diets. Our focus on micronutrient adequacy leaves aside questions of energy adequacy. While we do not plan to focus on energy adequacy, we propose to describe energy intakes in each dataset and compare them with requirements as a rough yardstick of adequacy, at the level of the sample (not individual women or observation days). We will use the FAO and WHO energy requirements (FAO, 2004) for this purpose. In the same way, macronutrient intakes will be presented as percent of kilocalories and compared with recommended ranges.

Table A2 - 1 below shows descriptive statistics that will be presented at best – depending on what is available in each dataset – and WHO recommendations that will be considered for comparison. When possible, we will present descriptive statistics for protein from animal-source foods and plant-source foods separately, as this relates both to protein quality and, probably more importantly, to bioavailability of several micronutrients. At a minimum, descriptive statistics can be report for energy, total protein, total carbohydrate, and total fat.

In addition to describing energy intakes and comparing to requirements, energy intakes will be controlled for in some analyses of the relationship between diet diversity and micronutrient adequacy. This is because in many previous studies, energy intakes have been shown to increase with increases in dietary diversity (Ogle, *et al.*, 2001; Foote, *et al.*, 2004; Torheim, *et al.*, 2004). We want to be able to understand to what extent any observed increases in micronutrient intakes are due to increases in quantity as compared to increases in micronutrient density.

A2.2. Selection of micronutrients for summary indicator

Considerations included known public health relevance, as well as availability of nutrient data both in datasets collected by the potential collaborators, and in a range of food composition tables likely to be used.

In previous work with infants and young children, we used a set of "problem" nutrients identified in a global review (WHO and UNICEF, 1998). To our knowledge, there is no such global review identifying a list of "problem" nutrients for women of reproductive age. The recent review cited previously (Kennedy and Meyers, 2005) concluded that available information is extremely limited.

Table A2 - 1. Energy and macronutrient intake goals/acceptable ranges

	Units	WHO population averages for adults (WHO, 2003) [a]
Energy	**kcal**	
Protein	g / % of kcal	10% - 15%
Animal source protein	g / % of kcal	
Plant source protein	g / % of kcal	
Total carbohydrate	g / % of kcal	55% - 75%
Sugars	g / % of kcal	< 10%b
Total fat	g / % of kcal	15% - 30%
Saturated fatty acids	g / % of kcal	< 10%

[a] Adapted from Gibson (2005), p. 205. This represents goals for prevention of diet-related chronic diseases. Figures are for total energy unless otherwise indicated
[b] "Free sugars" – mono- and disaccharides added by manufacturer, cook, or consumer plus sugars naturally present in honey, syrups, fruit juices.

However, it is known that poor pregnancy outcomes can result from a wide range of micronutrient deficiencies, including deficiencies in iron, folate, B vitamins, antioxidants, vitamin D, and iodine (Allen, 2005). Similarly, low maternal intake or stores during lactation can also affect breast milk levels of B vitamins, vitamin A, and iodine. In addition, low intakes of calcium have also been documented among women of reproductive age (Bartley, *et al*., 2005). Consequences for child-bearing and lactation are not the only concerns; micronutrient deficiencies affect women's health from adolescence through aging. The group agreed on the following list of micronutrients:

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

Vitamin D had been considered but was dropped both because it does not have an estimated average requirement (EAR) and because of absence from many food composition tables. Similarly, reliable data on iodine content of foods are generally not available.

APPENDIX

3

Estimated average requirements

Table A3 - 1. Requirements (EAR) to be used for assessing probability of adequacy [a, b]

	Females 19-65 years		Females 15-18 years		Pregnant women		Lactating women	
	EAR	SD [c]	EAR	SD [c]	EAR	SD [c]	EAR	SD [c]
Vit A (RE/d) [d]	270 [e]	54	365 [e]	73	370 [e]	74	450 [e]	90
Vit C (mg/d)	38 [e]	3.8	33 [e]	3.3	46 [e]	4.6	58 [e]	5.8
Thiamin (mg/d)	0.9 [f]	0.09	0.9 [f]	0.09	1.2 [f]	0.12	1.2 [f]	0.12
Riboflavin (mg/d)	0.9 [f]	0.09	0.8 [f]	0.08	1.2 [f]	0.12	1.3 [f]	0.13
Niacin (mg/d)	11 [f]	1.65	12 [f]	2	14 [f]	2.1	13 [f]	1.95
Vit B6 (mg/d)	1.1 [f]	0.11	1.0 [f]	0.1	1.6 [f]	0.16	1.7 [f]	0.17
Folate (µg/d)	320 [e]	32	330 [e]	33	520 [e]	52	450 [e]	45
Vit B12 (µg/d)	2.0 [e]	0.2	2.0 [e]	0.2	2.2 [e]	0.22	2.4 [e]	0.24
Calcium (mg/d) [g]	800	100	1100	100	800	100	800	100
Iron (mg/d) [h]	See Table A3 - 2	-	See Table A3 - 3	-	10% bioavail: 24.9 [i]	2.34	10% bioavail: 11.7 [j]	3.51
					5% bioavail: 49.9	4.69	5% bioavail: 23.40	7.02
Zinc (mg/d) [k]	34% bioavail: 6	0.75	34% bioavail: 7	0.88	34% bioavail: 8	1	44% bioavail: 7	0.88
	25% bioavail: 7	0.88	25% bioavail: 9	1.13	25% bioavail: 10	1.25	35% bioavail: 8	1

[a] All values are taken from WHO and FAO (WHO, 2004) unless otherwise stated.

[b] Values for EAR are adjusted for an assumed bioavailability (WHO, 2004). Thus, EAR refers to intake of the nutrients and not the physiological need for the absorbed nutrient.

[c] All SDs were calculated based on EAR and CV (SD=CV*EAR/100). CV is assumed to be 10% for all micronutrients except 15% for niacin (IOM, 2000), 20% for vitamin A (IOM, 2000), 12.5% for zinc (WHO, 2004), 9.4% and 30% for iron, for pregnant and lactating women respectively (IOM, 2000), 12.5% and 9% for calcium, for adults and adolescents women respectively (IOM, 2011).

[d] One µg retinol equivalent (RE) is equal to 1 µg all-trans-retinol, 6 µg β-carotene and 12 µg α-carotene or β-cryptoxanthin (WHO, 2004). Note also the EAR for vitamin A refers to intake adequate to prevent the appearance of deficiency-related syndromes (WHO, 2004).

[e] EAR taken from WHO and FAO (WHO, 2004).

[f] EAR back-calculated from RNI (Recommended Nutrient Intake) (WHO, 2004).

[g] EAR taken from IOM (2011).

[h] Gives EAR on iron for two levels of absorption. According to WHO and FAO (WHO, 2004), either a very low (5%) or low (10%) absorption level can be assumed in a developing country setting.

[i] EAR back-calculated from IOM (2000) on WHO and FAO guidance from a basis of 22 mg/d for an average bioavailability assumed to be 23%.

[j] EAR based on IOM (2000).

[k] As suggested by IZiNCG (2004), two sets of requirements (one for both NPNL and pregnant women and one for lactating women) should be used depending on dietary patterns: 34%/44% for mixed diets or refined vegetarian diets; 25%/35% for unrefined cereal-based diets.

Table A3 - 2. Probabilities of adequate iron intakes (mg/d) and associated ranges of usual intake in adolescent girls (15 – 18 years) not using oral contraceptives (OC) [a]

Probability of adequacy	Total absorbed iron	10% bioavailability	5% bioavailability
0	<0.833	<8.33	<16.67
0.04	0.833-0.911	8.33-9.11	16.67-18.22
0.07	0.912-1.010	9.12-10.10	18.23-20.20
0.15	1.011-1.136	10.11-11.36	20.21-22.72
0.25	1.137-1.237	11.37-12.37	22.73-24.73
0.35	1.238-1.330	12.38-13.30	24.74-26.60
0.45	1.331-1.424	13.31-14.24	26.61-28.49
0.55	1.425-1.526	14.25-15.26	28.50-30.53
0.65	1.527-1.647	15.27-16.47	30.54-32.94
0.75	1.648-1.805	16.48-18.05	32.95-26.11
0.85	1.806-2.077	18.06-20.77	36.12-41.54
0.92	2.078-2.354	20.78-23.54	41.55-47.09
0.96	2.355-2.664	23.55-26.64	47.10-53.28
1	>2.664	>26.64	>53.28

[a] This table was adapted from Table I-6 in IOM (2000) which gives probability of adequacy (PA) for various levels of iron intakes, using an iron bioavailability of 18%. Based on those figures, the PA for various levels of *absorbed* iron has been calculated, adjusted for a bioavailability of 10% and 5%.

Table A3 - 3. Probabilities of adequate iron intakes (mg/d) and associated ranges of usual intake in adult women not using oral contraceptives (OC) [a]

Probability of adequacy	Total absorbed iron	10% bioavailability	5% bioavailability
0	<0.796	<7.96	<15.91
0.04	0.796-0.879	7.96-8.79	15.91-17.59
0.07	0.880-0.981	8.80-9.81	17.60-19.65
0.15	0.982-1.120	9.82-11.20	19.66-22.42
0.25	1.121-1.237	11.21-12.37	22.43-24.76
0.35	1.238-1.343	12.38-13.43	24.77-26.88
0.45	1.344-1.453	13.44-14.53	26.89-29.08
0.55	1.454-1.577	14.54-15.77	29.09-31.56
0.65	1.578-1.734	15.78-17.34	31.57-34.69
0.75	1.735-1.948	17.35-19.48	34.70-38.98
0.85	1.949-2.349	19.49-23.49	38.99-47.01
0.92	2.350-2.789	23.50-27.89	47.02-55.79
0.96	2.790-3.281	27.90-32.81	55.80-65.63
1	>3.281	>32.81	>65.63

[a] This table was adapted from Table I-7 in IOM (2000) which gives probability of adequacy (PA) for various levels of iron intakes, using an iron bioavailability of 18%. Based on those figures, the PA for various levels of *absorbed* iron has been calculated, adjusted for a bioavailability of 10% and 5%.

Discussion about selection of EAR, CV and bioavailability levels

Vitamin A

According to WHO and FAO (WHO, 2004) the CV for vitamin A requirements is unknown, but IOM has used 20 percent. We use the EAR of WHO and FAO with a CV of 20 percent. For adolescents (ages 15-18), WHO and FAO give a range for the EAR of 330 – 400 µg/d. We use the mid-point of this range.

Vitamin C

The WHO and FAO EAR for adolescents is lower than for adult women, and also lower compared to other recommendations. WHO and FAO also note that this EAR of 40 mg/d is "arbitrary". We therefore chose to use the EAR for adult women (45 mg/d) for adolescents.

Zinc

In 2004, IZiNCG presented revised dietary zinc requirements, including EAR[1]. It also estimated a CV for the requirement distribution of 12.5 percent, indicating a narrower requirement distribution than implied by the WHO and FAO[2] CV of 25 percent. Hotz assessed the internal validity of these new requirements and found that they predicted zinc status (Hotz, 2007). They also yielded similar estimates of prevalence of zinc deficiency as did biochemical indicators, including among pregnant and non-pregnant women. Therefore, since these requirements were adopted for the purposes of the WDDP-I, they were also used for the WDDP-II.

As with the WHO and FAO requirements, researchers must choose a requirement depending on an assumption for absorption, which is based on knowledge of diet patterns and likely bioavailability. For mixed or refined vegetarian diets (with a phytate to zinc molar ratio of 4-18) an absorption level of 34 percent is suggested for both NPNL and pregnant women and an absorption level of 44 percent for lactating women. For high phytate, unrefined cereal-based diets (molar ratio greater than 18), an absorption level of 25 percent is suggested (IZiNCG, 2004). Note that the level of absorption IZiNCG suggests for high phytate diets (25 percent) is considerably higher than the absorption level suggested by the WHO and FAO requirements document (15 percent).

Iron

WHO and FAO guidance suggests assuming low absorption when intake of flesh foods and vitamin C is negligible and intermediate when intake is minimal, but no quantitative definitions are provided for negligible or minimal. It also provides guidance on factors influencing dietary iron absorption. Factors that increase dietary iron absorption include presence of dietary heme sources in the diet and ascorbic acid content. Factors that inhibit non-heme iron absorption are phytate and phenolic compounds including tea, coffee, cocoa, red wine, calcium and soy. Gibson and Ferguson suggest interpreting minimal to describe diets in which the main meal includes at least 50 grams (g) of flesh foods and 30 mg of vitamin C (Gibson and Ferguson, 2008).

[1] IZiNCG 2004.

[2] 2004.

APPENDIX 4

Assigning foods to groups

The 21-food group indicator is the most disaggregated level. The groups of concern for WDDP-II, the FGI-7, FGI-9, FGI-10E and FGI-12, are constructed from these 21 groups. Therefore the table below provide indications and guidance on assigning food to groups of these indicators. This guidance is derived from the WDDP-I protocol (Arimond, *et al*., 2008) and from FAO guidelines for measuring household and individual dietary diversity (FAO, 2010).

FGI-21	
Grains and grain products	Grains (millet, sorghum, maize, rice, wheat, etc.) and grain products (breads, porridge, noodles, flour, etc.) except sweet biscuits and cakes.
All other starchy staples	All non-grain-based starchy staples like roots, tubers and plantains (manioc, taro, sweet potato, yam, etc.)
Cooked dry beans and peas	Beans, dried peas, lentils and foods made from these except soy beans
Soybeans and soy products	Soy beans, tofu, tempeh, soy milk, etc.
Nuts and seeds	Nuts, seeds and products made from these (groundnut, sesame, peanut butter, etc.)
Milk and yoghurt	Fresh, dried or tinned milk of any mammal and yoghurt
Cheese	
Organ meat	Liver, kidney, heart, lung and other organ meats or blood-based foods such as blood pudding
Eggs	Any birds
Small fish eaten whole with bones	
Large whole fish, dried fish, shellfish, other seafood and molluscs	All types of large fish, seafood and molluscs, including processed food made from these (fresh, dried or canned fish, shark and whale, fish eggs, crab, lobster, mussels, shrimp, octopus, sea snail, snail, etc.)
Large or small wild or domesticated mammals, reptiles and amphibians	Beef, pork, veal, lamb, goat, game meat, mutton, rabbit, antelope, cane rat, rat, cat, dog, anteater, guinea pig, frogs, snakes, etc.
Wild or domesticated birds	Chicken, duck, goose, guinea hen, turkey, pigeon, game birds, etc.
Insects and grubs	Any insects or grubs
Vitamin A-rich dark green leafy vegetables [a]	Medium to dark green leafy vegetables source of vitamin A (cassava leaves, sweet potato leaves, amaranth leaves, bean leaves, spinach, etc.)
Vitamin A-rich deep yellow/orange/red vegetables [a]	Roots, tubers and red/yellow/orange vegetables source of vitamin A (pumpkin, carrot, squash, orange-fleshed sweet potato and 100% juice from these)
Vitamin A-rich fruits [a]	Fruits source of vitamin A (mango, apricot, peach, 100% juice from these, etc.)
Vitamin C-rich vegetables [b]	Vegetables source of vitamin C (cabbage, peppers, broccoli, tomatoes, 100% juice from these, etc.)
Vitamin C-rich fruits [b]	Fruits source of vitamin C (citrus, berries, papaya, guava, 100% juice from these, etc.)
All other vegetables	
All other fruits	Including banana and 100% juice
Red palm fruit products [c]	Red palm oil, palm nut pulp and any other product made from red palm fruit
Other fats and oils [d]	Vegetable and nut oils (from avocado, coconut, groundnut, soybean, sunflower, etc.) and animal oils (lard, suet, butter, sour cream, etc.), except vitamin A-rich red palm oil
Sweets & added sugars [d]	All sweets, added sugars, including sweet beverages (soda, "juice drinks")
Alcohol [d]	Commercially produced and locally brewed spirits, low-alcohol locally brewed beer, other low-alcohol fermented beverages
All other beverages [d]	Coffee, tea, clear broths
Spices and condiments [d]	Items commonly used in small quantities and mainly used to enhance the flavour of dish including various flavouring pastes, sauces and seeds (chilies, fish powder, ketchup, mustard, herbs, Maggi cubes, soya sauce, spices, etc.)

[a] "Vitamin A-rich" is defined as > 60 RAE/100g or 120 RE/100g.

[b] "Vitamin C-rich" is defined as > 9 mg/100g.

[c] Will be include in the "vitamin A-rich fruits" group.

[d] Shaded groups do not contribute to any of the diversity indicator scores. In populations/samples where sweets and/or alcohol may provide a substantial proportion of energy intakes, or where high coffee/tea intakes may provide substantial anti-nutrients, it may be useful to code and report grams of intake and also percent of kcal, as relevant. Grams and percent of kcal from fats are already directly reported from nutrient content of foods.

APPENDIX 5

Data and methods to approximately estimate probability of adequacy (PA) and mean probability of adequacy (MPA) across 11 micronutrients for German women of reproductive age

By

Doris Wiesmann, April 4, 2013

Data

Data source: Report on the findings of a nationally representative dietary study in Germany in 2005-2006, Part II, Annex Tables A. 34, 39-45, 48, 50, and 53 on percentiles of dietary intakes of vitamin A, vitamin C, thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, calcium, iron, and zinc, pp.245-264 (Max Rubner-Institut, 2008). Reports from this study are only available in German, basic information in English is posted at http://www.was-esse-ich.de/index.php?id=44

Fortification and supplementation: Basic staples are not fortified in Germany. Some breakfast cereals, beverages and special dietetic products are fortified, and this was taken into account by the authors of the study for the nutrient intake calculations. Twenty-eight percent of all respondents (men and women 14-80 years) took supplements (Max Rubner-Institut, 2008). However, micronutrient intakes from supplements were not considered for estimating PA and MPA from the annex tables in the report. This was not possible because micronutrient intakes from supplements were presented in separate tables, and the findings could not be aggregated with the percentiles of micronutrient intakes from foods. It can be argued that for the purpose of estimating MPA as a reference point for the WDDP-II, using data for a population that is not economically constrained and does not benefit from general fortification of basic staples, it is preferable to neglect supplementation entirely.

Dietary data collection method: The main survey instrument was a computerized diet history interview over four weeks, which was complemented by a weighed record for a random subsample of respondents, and two 24-hour recalls via telephone (http://www.was-esse-ich.de/index.php?id=47). Although not stated explicitly in the report, it can be assumed that this information was used to derive the long-term, "usual" food and nutrient intakes of individuals.

Sample size: 4 876 women were in the relevant age group 14-50 years (because of the specified age groups, the age range 14-50 years had to be used instead of 15-49 years as in the WDDP). The survey covered men and women 14-80 years. Information on pregnancy and lactation status was collected, but the annex tables are not disaggregated by physiological status. The vast majority of women 14-50 years can be assumed to be non-pregnant and non-lactating in Germany.

Sampling weights: A complex weighting scheme was developed and applied to calibrate the demographic groups in the sample to the findings of the national census from 2007, and avoid that the results became distorted by varying degrees of non-response (Max Rubner-Institut, 2008, p.24f).

Data quality: Among women of reproductive age, median energy intakes for the age groups 14-18, 19-24, 25-34, and 35-50 years varied between 1 870 and 1 966 kcal/day, and mean energy intakes between 1 948 and 2 108 kcal/day. Recommended daily intakes ranged from 2 500 kcal/day for females aged 14 years to 2 300 kcal/day for the age groups 25-34 and 35-50 years (Max Rubner-Institut, 2008). It is likely that energy intakes are downward biased by under-reporting, yet, this is probably not a large problem.

Estimation method

Content of report tables: The annex tables in Max Rubner-Institut (2008) indicate the 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles of nutrient intakes. They also provide the recommended daily intakes (RDI) by age group for Germany, Austria and Switzerland (referred to as "D-A-CH" in the tables, from the acronyms of these three countries), and the percentage below the RDI. Results for the PA of micronutrient intakes are not given.

Estimation of PA from percentiles: To approximately estimate PA and MPA, micronutrient intakes of German women aged 14-18, 19-24, 25-34 and 35-50 years were matched with the EARs for non-pregnant non-lactating (NPNL) females 15-18 and 19-65 years used in the WDDP-II (see WDDP-I protocol addendum from October[1] 2008, and EARs for calcium from IOM 2011). The percentage of women with intakes below the EAR was then estimated by applying the EAR cutpoint method to the percentiles.

Calculation examples: The calculation of the PA was simple in case the EAR coincided with one of the

[1] Arimond, *et al.*, 2008

percentile values. For example, the EAR of thiamin for NPNL females is 0.9 mg/day, which equals the 25th percentile of thiamin intakes of women 19-24 years in Max Rubner-Institut (2008). It was therefore assumed that 25 percent of women in this age group had thiamin intakes below their EAR. The probability of inadequacy ("PI") of thiamin intakes of women 19-24 years was consequently estimated at 25 percent, and the probability of adequacy ("PA") at 75 percent.

If the EAR fell between two percentile values, the percentage of women between the percentiles was divided up. A simplified approach was used for this purpose, assuming that the number of women increased linearly with the micronutrient intake between the percentile values (in reality, increases in the number and percentage of observations between the percentile thresholds are not linear for the skewed distribution of micronutrient intakes or any normal distribution, because observations are clustered around the median). For example, for women 25-34 years, the 10th percentile (P10) of vitamin B_{12} intakes was 1.9 mg/day, and the 25th percentile (P25) 2.7 mg/day. The EAR for NPNL women 15-65 years is 2.0 mg/day. The PI was computed as follows:

$$\begin{aligned} PI &= (EAR-P10) / (P25-P10) * 15 + 10 \\ &= (2.0-1.9) / (2.7-1.9) * 15 + 10 \\ &= 11.875 \end{aligned}$$

The value of 15 represents the percent of women between the 10th and 25th percentile. A fraction of these 15 percent is calculated and added to the 10 percent of women in the 10th percentile. The PA is then derived as:

$$\begin{aligned} PA &= 100 - PI \\ &= 88.125 \end{aligned}$$

Aggregation: After estimating the PA for each age group, the aggregate PA for women 14-50 years was calculated, weighting the PA for each age group by the number of women in each group. Sampling weights could not be applied, because they were not provided in the report.

PA of calcium: For calcium, the above approach to determine the percent of women at certain intake thresholds was fitted to the method by Foote *et al*. (2004), which had been applied to the adequate intake of calcium in the WDDP-I. This was done in addition to deriving the PA from the EAR of calcium following the method described above.

PA of iron: For iron, tentative estimates of PA were computed by inserting the midpoints of the skewed requirement distributions of NPNL women 15-18 and 19-50 years in place of the EARs. To take into account the skewed distribution of iron requirements and obtain a better estimate of PA, the tables in IOM (2001) were used, estimating the percent of women falling between the thresholds for each level of PA. The same level of iron absorption of 18 percent as given in IOM (2001) was assumed for Germany.

MPA: MPA is computed by averaging the estimated PA across 11 micronutrients (vitamin A, vitamin C, thiamin, riboflavin, niacin, vitamin B_6, folate, vitamin B_{12}, calcium, iron, and zinc).

Sources of error

Unknown physiological status: Because the annex tables provide results for all women and the proportion of lactating and pregnant women is unknown and likely to be very low, the EARs for NPNL women were used. Because pregnant and lactating women have higher EARs than NPNL women, this could result in a slight overestimation of MPA for all women. The magnitude of this error is probably very small.

Neglect of sampling weights: The neglect of sampling weights when aggregating the PA for the age groups 14-18, 19-24, 25-34 and 35-50 years is one potential source of error. To assess the likely size of this error, the percentages of women below the RDI were copied from the report (Max Rubner-Institut, 2008) for all age groups, including the ages 51-64 and 65-80 years. The percentage below the RDI was then aggregated for all age groups based on the number of women in each group, corresponding to what was done for the PA. The aggregated value for percent below the RDI was compared to the percent of all women below the RDI given in the report. The differences were minimal, ranging from -0.3 to 0.3 percentage points. This suggests that the neglect of sampling weights is a very minor source of error.

Simplified assumption about the distribution of intakes: Another source of error is the simplified assumption about the distribution that is used for dividing up the percent of women if the EAR falls between percentile values. To obtain an impression about the likely magnitude of this error, the above method to estimate percent below the EAR (that is, the PI) from the percentiles was applied to estimate percent below the RDI. These estimates were then compared to the actual percent below the RDI given in the report tables.

At the level of the age group, the deviations between the estimated and reported values for percent below the RDI ranged from -2.3 to 4.0 percentage points. When the two sets of values were aggregated for the four age groups to obtain an estimate of the percent of women 14-50 years with intakes below the RDI, the differences narrowed down, ranging from -1.2 to 2.2 percentage points. When averaging the percent of women with intakes below the RDI across all 11 micronutrients, the value obtained from the estimation method fell 0.4 percentage points below the value calculated from reported figures. Thus, it can be concluded that the effect of the simple estimation method on MPA is unlikely to be large; the error might be in the range of 1-2 percentage points.

Results

	Probability of adequacy (PA)	
Nutrient	Calcium: EAR	Calcium: Foote method
Vitamin A	97.7	97.7
Vitamin C	96.3	96.3
Thiamin	77.6	77.6
Riboflavin	92.6	92.6
Niacin	98.3	98.3
Vitamin B6	91.2	91.2
Folate	30.6	30.6
Vitamin B12	88.8	88.8
Calcium	69.0	78.1
Zinc	88.0	88.0
Iron	78.4	78.4
MPA	**82.6**	**83.4**

References

Foote, J.A., Murphy, S.P., Wilkens, L.R., Basiotis, P.P. and Carlson, A. 2004. Dietary variety increases the probability of nutrient adequacy among adults. *Journal of Nutrition* 134:1779-1785.

IOM (Institute of Medicine, USA). 2001. *Dietary reference intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium and zinc*. Washington, D.C., USA, National Academies Press.

IOM (Institute of Medicine, USA). 2011. *Dietary reference intakes for calcium and vitamin D*. Washington, DC, USA, National Academies Press.

Max Rubner-Institut. 2008. *Nationale Verzehrs-Studie II, Ergebnisbericht, Teil 2: Die bundesweite Befragung zur Ernährung von Jugendlichen und Erwachsenen*. Bundesforschungsinstitut für Ernährung und Lebensmittel (ed.). Karlsruhe, Max Rubner-Institut. Posted at http://www.was-esse-ich.de/uploads/media/NVSII_Abschlussbericht_Teil_2.pdf

APPENDIX 6

Summary results of analyses carried out for alternative FGI-9A, FGI-9B, FGI-9C and FGI-9D

Here are presented the summary results of the analyses for FGI-9A, FGI-9B, FGI-9C and FGI-9D.

Figures A6 - 1 to **3** show the AUC for each dataset and each FGI, at different MPA levels.

Table A6 1 and **2** present the "best" cutoffs identified from the sensitivity – specificity analysis for the restricted and non-restricted FGIs.

Figure A6 - 1. AUC for MPA > 0.50 among NPNL women, by study site, for restricted FGI-9, FGI-9A, FGI-9B, FGI-9C and FGI-9D

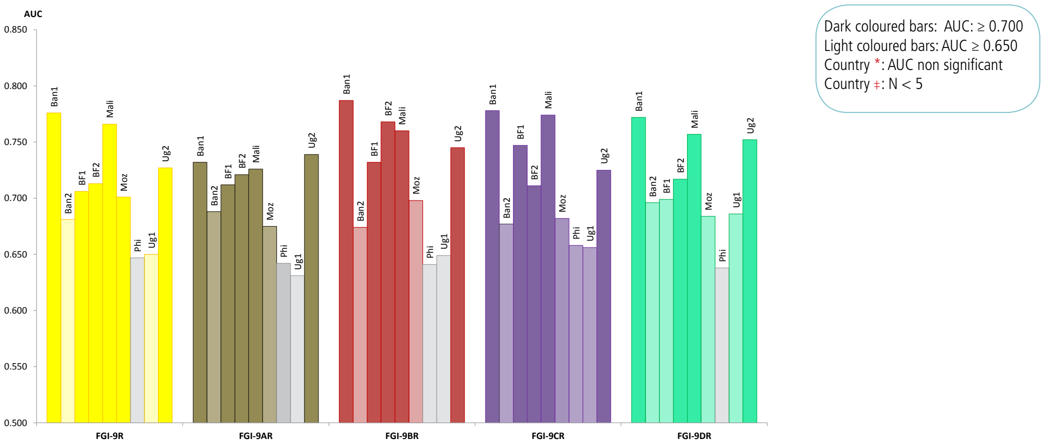

Figure A6 - 2. AUC for MPA > 0.60 among NPNL women, by study site, for restricted FGI-9, FGI-9A, FGI-9B, FGI-9C and FGI-9D

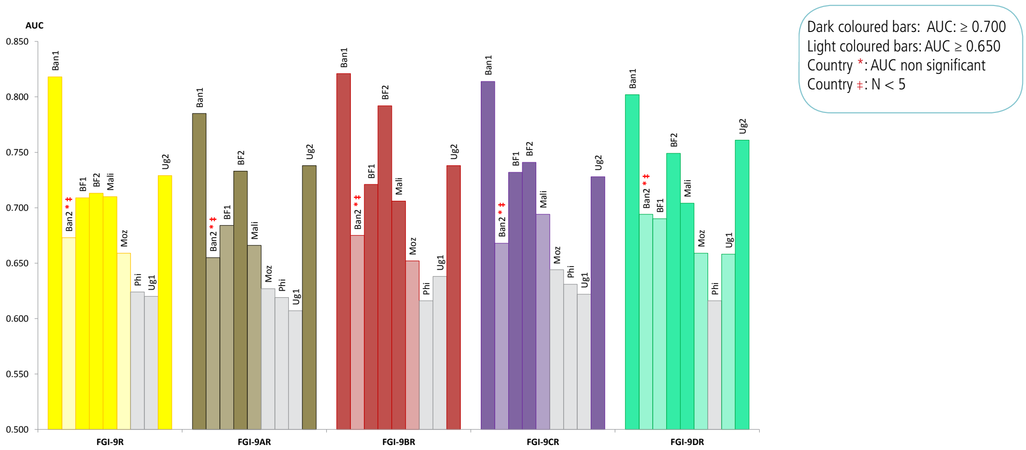

Figure A6 - 3. AUC for MPA > 0.70 among NPNL women, by study site, for restricted FGI-9, FGI-9A, FGI-9B, FGI-9C and FGI-9D

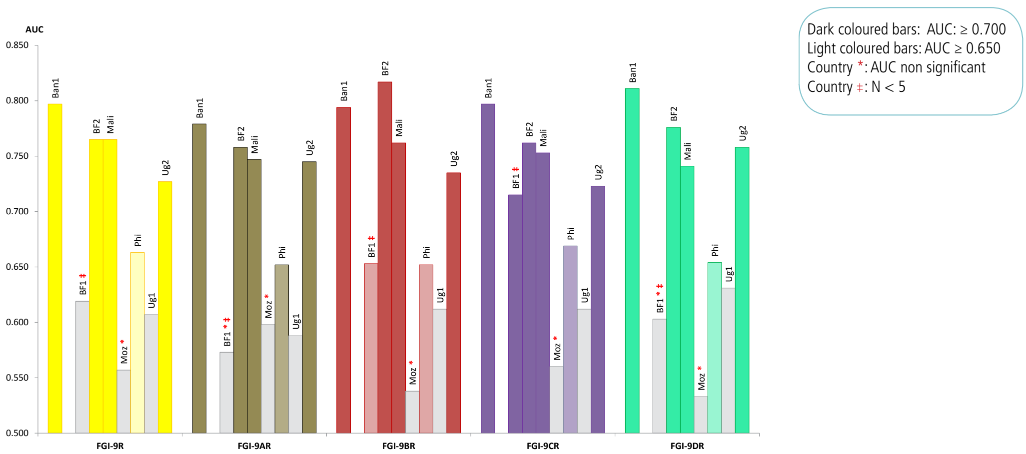

Table A6 - 1. Summary of "best" cutoff identified for FGI-9R, FGI-9AR, FGI-9BR, FGI-9CR and FGI-9DR, for NPNL, across all sites [a, b, c]

	FGI-9R					FGI-9AR					FGI-9BR					FGI-9CR				FGI-9DR					
MPA > 0.50																									
≥ 3	*BF2 (33)*					*BF2 (33)*					*BF2 (32)*					*BF2 (33)*				*BF2 (33)*					
≥ 4	*Ban2 (40)*	*Moz (34)*	***Ug2 (27)***								***BF2 (30)***	*Moz (35)*	***Ug2 (25)***			*Ban2 (40)*	*Moz (35)*	***Ug2 (27)***		*Moz (37)*	***Ug2 (25)***				
≥ 5	***Ban1 (20)***	*BF1 (36)*	***Mali (28)***	*Phi (38)*		*Ban1 (32)*	*Ban2 (36)*	*BF1 (38)*	*Mali (38)*	*Ug1 (37)*	***Ban1 (20)***	*BF1 (37)*	***Mali (29)***	*Phi (39)*	*Ug2 (39)*	***Ban1 (20)***	*BF1 (34)*	***Mali (28)***	*Phi (39)*	***Ban1 (23)***	*BF1 (36)*	***Mali (29)***	*Phi (39)*	*Ug1 (39)*	*Ug2 (37)*
≥ 6																									
≥ 7																									
MPA > 0.60																									
≥ 3																									
≥ 4	*Moz (39)*	*Ug2 (31)*									***BF2 (25)***	*Moz (42)*				*Ug2 (31)*									
≥ 5	***Ban1 (19)***	*BF1 (40)*	*Mali (35)*	*Phi (37)*	*Ug2 (37)*	*Ban1 (33)*	*Phi (40)*	*Ug2 (31)*			***Ban1 (19)***	*Mali (36)*	*Phi (38)*	*Ug2 (34)*		***Ban1 (20)***	*Ug2 (37)*			***Ban1 (24)***	*Mali (36)*	*Phi (38)*	*Ug1 (37)*	*Ug2 (30)*	
≥ 6											***BF1 (19)***														
≥ 7																									
MPA > 0.70																									
≥ 3																									
≥ 4	***BF2 (22)***					***BF2 (22)***					***BF2 (24)***					***BF2 (22)***				***BF2 (22)***					
≥ 5	***Ban1 (20)***	Mali (35)	*Phi (37)*	*Ug2 (32)*		*Ban1 (35)*	*Ug2 (36)*				***Ban1 (21)***	Mali (36)	*Phi (36)*	*Ug1 (39)*	*Ug2 (32)*	***Ban1 (21)***	*Ug2 (32)*			***Ban1 (25)***	Mali (36)	*Phi (37)*	*Ug2 (31)*		
≥ 6											**BF1 (19)**					**Mali (24)**	*Phi (32)*								
≥ 7																									

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).

[b] Range of values observed across all sites

[c] **Bold font indicates rate of misclassification ≤ 30%;**

Italic font indicates ≥ 10 women reaching the MPA level;

Green highlighting indicates both sensitivity and specificity ≥ 60%;

Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;

Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;

When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A6 - 2. Summary of "best" cutoff identified for FGI-9, FGI-9A, FGI-9B, FGI-9C and FGI-9D, for NPNL, across all sites [a, b, c]

	FGI-9			FGI-9A			FGI-9B		FGI-9C		FGI-9D		
MPA > 0.50													
≥ 3													
≥ 4	*Moz (34)*						*Moz (32)*		*Moz (33)*				
≥ 5	*Ban2 (40)*	*Phi (39)*	*Ug2 (37)*				*Ban2 (39)*	*Ug2 (32)*	*Ug2 (36)*		*Phi (40)*	*Ug1 (32)*	***Ug2 (29)***
≥ 6	*BF1 (39)*	*Mali (33)*		*Ban1 (33)*	*Ban2 (37)*		*Mali (34)*		*Mali (34)*		*Mali (36)*		
≥ 7									***BF1 (29)***	***Mali (28)***			
MPA > 0.60													
≥ 3													
≥ 4													
≥ 5	*Ug2 (37)*						*Ug1 (39)*	*Ug2 (35)*	*Ug2 (36)*				
≥ 6				*Ban1 (32)*	Ban2 (36)	*Ug2 (39)*	***Ban1 (18)***		*Phi (39)*		***Ban1 (26)***	*Ug2 (36)*	
≥ 7				***BF1 (23)***					***BF1 (29)***	*Mali (31)*			
MPA > 0.70													
≥ 3													
≥ 4													
≥ 5	*Ug2 (39)*			*Moz (31)*					*Ug2 (38)*				
≥ 6	***Ban1 (16)***			*Ban1 (32)*	*Phi (34)*	*Ug2 (33)*	***Ban1 (17)***		***Ban1 (17)***	*Phi (37)*	***Ban1 (25)***	*Ug2 (35)*	
≥ 7				***Ban1 (10)***	**BF1 (23)**	**Mali (28)**			BF1 (31)				

[a] In selecting the "best" cutoff, we considered the balance of sensitivity and specificity, with a preference for specificity; we also considered the total rate of misclassification (which is indicated in parentheses for each site's "best" cutoff).
[b] Range of values observed across all sites
[c] **Bold font indicates rate of misclassification ≤ 30%**;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

APPENDIX 7

Results of the sensitivity analyses for FGI-7R among NPNL women, by study site

Table A7 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
299	≥2	100	0.8	13.7	85.7	0	85.7
251	≥3	100	19.2	16.3	69.8	0	69.8
155	≥4	90.2	54.6	23.9	39.2	1.3	40.5
51	≥5	39	86.5	31.4	11.6	8.3	19.9
8	≥6	4.9	97.7	25	2	13	15
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
299	≥2	100	0.7	6.4	93	0	93
251	≥3	100	17.7	7.6	77.1	0	77.1
155	≥4	94.7	51.4	11.6	45.5	0.3	45.8
51	≥5	42.1	84.8	15.7	14.3	3.7	17.9
8	≥6	10.5	97.9	25	2	5.6	7.6
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
299	≥2	100	0.7	3.7	95.7	0	95.7
251	≥3	100	17.2	4.4	79.7	0	79.7
155	≥4	90.9	50	6.5	48.2	0.3	48.5
51	***≥5***	***54.5***	***84.5***	***11.8***	***15***	***1.7***	***16.6***
8	≥6	18.2	97.9	25	2	3	5
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A7 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
198	≥2	100	1.9	20.2	78.6	0	78.6
165	≥3	100	22.4	24.2	62.2	0	62.2
93	≥4	65	58.4	28	33.3	7	40.3
29	≥5	17.5	86.3	24.1	10.9	16.4	27.4
5	≥6	5	98.1	40	1.5	18.9	20.4
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
198	≥2	100	1.5	2	96.5	0	96.5
165	≥3	100	18.3	2.4	80.1	0	80.1
93	≥4	75	54.3	3.2	44.8	0.5	45.3
29	≥5	0	85.3	0	14.4	2	16.4
5	≥6	0	97.5	0	2.5	2	4.5
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
198	≥2	-	1.5	0	98.5	0	98.5
165	≥3	-	17.9	0	82.1	0	82.1
93	≥4	-	53.7	0	46.3	0	46.3
29	≥5	-	85.6	0	14.4	0	14.4
5	≥6	-	97.5	0	2.5	0	2.5
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A7 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
124	≥3	100	5.9	23.4	73.1	0	73.1
94	≥4	96.6	34.7	29.8	50.8	0.8	51.5
51	*≥5*	*58.6*	*66.3*	*33.3*	*26.2*	*9.2*	*35.4*
8	≥6	13.8	96	50	3.1	19.2	22.3
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
124	≥3	100	5.3	12.9	83.1	0	83.1
94	≥4	100	31.6	17	60	0	60
51	*≥5*	*50*	*62.3*	*15.7*	*33.1*	*6.2*	*39.2*
8	≥6	25	96.5	50	3.1	9.2	12.3
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
124	≥3	100	4.8	3.2	92.3	0	92.3
94	≥4	100	28.6	4.3	69.2	0	69.2
51	≥5	50	61.1	3.9	37.7	1.5	39.2
8	≥6	25	94.4	12.5	5.4	2.3	7.7
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A7 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
127	≥2	100	9.2	45.7	51.5	0	51.5
84	*≥3*	*84.5*	*53.9*	*58.3*	*26.1*	*6.7*	*32.8*
30	≥4	32.8	85.5	63.3	8.2	29.1	37.3
1	≥5	1.7	100	100	0	42.5	42.5
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
127	≥2	100	7.5	32.3	64.2	0	64.2
84	≥3	90.2	49.5	44	35.1	3	38.1
30	≥4	41.5	86	56.7	9.7	17.9	27.6
1	≥5	2.4	100	100	0	29.9	29.9
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
127	≥2	100	6.4	18.9	76.9	0	76.9
84	≥3	95.8	44.5	27.4	45.5	0.7	46.3
30	***≥4***	***50***	***83.6***	***40***	***13.4***	***9***	***22.4***
1	≥5	4.2	100	100	0	17.2	17.2
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A7 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
MPA > 0.50							
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
100	≥3	100	3.3	42	56.9	0	56.9
84	≥4	100	30	50	41.2	0	41.2
42	***≥5***	***66.7***	***76.7***	***66.7***	***13.7***	***13.7***	***27.5***
14	≥6	23.8	93.3	71.4	3.9	31.4	35.3
0	≥7	-	-	-	-	-	-
MPA > 0.60							
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
100	≥3	100	2.5	21	77.5	0	77.5
84	≥4	100	22.2	25	61.8	0	61.8
42	*≥5*	*66.7*	*65.4*	*33.3*	*27.5*	*6.9*	*34.3*
14	≥6	28.6	90.1	42.9	7.8	14.7	22.5
0	≥7	-	-	-	-	-	-
MPA > 0.70							
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
100	≥3	100	2.2	9	89.2	0	89.2
84	≥4	100	19.4	10.7	73.5	0	73.5
42	≥5	88.9	63.4	19	33.3	1	34.3
14	≥6	33.3	88.2	21.4	10.8	5.9	16.7
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A7 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
97	≥1	100	0	60.8	39.2	0	39.2
97	≥2	100	0	60.8	39.2	0	39.2
88	≥3	96.6	18.4	64.8	32	2.1	34
36	≥4	47.5	78.9	77.8	8.2	32	40.2
5	≥5	8.5	100	100	0	55.7	55.7
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
97	≥1	100	0	43.3	56.7	0	56.7
97	≥2	100	0	43.3	56.7	0	56.7
88	≥3	95.2	12.7	45.5	49.5	2.1	51.5
36	≥4	47.6	70.9	55.6	16.5	22.7	39.2
5	≥5	7.1	96.4	60	2.1	40.2	42.3
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
97	≥1	100	0	17.5	82.5	0	82.5
97	≥2	100	0	17.5	82.5	0	82.5
88	≥3	88.2	8.8	17	75.3	2.1	77.3
36	*≥4*	*52.9*	*66.3*	*25*	*27.8*	*8.2*	*36.1*
5	≥5	0	93.8	0	5.2	17.5	22.7
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A7 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
624	≥3	91.4	19.8	57.7	36.5	4.7	41.2
469	≥4	72.3	44.1	60.8	25.4	15.1	40.5
286	≥5	49.7	72.6	68.5	12.4	27.4	39.8
139	≥6	25.9	88.8	73.4	5.1	40.4	45.5
35	≥7	6.6	97.3	74.3	1.2	50.9	52.1
				MPA > 0.60			
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
624	≥3	91.1	16.2	36.2	55	3	58.1
469	≥4	72.6	39.2	38.4	40	9.4	49.4
286	*≥5*	*52.8*	*67.4*	*45.8*	*21.4*	*16.2*	*37.6*
139	≥6	27	84.8	48.2	10	25	35
35	≥7	6.9	96.2	48.6	2.5	32	34.4
				MPA > 0.70			
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
624	≥3	94.4	15.4	18.9	70	1	71
469	≥4	79.2	38.1	21.1	51.2	3.6	54.8
286	*≥5*	*60*	*64.7*	*26.2*	*29.2*	*6.9*	*36.1*
139	≥6	32.8	83.6	29.5	13.6	11.6	25.2
35	≥7	8.8	96	31.4	3.3	15.8	19.1

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A7 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
188	≥3	96.8	9.5	79.8	19.3	2.5	21.8
140	≥4	75.5	45.2	83.6	11.7	19.3	31
52	≥5	28.4	81	84.6	4.1	56.3	60.4
6	≥6	3.9	100	100	0	75.6	75.6
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
188	≥3	96.4	5.9	57.4	40.6	2	42.6
140	≥4	79.5	40	63.6	25.9	11.7	37.6
52	≥5	33	82.4	71.2	7.6	38.1	45.7
6	≥6	4.5	98.8	83.3	0.5	54.3	54.8
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
188	≥3	100	6.2	27.1	69.5	0	69.5
140	≥4	84.3	33.6	30.7	49.2	4.1	53.3
52	≥5	33.3	76	32.7	17.8	17.3	35
6	≥6	3.9	97.3	33.3	2	24.9	26.9
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A7 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
610	≥1	100	0	72.5	27.5	0	27.5
609	≥2	100	0.6	72.6	27.4	0	27.4
554	≥3	95.5	21.4	76.2	21.6	3.3	24.9
382	*≥4*	*71.3*	*60.1*	*82.5*	*11*	*20.8*	*31.8*
184	≥5	36.4	86.3	87.5	3.8	46.1	49.8
50	≥6	10.4	97.6	92	0.7	64.9	65.6
4	≥7	0.9	100	100	0	71.8	71.8
				MPA > 0.60			
610	≥1	100	0	55.1	44.9	0	44.9
609	≥2	100	0.4	55.2	44.8	0	44.8
554	≥3	97	16.8	58.8	37.4	1.6	39
382	*≥4*	*76.8*	*54.7*	*67.5*	*20.3*	*12.8*	*33.1*
184	≥5	41.7	83.9	76.1	7.2	32.1	39.3
50	≥6	13.1	97.8	88	1	47.9	48.9
4	≥7	1.2	100	100	0	54.4	54.4
				MPA > 0.70			
610	≥1	100	0	33.6	66.4	0	66.4
609	≥2	100	0.2	33.7	66.2	0	66.2
554	≥3	99.5	13.6	36.8	57.4	0.2	57.5
382	≥4	81.5	46.9	43.7	35.2	6.2	41.5
184	≥5	47.8	78.8	53.3	14.1	17.5	31.6
50	≥6	13.2	94.3	54	3.8	29.2	33
4	≥7	1	99.5	50	0.3	33.3	33.6

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

APPENDIX

8

Results of the sensitivity analyses for FGI-7 among NPNL women, by study site

Table A8 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
301	≥2	100	0	13.6	86.4	0	86.4
289	≥3	100	4.6	14.2	82.4	0	82.4
243	≥4	97.6	21.9	16.5	67.4	0.3	67.8
105	≥5	48.8	67.3	19	28.2	7	35.2
20	≥6	12.2	94.2	25	5	12	16.9
1	≥7	0	99.6	0	0.3	13.6	14
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
301	≥2	100	0	6.3	93.7	0	93.7
289	≥3	100	4.3	6.6	89.7	0	89.7
243	≥4	100	20.6	7.8	74.4	0	74.4
105	*≥5*	*52.6*	*66.3*	*9.5*	*31.6*	*3*	*34.6*
20	≥6	15.8	94	15	5.6	5.3	11
1	≥7	0	99.6	0	0.3	6.3	6.6
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
301	≥2	100	0	3.7	96.3	0	96.3
289	≥3	100	4.1	3.8	92.4	0	92.4
243	≥4	100	20	4.5	77.1	0	77.1
105	*≥5*	*63.6*	*66.2*	*6.7*	*32.6*	*1.3*	*33.9*
20	≥6	27.3	94.1	15	5.6	2.7	8.3
1	≥7	0	99.7	0	0.3	3.7	4

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A8 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
201	≥2	100	0	19.9	80.1	0	80.1
194	≥3	100	4.3	20.6	76.6	0	76.6
150	≥4	82.5	27.3	22	58.2	3.5	61.7
72	≥5	40	65.2	22.2	27.9	11.9	39.8
11	≥6	5	94.4	18.2	4.5	18.9	23.4
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
201	≥2	100	0	2	98	0	98
194	≥3	100	3.6	2.1	94.5	0	94.5
150	≥4	75	25.4	2	73.1	0.5	73.6
72	≥5	25	64	1.4	35.3	1.5	36.8
11	≥6	0	94.4	0	5.5	2	7.5
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
201	≥2	-	0	0	100	0	100
194	≥3	-	3.5	0	96.5	0	96.5
150	≥4	-	25.4	0	74.6	0	74.6
72	≥5	-	64.2	0	35.8	0	35.8
11	≥6	-	94.5	0	5.5	0	5.5
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A8 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
130	≥3	100	0	22.3	77.7	0	77.7
125	≥4	100	5	23.2	73.8	0	73.8
98	≥5	96.6	30.7	28.6	53.8	0.8	54.6
17	≥6	20.7	89.1	35.3	8.5	17.7	26.2
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
130	≥3	100	0	12.3	87.7	0	87.7
125	≥4	100	4.4	12.8	83.8	0	83.8
98	≥5	100	28.1	16.3	63.1	0	63.1
17	≥6	31.3	89.5	29.4	9.2	8.5	17.7
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
130	≥3	100	0	3.1	96.9	0	96.9
125	≥4	100	4	3.2	93.1	0	93.1
98	≥5	100	25.4	4.1	72.3	0	72.3
17	≥6	25	87.3	5.9	12.3	2.3	14.6
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A8 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
134	≥2	100	0	43.3	56.7	0	56.7
125	≥3	96.6	9.2	44.8	51.5	1.5	53
83	≥4	69	43.4	48.2	32.1	13.4	45.5
28	≥5	22.4	80.3	46.4	11.2	33.6	44.8
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
134	≥2	100	0	30.6	69.4	0	69.4
125	≥3	95.1	7.5	31.2	64.2	1.5	65.7
83	≥4	63.4	38.7	31.3	42.5	11.2	53.7
28	≥5	24.4	80.6	35.7	13.4	23.1	36.6
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
134	≥2	100	0	17.9	82.1	0	82.1
125	≥3	100	8.2	19.2	75.4	0	75.4
83	≥4	62.5	38.2	18.1	50.7	6.7	57.5
28	≥5	25	80	21.4	16.4	13.4	29.9
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A8 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
102	≥3	100	0	41.2	58.8	0	58.8
100	≥4	100	3.3	42	56.9	0	56.9
86	≥5	92.9	21.7	45.3	46.1	2.9	49
35	*≥6*	*52.4*	*78.3*	*62.9*	*12.7*	*19.6*	*32.4*
2	≥7	4.8	100	100	0	39.2	39.2
				MPA > 0.60			
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
102	≥3	100	0	20.6	79.4	0	79.4
100	≥4	100	2.5	21	77.5	0	77.5
86	≥5	90.5	17.3	22.1	65.7	2	67.6
35	*≥6*	*57.1*	*71.6*	*34.3*	*22.5*	*8.8*	*31.4*
2	≥7	0	97.5	0	2	20.6	22.5
				MPA > 0.70			
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
102	≥3	100	0	8.8	91.2	0	91.2
100	≥4	100	2.2	9	89.2	0	89.2
86	≥5	100	17.2	10.5	75.5	0	75.5
35	≥6	55.6	67.7	14.3	29.4	3.9	33.3
2	≥7	0	97.8	0	2	8.8	10.8

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A8 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
97	≥1	100	0	60.8	39.2	0	39.2
97	≥2	100	0	60.8	39.2	0	39.2
89	≥3	96.6	15.8	64	33	2.1	35.1
50	*≥4*	*62.7*	*65.8*	*74*	*13.4*	*22.7*	*36.1*
7	≥5	10.2	97.4	85.7	1	54.6	55.7
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
97	≥1	100	0	43.3	56.7	0	56.7
97	≥2	100	0	43.3	56.7	0	56.7
89	≥3	95.2	10.9	44.9	50.5	2.1	52.6
50	≥4	57.1	52.7	48	26.8	18.6	45.4
7	≥5	7.1	92.7	42.9	4.1	40.2	44.3
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
97	≥1	100	0	17.5	82.5	0	82.5
97	≥2	100	0	17.5	82.5	0	82.5
89	≥3	88.2	7.5	16.9	76.3	2.1	78.4
50	≥4	70.6	52.5	24	39.2	5.2	44.3
7	≥5	0	91.3	0	7.2	17.5	24.7
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A8 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
647	≥3	93.1	14.9	56.7	38.7	3.7	42.5
538	≥4	80.2	32.5	58.7	30.7	10.8	41.5
350	≥5	57.6	62.6	64.9	17	23.1	40.1
171	≥6	31.5	85.7	72.5	6.5	37.3	43.8
43	≥7	8.1	96.7	74.4	1.5	50.1	51.6
				MPA > 0.60			
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
647	≥3	92.7	12.2	35.5	57.7	2.5	60.2
538	≥4	80.6	28.8	37.2	46.7	6.6	53.4
350	≥5	60.1	57.7	42.6	27.8	13.7	41.5
171	≥6	32.3	80.8	46.8	12.6	23.2	35.8
43	≥7	8.9	95.6	51.2	2.9	31.3	34.2
				MPA > 0.70			
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
647	≥3	95.2	11.7	18.4	73	0.8	73.9
538	≥4	84.8	27.8	19.7	59.8	2.6	62.4
350	≥5	66.4	55.4	23.7	36.9	5.8	42.7
171	≥6	39.2	79.6	28.7	16.9	10.5	27.4
43	≥7	12	95.3	34.9	3.9	15.2	19.1

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A8 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
195	≥3	100	4.8	79.5	20.3	0	20.3
163	≥4	85.2	26.2	81	15.7	11.7	27.4
70	≥5	37.4	71.4	82.9	6.1	49.2	55.3
18	≥6	9.7	92.9	83.3	1.5	71.1	72.6
0	≥7	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
195	≥3	100	2.4	57.4	42.1	0	42.1
163	≥4	89.3	25.9	61.3	32	6.1	38.1
70	≥5	42.9	74.1	68.6	11.2	32.5	43.7
18	≥6	12.5	95.3	77.8	2	49.7	51.8
0	≥7	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
195	≥3	100	1.4	26.2	73.1	0	73.1
163	≥4	92.2	20.5	28.8	58.9	2	60.9
70	≥5	45.1	67.8	32.9	23.9	14.2	38.1
18	≥6	9.8	91.1	27.8	6.6	23.4	29.9
0	≥7	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A8 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
610	≥1	100	0	72.5	27.5	0	27.5
610	≥2	100	0	72.5	27.5	0	27.5
593	≥3	98.6	6.5	73.5	25.7	1	26.7
499	≥4	88.5	35.7	78.4	17.7	8.4	26.1
267	≥5	49.1	70.2	81.3	8.2	36.9	45.1
67	≥6	12.7	93.5	83.6	1.8	63.3	65.1
4	≥7	0.9	100	100	0	71.8	71.8
				MPA > 0.60			
610	≥1	100	0	55.1	44.9	0	44.9
610	≥2	100	0	55.1	44.9	0	44.9
593	≥3	98.8	4.7	56	42.8	0.7	43.4
499	≥4	92.6	31.4	62.3	30.8	4.1	34.9
267	≥5	52.4	66.8	65.9	14.9	26.2	41.1
67	≥6	15.2	94.2	76.1	2.6	46.7	49.3
4	≥7	1.2	100	100	0	54.4	54.4
				MPA > 0.70			
610	≥1	100	0	33.6	66.4	0	66.4
610	≥2	100	0	33.6	66.4	0	66.4
593	≥3	100	4.2	34.6	63.6	0	63.6
499	≥4	95.6	25.2	39.3	49.7	1.5	51.1
267	*≥5*	*57.6*	*63.2*	*44.2*	*24.4*	*14.3*	*38.7*
67	≥6	16.1	91.6	49.3	5.6	28.2	33.8
4	≥7	1	99.5	50	0.3	33.3	33.6

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

A P P E N D I X

9

Results of the sensitivity analyses for FGI-9R among NPNL women, by study site

Table A9 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
299	≥2	100	0.8	13.7	85.7	0	85.7
252	≥3	100	18.8	16.3	70.1	0	70.1
161	≥4	90.2	52.3	23	41.2	1.3	42.5
63	***≥5***	***53.7***	***84.2***	***34.9***	***13.6***	***6.3***	***19.9***
11	≥6	7.3	96.9	27.3	2.7	12.6	15.3
1	≥7	0	99.6	0	0.3	13.6	14
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
299	≥2	100	0.7	6.4	93	0	93
252	≥3	100	17.4	7.5	77.4	0	77.4
161	≥4	94.7	49.3	11.2	47.5	0.3	47.8
63	***≥5***	***68.4***	***82.3***	***20.6***	***16.6***	***2***	***18.6***
11	≥6	15.8	97.2	27.3	2.7	5.3	8
1	≥7	0	99.6	0	0.3	6.3	6.6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
299	≥2	100	0.7	3.7	95.7	0	95.7
252	≥3	100	16.9	4.4	80.1	0	80.1
161	≥4	90.9	47.9	6.2	50.2	0.3	50.5
63	***≥5***	***63.6***	***80.7***	***11.1***	***18.6***	***1.3***	***19.9***
11	≥6	27.3	97.2	27.3	2.7	2.7	5.3
1	≥7	0	99.7	0	0.3	3.7	4
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
198	≥2	100	1.9	20.2	78.6	0	78.6
166	≥3	100	21.7	24.1	62.7	0	62.7
96	*≥4*	*70*	*57.8*	*29.2*	*33.8*	*6*	*39.8*
37	≥5	30	84.5	32.4	12.4	13.9	26.4
8	≥6	7.5	96.9	37.5	2.5	18.4	20.9
1	≥7	0	99.4	0	0.5	19.9	20.4
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
198	≥2	100	1.5	2	96.5	0	96.5
166	≥3	100	17.8	2.4	80.6	0	80.6
96	≥4	100	53.3	4.2	45.8	0	45.8
37	≥5	0	81.2	0	18.4	2	20.4
8	≥6	0	95.9	0	4	2	6
1	≥7	0	99.5	0	0.5	2	2.5
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
198	≥2	-	1.5	0	98.5	0	98.5
166	≥3	-	17.4	0	82.6	0	82.6
96	≥4	-	52.2	0	47.8	0	47.8
37	≥5	-	81.6	0	18.4	0	18.4
8	≥6	-	96	0	4	0	4
1	≥7	-	99.5	0	0.5	0	0.5
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
125	≥3	100	5	23.2	73.8	0	73.8
96	≥4	96.6	32.7	29.2	52.3	0.8	53.1
56	*≥5*	*65.5*	*63.4*	*33.9*	*28.5*	*7.7*	*36.2*
19	≥6	27.6	89.1	42.1	8.5	16.2	24.6
2	≥7	3.4	99	50	0.8	21.5	22.3
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
125	≥3	100	4.4	12.8	83.8	0	83.8
96	≥4	100	29.8	16.7	61.5	0	61.5
56	*≥5*	*62.5*	*59.6*	*17.9*	*35.4*	*4.6*	*40*
19	≥6	37.5	88.6	31.6	10	7.7	17.7
2	≥7	6.3	99.1	50	0.8	11.5	12.3
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
125	≥3	100	4	3.2	93.1	0	93.1
96	≥4	100	27	4.2	70.8	0	70.8
56	≥5	50	57.1	3.6	41.5	1.5	43.1
19	≥6	25	85.7	5.3	13.8	2.3	16.2
2	≥7	0	98.4	0	1.5	3.1	4.6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
127	≥2	100	9.2	45.7	51.5	0	51.5
84	*≥3*	*84.5*	*53.9*	*58.3*	*26.1*	*6.7*	*32.8*
30	≥4	32.8	85.5	63.3	8.2	29.1	37.3
2	≥5	1.7	98.7	50	0.7	42.5	43.3
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
127	≥2	100	7.5	32.3	64.2	0	64.2
84	≥3	90.2	49.5	44	35.1	3	38.1
30	≥4	41.5	86	56.7	9.7	17.9	27.6
2	≥5	2.4	98.9	50	0.7	29.9	30.6
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
127	≥2	100	6.4	18.9	76.9	0	76.9
84	≥3	95.8	44.5	27.4	45.5	0.7	46.3
30	***≥4***	***50***	***83.6***	***40***	***13.4***	***9***	***22.4***
2	≥5	4.2	99.1	50	0.7	17.2	17.9
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
100	≥3	100	3.3	42	56.9	0	56.9
84	≥4	100	30	50	41.2	0	41.2
43	***≥5***	***66.7***	***75***	***65.1***	***14.7***	***13.7***	***28.4***
15	≥6	26.2	93.3	73.3	3.9	30.4	34.3
4	≥7	4.8	96.7	50	2	39.2	41.2
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
100	≥3	100	2.5	21	77.5	0	77.5
84	≥4	100	22.2	25	61.8	0	61.8
43	*≥5*	*66.7*	*64.2*	*32.6*	*28.4*	*6.9*	*35.3*
15	≥6	33.3	90.1	46.7	7.8	13.7	21.6
4	≥7	0	95.1	0	3.9	20.6	24.5
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
100	≥3	100	2.2	9	89.2	0	89.2
84	≥4	100	19.4	10.7	73.5	0	73.5
43	*≥5*	*88.9*	*62.4*	*18.6*	*34.3*	*1*	*35.3*
15	≥6	33.3	87.1	20	11.8	5.9	17.6
4	≥7	0	95.7	0	3.9	8.8	12.7
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
103	≥1	100	0	59.2	40.8	0	40.8
103	≥2	100	0	59.2	40.8	0	40.8
97	≥3	100	14.3	62.9	35	0	35
60	*≥4*	*70.5*	*59.5*	*71.7*	*16.5*	*17.5*	*34*
9	≥5	14.8	100	100	0	50.5	50.5
1	≥6	1.6	100	100	0	58.3	58.3
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
103	≥1	100	0	40.8	59.2	0	59.2
103	≥2	100	0	40.8	59.2	0	59.2
97	≥3	100	9.8	43.3	53.4	0	53.4
60	*≥4*	*73.8*	*52.5*	*51.7*	*28.2*	*10.7*	*38.8*
9	≥5	14.3	95.1	66.7	2.9	35	37.9
1	≥6	0	98.4	0	1	40.8	41.7
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
103	≥1	100	0	16.5	83.5	0	83.5
103	≥2	100	0	16.5	83.5	0	83.5
97	≥3	100	7	17.5	77.7	0	77.7
60	≥4	64.7	43	18.3	47.6	5.8	53.4
9	≥5	11.8	91.9	22.2	6.8	14.6	21.4
1	≥6	0	98.8	0	1	16.5	17.5
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
630	≥3	92.4	19.1	57.8	36.8	4.1	40.9
478	≥4	73.6	42.9	60.7	26	14.4	40.4
307	*≥5*	*53.8*	*71.1*	*69.1*	*13.1*	*25.2*	*38.3*
171	≥6	31.7	86	73.1	6.4	37.2	43.6
75	≥7	14	93.9	73.3	2.8	46.9	49.7
25	≥8	5.1	98.5	80	0.7	51.7	52.4
2	≥9	0.3	99.7	50	0.1	54.4	54.5
				MPA > 0.60			
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
630	≥3	92.7	15.8	36.5	55.3	2.5	57.8
478	≥4	74.2	38.1	38.5	40.7	8.9	49.5
307	*≥5*	*58.1*	*65.7*	*46.9*	*22.5*	*14.4*	*36.9*
171	≥6	33.5	81.5	48.5	12.2	22.8	35
75	≥7	14.5	91.8	48	5.4	29.3	34.7
25	≥8	5.2	97.5	52	1.7	32.5	34.2
2	≥9	0.4	99.8	50	0.1	34.2	34.3
				MPA > 0.70			
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
630	≥3	96	14.7	19	70.5	0.7	71.2
478	≥4	82.4	37.3	21.5	51.9	3	54.9
307	*≥5*	*66.4*	*62.5*	*27*	*31*	*5.8*	*36.8*
171	≥6	39.2	79.6	28.7	16.9	10.5	27.4
75	≥7	16.8	91	28	7.5	14.4	21.9
25	≥8	6.4	97.2	32	2.4	16.2	18.5
2	≥9	0.8	99.8	50	0.1	17.2	17.3

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
188	≥3	96.8	9.5	79.8	19.3	2.5	21.8
145	≥4	78.7	45.2	84.1	11.7	16.8	28.4
62	≥5	34.8	81	87.1	4.1	51.3	55.3
11	≥6	7.1	100	100	0	73.1	73.1
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
188	≥3	96.4	5.9	57.4	40.6	2	42.6
145	≥4	82.1	37.6	63.4	26.9	10.2	37.1
62	≥5	37.5	76.5	67.7	10.2	35.5	45.7
11	≥6	7.1	96.5	72.7	1.5	52.8	54.3
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
188	≥3	100	6.2	27.1	69.5	0	69.5
145	≥4	86.3	30.8	30.3	51.3	3.6	54.8
62	≥5	39.2	71.2	32.3	21.3	15.7	37.1
11	≥6	9.8	95.9	45.5	3	23.4	26.4
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A9 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
610	≥1	100	0	72.5	27.5	0	27.5
608	≥2	100	1.2	72.7	27.2	0	27.2
557	≥3	95.9	20.8	76.1	21.8	3	24.8
417	***≥4***	***78.5***	***58.3***	***83.2***	***11.5***	***15.6***	***27***
226	≥5	44.8	83.3	87.6	4.6	40	44.6
72	≥6	14.9	96.4	91.7	1	61.6	62.6
14	≥7	2.9	99.4	92.9	0.2	70.3	70.5
4	≥8	0.9	100	100	0	71.8	71.8
1	≥9	0.2	100	100	0	72.3	72.3
				MPA > 0.60			
610	≥1	100	0	55.1	44.9	0	44.9
608	≥2	100	0.7	55.3	44.6	0	44.6
557	≥3	97.3	16.1	58.7	37.7	1.5	39.2
417	*≥4*	*84.2*	*51.1*	*67.9*	*22*	*8.7*	*30.7*
226	*≥5*	*50.3*	*79.2*	*74.8*	*9.3*	*27.4*	*36.7*
72	≥6	18.8	96.7	87.5	1.5	44.8	46.2
14	≥7	3.9	99.6	92.9	0.2	53	53.1
4	≥8	1.2	100	100	0	54.4	54.4
1	≥9	0.3	100	100	0	54.9	54.9
				MPA > 0.70			
610	≥1	100	0	33.6	66.4	0	66.4
608	≥2	100	0.5	33.7	66.1	0	66.1
557	≥3	99.5	12.8	36.6	57.9	0.2	58
417	≥4	90.2	42.7	44.4	38	3.3	41.3
226	*≥5*	*58*	*73.6*	*52.7*	*17.5*	*14.1*	*31.6*
72	≥6	22	93.3	62.5	4.4	26.2	30.7
14	≥7	4.4	98.8	64.3	0.8	32.1	33
4	≥8	1.5	99.8	75	0.2	33.1	33.3
1	≥9	0.5	100	100	0	33.4	33.4

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

APPENDIX 10

Results of the sensitivity analyses for FGI-9 among NPNL women, by study site

Table A10 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
301	≥2	100	0	13.6	86.4	0	86.4
289	≥3	100	4.6	14.2	82.4	0	82.4
251	≥4	100	19.2	16.3	69.8	0	69.8
146	≥5	75.6	55.8	21.2	38.2	3.3	41.5
49	≥6	31.7	86.2	26.5	12	9.3	21.3
8	≥7	7.3	98.1	37.5	1.7	12.6	14.3
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
301	≥2	100	0	6.3	93.7	0	93.7
289	≥3	100	4.3	6.6	89.7	0	89.7
251	≥4	100	17.7	7.6	77.1	0	77.1
146	≥5	100	55	13	42.2	0	42.2
49	≥6	36.8	85.1	14.3	14	4	17.9
8	≥7	15.8	98.2	37.5	1.7	5.3	7
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
301	≥2	100	0	3.7	96.3	0	96.3
289	≥3	100	4.1	3.8	92.4	0	92.4
251	≥4	100	17.2	4.4	79.7	0	79.7
146	≥5	100	53.4	7.5	44.9	0	44.9
49	***≥6***	***54.5***	***85.2***	***12.2***	***14.3***	***1.7***	***15.9***
8	≥7	27.3	98.3	37.5	1.7	2.7	4.3
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A10 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
201	≥2	100	0	19.9	80.1	0	80.1
194	≥3	100	4.3	20.6	76.6	0	76.6
153	≥4	87.5	26.7	22.9	58.7	2.5	61.2
86	*≥5*	*57.5*	*60.9*	*26.7*	*31.3*	*8.5*	*39.8*
28	≥6	22.5	88.2	32.1	9.5	15.4	24.9
4	≥7	2.5	98.1	25	1.5	19.4	20.9
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
201	≥2	100	0	2	98	0	98
194	≥3	100	3.6	2.1	94.5	0	94.5
153	≥4	100	24.4	2.6	74.1	0	74.1
86	≥5	75	57.9	3.5	41.3	0.5	41.8
28	≥6	0	85.8	0	13.9	2	15.9
4	≥7	0	98	0	2	2	4
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
201	≥2	-	0	0	100	0	100
194	≥3	-	3.5	0	96.5	0	96.5
153	≥4	-	23.9	0	76.1	0	76.1
86	≥5	-	57.2	0	42.8	0	42.8
28	≥6	-	86.1	0	13.9	0	13.9
4	≥7	-	98	0	2	0	2
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A10 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
130	≥3	100	0	22.3	77.7	0	77.7
125	≥4	100	5	23.2	73.8	0	73.8
108	≥5	100	21.8	26.9	60.8	0	60.8
70	*≥6*	*82.8*	*54.5*	*34.3*	*35.4*	*3.8*	*39.2*
14	≥7	17.2	91.1	35.7	6.9	18.5	25.4
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
130	≥3	100	0	12.3	87.7	0	87.7
125	≥4	100	4.4	12.8	83.8	0	83.8
108	≥5	100	19.3	14.8	70.8	0	70.8
70	≥6	87.5	50.9	20	43.1	1.5	44.6
14	≥7	25	91.2	28.6	7.7	9.2	16.9
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
130	≥3	100	0	3.1	96.9	0	96.9
125	≥4	100	4	3.2	93.1	0	93.1
108	≥5	100	17.5	3.7	80	0	80
70	≥6	75	46.8	4.3	51.5	0.8	52.3
14	≥7	25	89.7	7.1	10	2.3	12.3
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A10 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
134	≥2	100	0	43.3	56.7	0	56.7
127	≥3	96.6	6.6	44.1	53	1.5	54.5
88	≥4	72.4	39.5	47.7	34.3	11.9	46.3
36	≥5	32.8	77.6	52.8	12.7	29.1	41.8
7	≥6	5.2	94.7	42.9	3	41	44
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
134	≥2	100	0	30.6	69.4	0	69.4
127	≥3	95.1	5.4	30.7	65.7	1.5	67.2
88	≥4	68.3	35.5	31.8	44.8	9.7	54.5
36	≥5	36.6	77.4	41.7	15.7	19.4	35.1
7	≥6	7.3	95.7	42.9	3	28.4	31.3
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
134	≥2	100	0	17.9	82.1	0	82.1
127	≥3	100	6.4	18.9	76.9	0	76.9
88	≥4	70.8	35.5	19.3	53	5.2	58.2
36	≥5	33.3	74.5	22.2	20.9	11.9	32.8
7	≥6	8.3	95.5	28.6	3.7	16.4	20.1
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A10 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
102	≥3	100	0	41.2	58.8	0	58.8
100	≥4	100	3.3	42	56.9	0	56.9
90	≥5	95.2	16.7	44.4	49	2	51
52	*≥6*	*71.4*	*63.3*	*57.7*	*21.6*	*11.8*	*33.3*
16	≥7	26.2	91.7	68.8	4.9	30.4	35.3
1	≥8	2.4	100	100	0	40.2	40.2
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
102	≥3	100	0	20.6	79.4	0	79.4
100	≥4	100	2.5	21	77.5	0	77.5
90	≥5	95.2	13.6	22.2	68.6	1	69.6
52	≥6	76.2	55.6	30.8	35.3	4.9	40.2
16	≥7	28.6	87.7	37.5	9.8	14.7	24.5
1	≥8	0	98.8	0	1	20.6	21.6
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
102	≥3	100	0	8.8	91.2	0	91.2
100	≥4	100	2.2	9	89.2	0	89.2
90	≥5	100	12.9	10	79.4	0	79.4
52	≥6	88.9	52.7	15.4	43.1	1	44.1
16	≥7	22.2	84.9	12.5	13.7	6.9	20.6
1	≥8	0	98.9	0	1	8.8	9.8
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A10 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
103	≥1	100	0	59.2	40.8	0	40.8
103	≥2	100	0	59.2	40.8	0	40.8
98	≥3	100	11.9	62.2	35.9	0	35.9
68	*≥4*	*77*	*50*	*69.1*	*20.4*	*13.6*	*34*
20	≥5	26.2	90.5	80	3.9	43.7	47.6
1	≥6	1.6	100	100	0	58.3	58.3
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
103	≥1	100	0	40.8	59.2	0	59.2
103	≥2	100	0	40.8	59.2	0	59.2
98	≥3	100	8.2	42.9	54.4	0	54.4
68	≥4	78.6	42.6	48.5	34	8.7	42.7
20	≥5	19	80.3	40	11.7	33	44.7
1	≥6	0	98.4	0	1	40.8	41.7
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
103	≥1	100	0	16.5	83.5	0	83.5
103	≥2	100	0	16.5	83.5	0	83.5
98	≥3	100	5.8	17.3	78.6	0	78.6
68	≥4	76.5	36	19.1	53.4	3.9	57.3
20	≥5	17.6	80.2	15	16.5	13.6	30.1
1	≥6	0	98.8	0	1	16.5	17.5
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A10 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
MPA > 0.50							
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
653	≥3	94.2	14.3	56.8	39	3.2	42.2
546	≥4	81.5	31.6	58.8	31.1	10.1	41.2
366	*≥5*	*60.4*	*61.1*	*65*	*17.7*	*21.6*	*39.3*
210	≥6	38.6	82.4	72.4	8	33.5	41.5
95	≥7	17.3	91.8	71.6	3.7	45.1	48.8
28	≥8	5.6	98.2	78.6	0.8	51.5	52.3
4	≥9	0.8	99.7	75	0.1	54.1	54.2
MPA > 0.60							
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
653	≥3	94.4	11.8	35.8	58	1.9	59.9
546	≥4	81.9	27.8	37.2	47.4	6.2	53.7
366	≥5	63.7	56.2	43.2	28.8	12.4	41.2
210	≥6	41.1	77.3	48.6	14.9	20.2	35.1
95	≥7	17.7	89.3	46.3	7.1	28.2	35.3
28	≥8	5.6	97.1	50	1.9	32.4	34.3
4	≥9	1.2	99.8	75	0.1	33.9	34
MPA > 0.70							
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
653	≥3	96.8	11	18.5	73.6	0.6	74.1
546	≥4	87.2	26.9	20	60.4	2.2	62.7
366	≥5	72	53.8	24.6	38.2	4.8	43
210	≥6	46.4	74.6	27.6	21	9.3	30.3
95	≥7	21.6	88.6	28.4	9.4	13.6	23
28	≥8	6.4	96.7	28.6	2.8	16.2	18.9
4	≥9	2.4	99.8	75	0.1	16.9	17

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A10 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
195	≥3	100	4.8	79.5	20.3	0	20.3
169	≥4	88.4	23.8	81.1	16.2	9.1	25.4
88	≥5	47.7	66.7	84.1	7.1	41.1	48.2
30	≥6	16.8	90.5	86.7	2	65.5	67.5
2	≥7	1.3	100	100	0	77.7	77.7
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
195	≥3	100	2.4	57.4	42.1	0	42.1
169	≥4	91.1	21.2	60.4	34	5.1	39.1
88	≥5	53.6	67.1	68.2	14.2	26.4	40.6
30	≥6	19.6	90.6	73.3	4.1	45.7	49.7
2	≥7	1.8	100	100	0	55.8	55.8
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
195	≥3	100	1.4	26.2	73.1	0	73.1
169	≥4	94.1	17.1	28.4	61.4	1.5	62.9
88	≥5	54.9	58.9	31.8	30.5	11.7	42.1
30	≥6	19.6	86.3	33.3	10.2	20.8	31
2	≥7	3.9	100	100	0	24.9	24.9
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A10 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
610	≥1	100	0	72.5	27.5	0	27.5
610	≥2	100	0	72.5	27.5	0	27.5
595	≥3	98.9	6	73.4	25.9	0.8	26.7
511	≥4	90	32.7	77.9	18.5	7.2	25.7
345	*≥5*	*63.8*	*62.5*	*81.7*	*10.3*	*26.2*	*36.6*
135	≥6	25.6	86.9	83.7	3.6	53.9	57.5
18	≥7	3.8	99.4	94.4	0.2	69.7	69.8
4	≥8	0.9	100	100	0	71.8	71.8
1	≥9	0.2	100	100	0	72.3	72.3
				MPA > 0.60			
610	≥1	100	0	55.1	44.9	0	44.9
610	≥2	100	0	55.1	44.9	0	44.9
595	≥3	99.1	4.4	56	43	0.5	43.4
511	≥4	93.5	28.1	61.4	32.3	3.6	35.9
345	*≥5*	*68.5*	*58*	*66.7*	*18.9*	*17.4*	*36.2*
135	≥6	29.2	86.5	72.6	6.1	39	45.1
18	≥7	5.1	99.6	94.4	0.2	52.3	52.5
4	≥8	1.2	100	100	0	54.4	54.4
1	≥9	0.3	100	100	0	54.9	54.9
				MPA > 0.70			
610	≥1	100	0	33.6	66.4	0	66.4
610	≥2	100	0	33.6	66.4	0	66.4
595	≥3	100	3.7	34.5	63.9	0	63.9
511	≥4	96.6	22.7	38.7	51.3	1.1	52.5
345	*≥5*	*76.6*	*53.6*	*45.5*	*30.8*	*7.9*	*38.7*
135	≥6	34.1	84	51.9	10.7	22.1	32.8
18	≥7	5.9	98.5	66.7	1	31.6	32.6
4	≥8	1.5	99.8	75	0.2	33.1	33.3
1	≥9	0.5	100	100	0	33.4	33.4

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

APPENDIX 11

Results of the sensitivity analyses for FGI-10ER among NPNL women, by study site

Table A11 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
299	≥2	100	0.8	13.7	85.7	0	85.7
257	≥3	100	16.9	16	71.8	0	71.8
177	≥4	90.2	46.2	20.9	46.5	1.3	47.8
84	***≥5***	***68.3***	***78.5***	***33.3***	***18.6***	***4.3***	***22.9***
30	≥6	26.8	92.7	36.7	6.3	10	16.3
7	≥7	7.3	98.5	42.9	1.3	12.6	14
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
299	≥2	100	0.7	6.4	93	0	93
257	≥3	100	15.6	7.4	79.1	0	79.1
177	≥4	94.7	43.6	10.2	52.8	0.3	53.2
84	***≥5***	***78.9***	***75.5***	***17.9***	***22.9***	***1.3***	***24.3***
30	≥6	36.8	91.8	23.3	7.6	4	11.6
7	≥7	0	97.5	0	2.3	6.3	8.6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
299	≥2	100	0.7	3.7	95.7	0	95.7
257	≥3	100	15.2	4.3	81.7	0	81.7
177	≥4	90.9	42.4	5.6	55.5	0.3	55.8
84	***≥5***	***81.8***	***74.1***	***10.7***	***24.9***	***0.7***	***25.6***
30	≥6	45.5	91.4	16.7	8.3	2	10.3
7	≥7	0	97.6	0	2.3	3.7	6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A11 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
198	≥2	100	1.9	20.2	78.6	0	78.6
168	≥3	100	20.5	23.8	63.7	0	63.7
100	≥4	70	55.3	28	35.8	6	41.8
46	≥5	42.5	82	37	14.4	11.4	25.9
12	≥6	10	95	33.3	4	17.9	21.9
3	≥7	5	99.4	66.7	0.5	18.9	19.4
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
198	≥2	100	1.5	2	96.5	0	96.5
168	≥3	100	16.8	2.4	81.6	0	81.6
100	≥4	100	51.3	4	47.8	0	47.8
46	≥5	25	77.2	2.2	22.4	1.5	23.9
12	≥6	0	93.9	0	6	2	8
3	≥7	0	98.5	0	1.5	2	3.5
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
198	≥2	-	1.5	0	98.5	0	98.5
168	≥3	-	16.4	0	83.6	0	83.6
100	≥4	-	50.2	0	49.8	0	49.8
46	≥5	-	77.1	0	22.9	0	22.9
12	≥6	-	94	0	6	0	6
3	≥7	-	98.5	0	1.5	0	1.5
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A11 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
MPA > 0.50							
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
124	≥3	100	5.9	23.4	73.1	0	73.1
97	≥4	96.6	31.7	28.9	53.1	0.8	53.8
61	*≥5*	*72.4*	*60.4*	*34.4*	*30.8*	*6.2*	*36.9*
27	≥6	41.4	85.1	44.4	11.5	13.1	24.6
7	≥7	6.9	95	28.6	3.8	20.8	24.6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
MPA > 0.60							
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
124	≥3	100	5.3	12.9	83.1	0	83.1
97	≥4	100	28.9	16.5	62.3	0	62.3
61	≥5	62.5	55.3	16.4	39.2	4.6	43.8
27	***≥6***	***50***	***83.3***	***29.6***	***14.6***	***6.2***	***20.8***
7	≥7	12.5	95.6	28.6	3.8	10.8	14.6
0	≥8	-	-	-	-	-	-
0	**≥9**	**-**	**-**	**-**	**-**	**-**	**-**
0	≥10	-	-	-	-	-	-
MPA > 0.70							
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
124	≥3	100	4.8	3.2	92.3	0	92.3
97	≥4	100	26.2	4.1	71.5	0	71.5
61	≥5	50	53.2	3.3	45.4	1.5	46.9
27	**≥6**	**50**	**80.2**	**7.4**	**19.2**	**1.5**	**20.8**
7	≥7	0	94.4	0	5.4	3.1	8.5
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A11 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
127	≥2	100	9.2	45.7	51.5	0	51.5
89	*≥3*	*89.7*	*51.3*	*58.4*	*27.6*	*4.5*	*32.1*
44	***≥4***	***53.4***	***82.9***	***70.5***	***9.7***	***20.1***	***29.9***
8	≥5	12.1	98.7	87.5	0.7	38.1	38.8
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
127	≥2	100	7.5	32.3	64.2	0	64.2
89	≥3	95.1	46.2	43.8	37.3	1.5	38.8
44	***≥4***	***63.4***	***80.6***	***59.1***	***13.4***	***11.2***	***24.6***
8	≥5	14.6	97.8	75	1.5	26.1	27.6
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
127	≥2	100	6.4	18.9	76.9	0	76.9
89	≥3	100	40.9	27	48.5	0	48.5
44	***≥4***	***75***	***76.4***	***40.9***	***19.4***	***4.5***	***23.9***
8	≥5	20.8	97.3	62.5	2.2	14.2	16.4
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A11 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
100	≥3	100	3.3	42	56.9	0	56.9
84	≥4	100	30	50	41.2	0	41.2
45	*≥5*	*66.7*	*71.7*	*62.2*	*16.7*	*13.7*	*30.4*
19	≥6	31	90	68.4	5.9	28.4	34.3
5	≥7	7.1	96.7	60	2	38.2	40.2
1	≥8	2.4	100	100	0	40.2	40.2
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
100	≥3	100	2.5	21	77.5	0	77.5
84	≥4	100	22.2	25	61.8	0	61.8
45	*≥5*	*66.7*	*61.7*	*31.1*	*30.4*	*6.9*	*37.3*
19	≥6	38.1	86.4	42.1	10.8	12.7	23.5
5	≥7	4.8	95.1	20	3.9	19.6	23.5
1	≥8	0	98.8	0	1	20.6	21.6
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
100	≥3	100	2.2	9	89.2	0	89.2
84	≥4	100	19.4	10.7	73.5	0	73.5
45	≥5	88.9	60.2	17.8	36.3	1	37.3
19	≥6	33.3	82.8	15.8	15.7	5.9	21.6
5	≥7	0	94.6	0	4.9	8.8	13.7
1	≥8	0	98.9	0	1	8.8	9.8
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A11 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
97	≥1	100	0	60.8	39.2	0	39.2
97	≥2	100	0	60.8	39.2	0	39.2
92	≥3	100	13.2	64.1	34	0	34
62	*≥4*	*72.9*	*50*	*69.4*	*19.6*	*16.5*	*36.1*
18	≥5	30.5	100	100	0	42.3	42.3
5	≥6	8.5	100	100	0	55.7	55.7
1	≥7	1.7	100	100	0	59.8	59.8
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
97	≥1	100	0	43.3	56.7	0	56.7
97	≥2	100	0	43.3	56.7	0	56.7
92	≥3	100	9.1	45.7	51.5	0	51.5
62	≥4	73.8	43.6	50	32	11.3	43.3
18	≥5	35.7	94.5	83.3	3.1	27.8	30.9
5	≥6	9.5	98.2	80	1	39.2	40.2
1	≥7	2.4	100	100	0	42.3	42.3
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
97	≥1	100	0	17.5	82.5	0	82.5
97	≥2	100	0	17.5	82.5	0	82.5
92	≥3	100	6.3	18.5	77.3	0	77.3
62	≥4	64.7	36.3	17.7	52.6	6.2	58.8
18	≥5	23.5	82.5	22.2	14.4	13.4	27.8
5	≥6	11.8	96.3	40	3.1	15.5	18.6
1	≥7	0	98.8	0	1	17.5	18.6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A11 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
624	≥3	91.4	19.8	57.7	36.5	4.7	41.2
474	≥4	73.1	43.5	60.8	25.7	14.7	40.4
308	*≥5*	*53*	*69.9*	*67.9*	*13.7*	*25.6*	*39.3*
179	≥6	32.2	84.2	70.9	7.2	36.9	44.1
89	≥7	16.2	92.4	71.9	3.5	45.6	49.1
31	≥8	6.1	97.9	77.4	1	51.2	52.1
3	≥9	0.5	99.7	66.7	0.1	54.2	54.4
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
624	≥3	91.1	16.2	36.2	55	3	58.1
474	≥4	73.4	38.5	38.4	40.4	9.1	49.5
308	*≥5*	*56.5*	*64.6*	*45.5*	*23.2*	*14.9*	*38.2*
179	≥6	35.9	81.1	49.7	12.4	22	34.4
89	≥7	17.7	90.5	49.4	6.2	28.2	34.4
31	≥8	5.6	96.4	45.2	2.4	32.4	34.7
3	≥9	0.8	99.8	66.7	0.1	34	34.2
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
624	≥3	94.4	15.4	18.9	70	1	71
474	≥4	80	37.5	21.1	51.7	3.5	55.2
308	*≥5*	*65.6*	*62.2*	*26.6*	*31.3*	*5.9*	*37.2*
179	≥6	40.8	78.6	28.5	17.7	10.2	27.9
89	≥7	22.4	89.8	31.5	8.4	13.4	21.9
31	≥8	7.2	96.3	29	3	16	19.1
3	≥9	1.6	99.8	66.7	0.1	17	17.2
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
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Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A11 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
192	≥3	98.7	7.1	79.7	19.8	1	20.8
172	≥4	91	26.2	82	15.7	7.1	22.8
108	*≥5*	*61.9*	*71.4*	*88.9*	*6.1*	*29.9*	*36*
49	≥6	27.7	85.7	87.8	3	56.9	59.9
9	≥7	5.2	97.6	88.9	0.5	74.6	75.1
1	≥8	0.6	100	100	0	78.2	78.2
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
192	≥3	99.1	4.7	57.8	41.1	0.5	41.6
172	≥4	93.8	21.2	61	34	3.6	37.6
108	*≥5*	*67*	*61.2*	*69.4*	*16.8*	*18.8*	*35.5*
49	≥6	32.1	84.7	73.5	6.6	38.6	45.2
9	≥7	6.3	97.6	77.8	1	53.3	54.3
1	≥8	0.9	100	100	0	56.3	56.3
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
192	≥3	100	3.4	26.6	71.6	0	71.6
172	≥4	94.1	15.1	27.9	62.9	1.5	64.5
108	≥5	70.6	50.7	33.3	36.5	7.6	44.2
49	≥6	37.3	79.5	38.8	15.2	16.2	31.5
9	≥7	5.9	95.9	33.3	3	24.4	27.4
1	≥8	2	100	100	0	25.4	25.4
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A11 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
610	≥1	100	0	72.5	27.5	0	27.5
609	≥2	100	0.6	72.6	27.4	0	27.4
571	≥3	97.7	17.3	75.7	22.8	1.6	24.4
470	***≥4***	***87.3***	***50***	***82.1***	***13.8***	***9.2***	***23***
317	*≥5*	*63.3*	*78*	*88.3*	*6.1*	*26.6*	*32.6*
166	≥6	34.4	91.7	91.6	2.3	47.5	49.8
64	≥7	13.6	97.6	93.8	0.7	62.6	63.3
16	≥8	3.4	99.4	93.8	0.2	70	70.2
4	≥9	0.9	100	100	0	71.8	71.8
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
610	≥1	100	0	55.1	44.9	0	44.9
609	≥2	100	0.4	55.2	44.8	0	44.8
571	≥3	98.2	12	57.8	39.5	1	40.5
470	≥4	91.4	40.5	65.3	26.7	4.8	31.5
317	***≥5***	***70.8***	***71.2***	***75.1***	***13***	***16.1***	***29***
166	≥6	41.4	90.1	83.7	4.4	32.3	36.7
64	≥7	17	97.4	89.1	1.1	45.7	46.9
16	≥8	4.5	99.6	93.8	0.2	52.6	52.8
4	≥9	1.2	100	100	0	54.4	54.4
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
610	≥1	100	0	33.6	66.4	0	66.4
609	≥2	100	0.2	33.7	66.2	0	66.2
571	≥3	100	9.6	35.9	60	0	60
470	≥4	95.1	32.1	41.5	45.1	1.6	46.7
317	*≥5*	*79*	*61.7*	*51.1*	*25.4*	*7*	*32.5*
166	***≥6***	***50.2***	***84.4***	***62***	***10.3***	***16.7***	***27***
64	≥7	22.9	95.8	73.4	2.8	25.9	28.7
16	≥8	5.9	99	75	0.7	31.6	32.3
4	≥9	2	100	100	0	33	33
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

APPENDIX 12

Results of the sensitivity analyses for FGI-10E among NPNL women, by study site

Table A12 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
301	≥2	100	0	13.6	86.4	0	86.4
291	≥3	100	3.8	14.1	83.1	0	83.1
262	≥4	100	15	15.6	73.4	0	73.4
180	≥5	92.7	45.4	21.1	47.2	1	48.2
86	***≥6***	***58.5***	***76.2***	***27.9***	***20.6***	***5.6***	***26.2***
24	≥7	19.5	93.8	33.3	5.3	11	16.3
6	≥8	7.3	98.8	50	1	12.6	13.6
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
301	≥2	100	0	6.3	93.7	0	93.7
291	≥3	100	3.5	6.5	90.4	0	90.4
262	≥4	100	13.8	7.3	80.7	0	80.7
180	≥5	100	42.9	10.6	53.5	0	53.5
86	***≥6***	***73.7***	***74.5***	***16.3***	***23.9***	***1.7***	***25.6***
24	≥7	21.1	92.9	16.7	6.6	5	11.6
6	≥8	10.5	98.6	33.3	1.3	5.6	7
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
301	≥2	100	0	3.7	96.3	0	96.3
291	≥3	100	3.4	3.8	93	0	93
262	≥4	100	13.4	4.2	83.4	0	83.4
180	≥5	100	41.7	6.1	56.1	0	56.1
86	***≥6***	***90.9***	***73.8***	***11.6***	***25.2***	***0.3***	***25.6***
24	≥7	36.4	93.1	16.7	6.6	2.3	9
6	≥8	18.2	98.6	33.3	1.3	3	4.3
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A12 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
201	≥2	100	0	19.9	80.1	0	80.1
195	≥3	100	3.7	20.5	77.1	0	77.1
159	≥4	90	23.6	22.6	61.2	2	63.2
99	≥5	67.5	55.3	27.3	35.8	6.5	42.3
41	≥6	32.5	82.6	31.7	13.9	13.4	27.4
11	≥7	7.5	95	27.3	4	18.4	22.4
2	≥8	2.5	99.4	50	0.5	19.4	19.9
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
201	≥2	100	0	2	98	0	98
195	≥3	100	3	2.1	95	0	95
159	≥4	100	21.3	2.5	77.1	0	77.1
99	≥5	100	51.8	4	47.3	0	47.3
41	≥6	25	79.7	2.4	19.9	1.5	21.4
11	≥7	0	94.4	0	5.5	2	7.5
2	≥8	0	99	0	1	2	3
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
201	≥2	-	0	0	100	0	100
195	≥3	-	3	0	97	0	97
159	≥4	-	20.9	0	79.1	0	79.1
99	≥5	-	50.7	0	49.3	0	49.3
41	≥6	-	79.6	0	20.4	0	20.4
11	≥7	-	94.5	0	5.5	0	5.5
2	≥8	-	99	0	1	0	1
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A12 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
130	≥3	100	0	22.3	77.7	0	77.7
127	≥4	100	3	22.8	75.4	0	75.4
110	≥5	100	19.8	26.4	62.3	0	62.3
81	≥6	89.7	45.5	32.1	42.3	2.3	44.6
36	≥7	44.8	77.2	36.1	17.7	12.3	30
7	≥8	6.9	95	28.6	3.8	20.8	24.6
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
130	≥3	100	0	12.3	87.7	0	87.7
127	≥4	100	2.6	12.6	85.4	0	85.4
110	≥5	100	17.5	14.5	72.3	0	72.3
81	≥6	93.8	42.1	18.5	50.8	0.8	51.5
36	≥7	43.8	74.6	19.4	22.3	6.9	29.2
7	≥8	12.5	95.6	28.6	3.8	10.8	14.6
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
130	≥3	100	0	3.1	96.9	0	96.9
127	≥4	100	2.4	3.1	94.6	0	94.6
110	≥5	100	15.9	3.6	81.5	0	81.5
81	≥6	100	38.9	4.9	59.2	0	59.2
36	≥7	25	72.2	2.8	26.9	2.3	29.2
7	≥8	0	94.4	0	5.4	3.1	8.5
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A12 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
134	≥2	100	0	43.3	56.7	0	56.7
127	≥3	96.6	6.6	44.1	53	1.5	54.5
97	≥4	84.5	36.8	50.5	35.8	6.7	42.5
48	≥5	46.6	72.4	56.3	15.7	23.1	38.8
15	≥6	17.2	93.4	66.7	3.7	35.8	39.6
3	≥7	5.2	100	100	0	41	41
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
134	≥2	100	0	30.6	69.4	0	69.4
127	≥3	95.1	5.4	30.7	65.7	1.5	67.2
97	≥4	85.4	33.3	36.1	46.3	4.5	50.7
48	≥5	48.8	69.9	41.7	20.9	15.7	36.6
15	≥6	17.1	91.4	46.7	6	25.4	31.3
3	≥7	7.3	100	100	0	28.4	28.4
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
134	≥2	100	0	17.9	82.1	0	82.1
127	≥3	100	6.4	18.9	76.9	0	76.9
97	≥4	87.5	30.9	21.6	56.7	2.2	59
48	*≥5*	*50*	*67.3*	*25*	*26.9*	*9*	*35.8*
15	≥6	16.7	90	26.7	8.2	14.9	23.1
3	≥7	8.3	99.1	66.7	0.7	16.4	17.2
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A12 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
102	≥3	100	0	41.2	58.8	0	58.8
100	≥4	100	3.3	42	56.9	0	56.9
90	≥5	95.2	16.7	44.4	49	2	51
56	*≥6*	*71.4*	*56.7*	*53.6*	*25.5*	*11.8*	*37.3*
21	≥7	33.3	88.3	66.7	6.9	27.5	34.3
1	≥8	2.4	100	100	0	40.2	40.2
1	≥9	2.4	100	100	0	40.2	40.2
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
102	≥3	100	0	20.6	79.4	0	79.4
100	≥4	100	2.5	21	77.5	0	77.5
90	≥5	95.2	13.6	22.2	68.6	1	69.6
56	≥6	76.2	50.6	28.6	39.2	4.9	44.1
21	≥7	38.1	84	38.1	12.7	12.7	25.5
1	≥8	0	98.8	0	1	20.6	21.6
1	≥9	0	98.8	0	1	20.6	21.6
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
102	≥3	100	0	8.8	91.2	0	91.2
100	≥4	100	2.2	9	89.2	0	89.2
90	≥5	100	12.9	10	79.4	0	79.4
56	≥6	88.9	48.4	14.3	47.1	1	48
21	≥7	22.2	79.6	9.5	18.6	6.9	25.5
1	≥8	0	98.9	0	1	8.8	9.8
1	≥9	0	98.9	0	1	8.8	9.8
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A12 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
97	≥1	100	0	60.8	39.2	0	39.2
97	≥2	100	0	60.8	39.2	0	39.2
93	≥3	100	10.5	63.4	35.1	0	35.1
67	≥4	79.7	47.4	70.1	20.6	12.4	33
30	≥5	40.7	84.2	80	6.2	36.1	42.3
5	≥6	8.5	100	100	0	55.7	55.7
3	≥7	5.1	100	100	0	57.7	57.7
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
97	≥1	100	0	43.3	56.7	0	56.7
97	≥2	100	0	43.3	56.7	0	56.7
93	≥3	100	7.3	45.2	52.6	0	52.6
67	≥4	78.6	38.2	49.3	35.1	9.3	44.3
30	≥5	40.5	76.4	56.7	13.4	25.8	39.2
5	≥6	9.5	98.2	80	1	39.2	40.2
3	≥7	4.8	98.2	66.7	1	41.2	42.3
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
97	≥1	100	0	17.5	82.5	0	82.5
97	≥2	100	0	17.5	82.5	0	82.5
93	≥3	100	5	18.3	78.4	0	78.4
67	≥4	76.5	32.5	19.4	55.7	4.1	59.8
30	≥5	29.4	68.8	16.7	25.8	12.4	38.1
5	≥6	11.8	96.3	40	3.1	15.5	18.6
3	≥7	5.9	97.5	33.3	2.1	16.5	18.6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A12 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
647	≥3	93.1	14.9	56.7	38.7	3.7	42.5
542	≥4	81	32.2	58.9	30.8	10.4	41.2
371	*≥5*	*60.7*	*59.9*	*64.4*	*18.3*	*21.4*	*39.7*
222	≥6	38.6	78.7	68.5	9.7	33.5	43.2
115	≥7	20.8	90	71.3	4.6	43.2	47.7
40	≥8	7.6	97	75	1.4	50.3	51.7
4	≥9	0.8	99.7	75	0.1	54.1	54.2
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
647	≥3	92.7	12.2	35.5	57.7	2.5	60.2
542	≥4	81	28.2	37.1	47.2	6.5	53.7
371	≥5	63.3	54.9	42.3	29.6	12.6	42.2
222	≥6	40.7	74.5	45.5	16.7	20.3	37.1
115	≥7	23.8	88.2	51.3	7.7	26.1	33.9
40	≥8	7.3	95.4	45	3	31.8	34.9
4	≥9	1.2	99.8	75	0.1	33.9	34
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
647	≥3	95.2	11.7	18.4	73	0.8	73.9
542	≥4	85.6	27.3	19.7	60.2	2.5	62.7
371	≥5	70.4	52.7	23.7	39.1	5.1	44.3
222	≥6	46.4	72.6	26.1	22.7	9.3	32
115	≥7	29.6	87	32.2	10.8	12.2	23
40	≥8	9.6	95.3	30	3.9	15.6	19.5
4	≥9	2.4	99.8	75	0.1	16.9	17
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A12 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
196	≥3	100	2.4	79.1	20.8	0	20.8
186	≥4	96.8	14.3	80.6	18.3	2.5	20.8
145	≥5	79.4	47.6	84.8	11.2	16.2	27.4
76	≥6	40.6	69	82.9	6.6	46.7	53.3
33	≥7	18.7	90.5	87.9	2	64	66
9	≥8	4.5	95.2	77.8	1	75.1	76.1
1	≥9	0.6	100	100	0	78.2	78.2
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
196	≥3	100	1.2	57.1	42.6	0	42.6
186	≥4	99.1	11.8	59.7	38.1	0.5	38.6
145	≥5	83	38.8	64.1	26.4	9.6	36
76	≥6	47.3	72.9	69.7	11.7	29.9	41.6
33	≥7	21.4	89.4	72.7	4.6	44.7	49.2
9	≥8	5.4	96.5	66.7	1.5	53.8	55.3
1	≥9	0.9	100	100	0	56.3	56.3
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
196	≥3	100	0.7	26	73.6	0	73.6
186	≥4	100	7.5	27.4	68.5	0	68.5
145	≥5	86.3	30.8	30.3	51.3	3.6	54.8
76	*≥6*	*51*	*65.8*	*34.2*	*25.4*	*12.7*	*38.1*
33	≥7	27.5	87	42.4	9.6	18.8	28.4
9	≥8	5.9	95.9	33.3	3	24.4	27.4
1	≥9	2	100	100	0	25.4	25.4
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A12 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
610	≥1	100	0	72.5	27.5	0	27.5
610	≥2	100	0	72.5	27.5	0	27.5
606	≥3	100	2.4	72.9	26.9	0	26.9
561	≥4	97.1	21.4	76.5	21.6	2.1	23.8
460	≥5	83.7	46.4	80.4	14.8	11.8	26.6
307	*≥6*	*58.1*	*70.2*	*83.7*	*8.2*	*30.3*	*38.5*
137	≥7	27.6	91.1	89.1	2.5	52.5	54.9
36	≥8	7.5	98.2	91.7	0.5	67	67.5
7	≥9	1.4	99.4	85.7	0.2	71.5	71.6
0	≥10	-	-	-	-	-	-
				MPA > 0.60			
610	≥1	100	0	55.1	44.9	0	44.9
610	≥2	100	0	55.1	44.9	0	44.9
606	≥3	100	1.5	55.4	44.3	0	44.3
561	≥4	98.2	15.7	58.8	37.9	1	38.9
460	≥5	87.8	39.8	64.1	27	6.7	33.8
307	*≥6*	*64.3*	*66.8*	*70.4*	*14.9*	*19.7*	*34.6*
137	≥7	32.1	89.4	78.8	4.8	37.4	42.1
36	≥8	9.8	98.9	91.7	0.5	49.7	50.2
7	≥9	1.8	99.6	85.7	0.2	54.1	54.3
0	≥10	-	-	-	-	-	-
				MPA > 0.70			
610	≥1	100	0	33.6	66.4	0	66.4
610	≥2	100	0	33.6	66.4	0	66.4
606	≥3	100	1	33.8	65.7	0	65.7
561	≥4	99.5	11.9	36.4	58.5	0.2	58.7
460	≥5	92.7	33.3	41.3	44.3	2.5	46.7
307	*≥6*	*73.7*	*61.5*	*49.2*	*25.6*	*8.9*	*34.4*
137	≥7	38.5	85.7	57.7	9.5	20.7	30.2
36	≥8	11.7	97	66.7	2	29.7	31.6
7	≥9	2	99.3	57.1	0.5	33	33.4
0	≥10	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

APPENDIX 13

Results of the sensitivity analyses for FGI-12R among NPNL women, by study site

Table A13 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
301	≥2	100	0	13.6	86.4	0	86.4
273	≥3	100	10.8	15	77.1	0	77.1
216	≥4	90.2	31.2	17.1	59.5	1.3	60.8
128	*≥5*	*78*	*63.1*	*25*	*31.9*	*3*	*34.9*
61	***≥6***	***51.2***	***84.6***	***34.4***	***13.3***	***6.6***	***19.9***
19	≥7	17.1	95.4	36.8	4	11.3	15.3
3	≥8	4.9	99.6	66.7	0.3	13	13.3
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
301	≥2	100	0	6.3	93.7	0	93.7
273	≥3	100	9.9	7	84.4	0	84.4
216	≥4	94.7	29.8	8.3	65.8	0.3	66.1
128	*≥5*	*89.5*	*60.6*	*13.3*	*36.9*	*0.7*	*37.5*
61	***≥6***	***57.9***	***82.3***	***18***	***16.6***	***2.7***	***19.3***
19	≥7	10.5	94	10.5	5.6	5.6	11.3
3	≥8	5.3	99.3	33.3	0.7	6	6.6
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
301	≥2	100	0	3.7	96.3	0	96.3
273	≥3	100	9.7	4	87	0	87
216	≥4	90.9	29	4.6	68.4	0.3	68.8
128	*≥5*	*90.9*	*59.3*	*7.8*	*39.2*	*0.3*	*39.5*
61	***≥6***	***63.6***	***81.4***	***11.5***	***17.9***	***1.3***	***19.3***
19	≥7	18.2	94.1	10.5	5.6	3	8.6
3	≥8	9.1	99.3	33.3	0.7	3.3	4
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
200	≥2	100	0.6	20	79.6	0	79.6
194	≥3	100	4.3	20.6	76.6	0	76.6
145	≥4	95	33.5	26.2	53.2	1	54.2
90	*≥5*	*67.5*	*60.9*	*30*	*31.3*	*6.5*	*37.8*
36	≥6	30	85.1	33.3	11.9	13.9	25.9
10	≥7	10	96.3	40	3	17.9	20.9
3	≥8	2.5	98.8	33.3	1	19.4	20.4
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
200	≥2	100	0.5	2	97.5	0	97.5
194	≥3	100	3.6	2.1	94.5	0	94.5
145	≥4	100	28.4	2.8	70.1	0	70.1
90	≥5	100	56.3	4.4	42.8	0	42.8
36	≥6	0	81.7	0	17.9	2	19.9
10	≥7	0	94.9	0	5	2	7
3	≥8	0	98.5	0	1.5	2	3.5
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
200	≥2	-	0.5	0	99.5	0	99.5
194	≥3	-	3.5	0	96.5	0	96.5
145	≥4	-	27.9	0	72.1	0	72.1
90	≥5	-	55.2	0	44.8	0	44.8
36	≥6	-	82.1	0	17.9	0	17.9
10	≥7	-	95	0	5	0	5
3	≥8	-	98.5	0	1.5	0	1.5
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
124	≥3	100	5.9	23.4	73.1	0	73.1
103	≥4	96.6	25.7	27.2	57.7	0.8	58.5
74	*≥5*	*89.7*	*52.5*	*35.1*	*36.9*	*2.3*	*39.2*
41	***≥6***	***58.6***	***76.2***	***41.5***	***18.5***	***9.2***	***27.7***
12	≥7	20.7	94.1	50	4.6	17.7	22.3
3	≥8	3.4	98	33.3	1.5	21.5	23.1
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
124	≥3	100	5.3	12.9	83.1	0	83.1
103	≥4	100	23.7	15.5	66.9	0	66.9
74	≥5	87.5	47.4	18.9	46.2	1.5	47.7
41	*≥6*	*50*	*71.1*	*19.5*	*25.4*	*6.2*	*31.5*
12	≥7	25	93	33.3	6.2	9.2	15.4
3	≥8	0	97.4	0	2.3	12.3	14.6
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
124	≥3	100	4.8	3.2	92.3	0	92.3
103	≥4	100	21.4	3.9	76.2	0	76.2
74	≥5	100	44.4	5.4	53.8	0	53.8
41	≥6	50	69	4.9	30	1.5	31.5
12	≥7	0	90.5	0	9.2	3.1	12.3
3	≥8	0	97.6	0	2.3	3.1	5.4
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
127	≥2	100	9.2	45.7	51.5	0	51.5
91	***≥3***	***91.4***	***50***	***58.2***	***28.4***	***3.7***	***32.1***
44	***≥4***	***53.4***	***82.9***	***70.5***	***9.7***	***20.1***	***29.9***
15	≥5	19	94.7	73.3	3	35.1	38.1
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
127	≥2	100	7.5	32.3	64.2	0	64.2
91	≥3	95.1	44.1	42.9	38.8	1.5	40.3
44	***≥4***	***63.4***	***80.6***	***59.1***	***13.4***	***11.2***	***24.6***
15	≥5	19.5	92.5	53.3	5.2	24.6	29.9
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
127	≥2	100	6.4	18.9	76.9	0	76.9
91	≥3	100	39.1	26.4	50	0	50
44	***≥4***	***75***	***76.4***	***40.9***	***19.4***	***4.5***	***23.9***
15	≥5	25	91.8	40	6.7	13.4	20.1
0	≥6	-	-	-	-	-	-
0	≥7	-	-	-	-	-	-
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
100	≥3	100	3.3	42	56.9	0	56.9
89	≥4	100	21.7	47.2	46.1	0	46.1
69	≥5	83.3	43.3	50.7	33.3	6.9	40.2
36	***≥6***	***57.1***	***80***	***66.7***	***11.8***	***17.6***	***29.4***
15	≥7	26.2	93.3	73.3	3.9	30.4	34.3
7	≥8	9.5	95	57.1	2.9	37.3	40.2
2	≥9	4.8	100	100	0	39.2	39.2
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
100	≥3	100	2.5	21	77.5	0	77.5
89	≥4	100	16	23.6	66.7	0	66.7
69	≥5	81	35.8	24.6	51	3.9	54.9
36	*≥6*	*57.1*	*70.4*	*33.3*	*23.5*	*8.8*	*32.4*
15	≥7	28.6	88.9	40	8.8	14.7	23.5
7	≥8	4.8	92.6	14.3	5.9	19.6	25.5
2	≥9	0	97.5	0	2	20.6	22.5
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
100	≥3	100	2.2	9	89.2	0	89.2
89	≥4	100	14	10.1	78.4	0	78.4
69	≥5	100	35.5	13	58.8	0	58.8
36	≥6	66.7	67.7	16.7	29.4	2.9	32.4
15	≥7	33.3	87.1	20	11.8	5.9	17.6
7	≥8	11.1	93.5	14.3	5.9	7.8	13.7
2	≥9	0	97.8	0	2	8.8	10.8
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
97	≥1	100	0	60.8	39.2	0	39.2
97	≥2	100	0	60.8	39.2	0	39.2
93	≥3	100	10.5	63.4	35.1	0	35.1
71	≥4	81.4	39.5	67.6	23.7	11.3	35.1
37	*≥5*	*52.5*	*84.2*	*83.8*	*6.2*	*28.9*	*35.1*
10	≥6	16.9	100	100	0	50.5	50.5
3	≥7	5.1	100	100	0	57.7	57.7
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
97	≥1	100	0	43.3	56.7	0	56.7
97	≥2	100	0	43.3	56.7	0	56.7
93	≥3	100	7.3	45.2	52.6	0	52.6
71	≥4	83.3	34.5	49.3	37.1	7.2	44.3
37	*≥5*	*57.1*	*76.4*	*64.9*	*13.4*	*18.6*	*32*
10	≥6	16.7	94.5	70	3.1	36.1	39.2
3	≥7	7.1	100	100	0	40.2	40.2
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
97	≥1	100	0	17.5	82.5	0	82.5
97	≥2	100	0	17.5	82.5	0	82.5
93	≥3	100	5	18.3	78.4	0	78.4
71	≥4	82.4	28.8	19.7	58.8	3.1	61.9
37	*≥5*	*52.9*	*65*	*24.3*	*28.9*	*8.2*	*37.1*
10	≥6	17.6	91.3	30	7.2	14.4	21.6
3	≥7	5.9	97.5	33.3	2.1	16.5	18.6
0	≥8	-	-	-	-	-	-
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
693	≥3	98	6.7	55.7	42.5	1.1	43.6
578	≥4	88.6	30.4	60.4	31.7	6.2	37.9
408	*≥5*	*66.2*	*55.3*	*64*	*20.3*	*18.4*	*38.7*
282	≥6	49	72.9	68.4	12.3	27.8	40.1
184	≥7	33	83.6	70.7	7.5	36.5	44
95	≥8	18	92.7	74.7	3.3	44.7	48
43	≥9	8.6	97.3	79.1	1.2	49.8	51
19	≥10	3.6	98.5	73.7	0.7	52.6	53.3
2	≥11	0.3	99.7	50	0.1	54.4	54.5
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
693	≥3	98	5.3	35.1	62.2	0.7	62.9
578	≥4	89.5	25.1	38.4	49.2	3.6	52.8
408	≥5	67.7	49.5	41.2	33.2	11.1	44.3
282	*≥6*	*52.8*	*68.2*	*46.5*	*20.9*	*16.2*	*37.1*
184	≥7	37.1	80.6	50	12.7	21.6	34.3
95	≥8	20.6	90.7	53.7	6.1	27.2	33.3
43	≥9	8.9	95.6	51.2	2.9	31.3	34.2
19	≥10	3.2	97.7	42.1	1.5	33.2	34.7
2	≥11	0.4	99.8	50	0.1	34.2	34.3
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
693	≥3	98.4	4.7	17.7	78.8	0.3	79.1
578	≥4	92.8	22.7	20.1	63.9	1.2	65.1
408	≥5	76.8	47.8	23.5	43.2	4	47.2
282	*≥6*	*62.4*	*65.9*	*27.7*	*28.2*	*6.5*	*34.7*
184	≥7	44	78.4	29.9	17.8	9.7	27.5
95	≥8	26.4	89.6	34.7	8.6	12.7	21.3
43	≥9	11.2	95.2	32.6	4	15.4	19.4
19	≥10	3.2	97.5	21.1	2.1	16.7	18.8
2	≥11	0.8	99.8	50	0.1	17.2	17.3
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
195	≥3	99.4	2.4	79	20.8	0.5	21.3
186	≥4	96.1	11.9	80.1	18.8	3	21.8
152	≥5	81.3	38.1	82.9	13.2	14.7	27.9
98	≥6	55.5	71.4	87.8	6.1	35	41.1
42	≥7	24.5	90.5	90.5	2	59.4	61.4
6	≥8	3.9	100	100	0	75.6	75.6
1	≥9	0.6	100	100	0	78.2	78.2
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
195	≥3	99.1	1.2	56.9	42.6	0.5	43.1
186	≥4	97.3	9.4	58.6	39.1	1.5	40.6
152	≥5	83.9	31.8	61.8	29.4	9.1	38.6
98	*≥6*	*61.6*	*65.9*	*70.4*	*14.7*	*21.8*	*36.5*
42	≥7	27.7	87.1	73.8	5.6	41.1	46.7
6	≥8	5.4	100	100	0	53.8	53.8
1	≥9	0.9	100	100	0	56.3	56.3
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
195	≥3	100	1.4	26.2	73.1	0	73.1
186	≥4	98	6.8	26.9	69	0.5	69.5
152	≥5	86.3	26	28.9	54.8	3.6	58.4
98	≥6	64.7	55.5	33.7	33	9.1	42.1
42	≥7	31.4	82.2	38.1	13.2	17.8	31
6	≥8	3.9	97.3	33.3	2	24.9	26.9
1	≥9	2	100	100	0	25.4	25.4
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A13 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
610	≥1	100	0	72.5	27.5	0	27.5
609	≥2	100	0.6	72.6	27.4	0	27.4
587	≥3	98.9	10.7	74.4	24.6	0.8	25.4
522	≥4	94.3	37.5	79.9	17.2	4.1	21.3
408	***≥5***	***78.5***	***63.7***	***85***	***10***	***15.6***	***25.6***
258	*≥6*	*52.5*	*84.5*	*89.9*	*4.3*	*34.4*	*38.7*
123	≥7	26	95.2	93.5	1.3	53.6	54.9
46	≥8	9.3	97	89.1	0.8	65.7	66.6
14	≥9	2.9	99.4	92.9	0.2	70.3	70.5
2	≥10	0.5	100	100	0	72.1	72.1
1	≥11	0.2	100	100	0	72.3	72.3
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
610	≥1	100	0	55.1	44.9	0	44.9
609	≥2	100	0.4	55.2	44.8	0	44.8
587	≥3	98.8	6.9	56.6	41.8	0.7	42.5
522	≥4	96.4	27.7	62.1	32.5	2	34.4
408	***≥5***	***84.5***	***54.7***	***69.6***	***20.3***	***8.5***	***28.9***
258	*≥6*	*60.1*	*79.6*	*78.3*	*9.2*	*22*	*31.1*
123	≥7	31.8	94.2	87	2.6	37.5	40.2
46	≥8	11.9	97.8	87	1	48.5	49.5
14	≥9	3.9	99.6	92.9	0.2	53	53.1
2	≥10	0.6	100	100	0	54.8	54.8
1	≥11	0.3	100	100	0	54.9	54.9
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
610	≥1	100	0	33.6	66.4	0	66.4
609	≥2	100	0.2	33.7	66.2	0	66.2
587	≥3	100	5.7	34.9	62.6	0	62.6
522	≥4	98.5	21	38.7	52.5	0.5	53
408	≥5	91.2	45.4	45.8	36.2	3	39.2
258	***≥6***	***70.2***	***71.9***	***55.8***	***18.7***	***10***	***28.7***
123	≥7	41.5	90.6	69.1	6.2	19.7	25.9
46	≥8	16.6	97	73.9	2	28	30
14	≥9	4.9	99	71.4	0.7	32	32.6
2	≥10	1	100	100	0	33.3	33.3
1	≥11	0.5	100	100	0	33.4	33.4
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

APPENDIX 14

Results of the sensitivity analyses for FGI-12 among NPNL women, by study site

Table A14 - 1. Bangladesh, rural (Ban1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
301	≥1	100	0	13.6	86.4	0	86.4
301	≥2	100	0	13.6	86.4	0	86.4
292	≥3	100	3.5	14	83.4	0	83.4
276	≥4	100	9.6	14.9	78.1	0	78.1
222	≥5	95.1	29.6	17.6	60.8	0.7	61.5
132	*≥6*	*70.7*	*60.4*	*22*	*34.2*	*4*	*38.2*
64	≥7	46.3	82.7	29.7	15	7.3	22.3
18	≥8	17.1	95.8	38.9	3.7	11.3	15
2	≥9	2.4	99.6	50	0.3	13.3	13.6
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
301	≥1	100	0	6.3	93.7	0	93.7
301	≥2	100	0	6.3	93.7	0	93.7
292	≥3	100	3.2	6.5	90.7	0	90.7
276	≥4	100	8.9	6.9	85.4	0	85.4
222	≥5	100	28	8.6	67.4	0	67.4
132	*≥6*	*84.2*	*58.9*	*12.1*	*38.5*	*1*	*39.5*
64	≥7	47.4	80.5	14.1	18.3	3.3	21.6
18	≥8	21.1	95	22.2	4.7	5	9.6
2	≥9	0	99.3	0	0.7	6.3	7
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
301	≥1	100	0	3.7	96.3	0	96.3
301	≥2	100	0	3.7	96.3	0	96.3
292	≥3	100	3.1	3.8	93.4	0	93.4
276	≥4	100	8.6	4	88	0	88
222	≥5	100	27.2	5	70.1	0	70.1
132	≥6	90.9	57.9	7.6	40.5	0.3	40.9
64	***≥7***	***72.7***	***80.7***	***12.5***	***18.6***	***1***	***19.6***
18	≥8	36.4	95.2	22.2	4.7	2.3	7
2	≥9	0	99.3	0	0.7	3.7	4.3
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A14 - 2. Bangladesh, rural (Ban2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
201	≥1	100	0	19.9	80.1	0	80.1
201	≥2	100	0	19.9	80.1	0	80.1
201	≥3	100	0	19.9	80.1	0	80.1
191	≥4	100	6.2	20.9	75.1	0	75.1
143	≥5	85	32.3	23.8	54.2	3	57.2
89	≥6	60	59.6	27	32.3	8	40.3
37	≥7	27.5	83.9	29.7	12.9	14.4	27.4
15	≥8	10	93.2	26.7	5.5	17.9	23.4
4	≥9	2.5	98.1	25	1.5	19.4	20.9
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
201	≥1	100	0	2	98	0	98
201	≥2	100	0	2	98	0	98
201	≥3	100	0	2	98	0	98
191	≥4	100	5.1	2.1	93	0	93
143	≥5	100	29.4	2.8	69.2	0	69.2
89	≥6	75	56.3	3.4	42.8	0.5	43.3
37	≥7	25	81.7	2.7	17.9	1.5	19.4
15	≥8	0	92.4	0	7.5	2	9.5
4	≥9	0	98	0	2	2	4
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
201	≥1	-	0	0	100	0	100
201	≥2	-	0	0	100	0	100
201	≥3	-	0	0	100	0	100
191	≥4	-	5	0	95	0	95
143	≥5	-	28.9	0	71.1	0	71.1
89	≥6	-	55.7	0	44.3	0	44.3
37	≥7	-	81.6	0	18.4	0	18.4
15	≥8	-	92.5	0	7.5	0	7.5
4	≥9	-	98	0	2	0	2
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A14 - 3. Burkina Faso, urban (BF1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
130	≥1	100	0	22.3	77.7	0	77.7
130	≥2	100	0	22.3	77.7	0	77.7
130	≥3	100	0	22.3	77.7	0	77.7
129	≥4	100	1	22.5	76.9	0	76.9
116	≥5	100	13.9	25	66.9	0	66.9
99	≥6	96.6	29.7	28.3	54.6	0.8	55.4
64	*≥7*	*79.3*	*59.4*	*35.9*	*31.5*	*4.6*	*36.2*
31	≥8	37.9	80.2	35.5	15.4	13.8	29.2
7	≥9	6.9	95	28.6	3.8	20.8	24.6
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
130	≥1	100	0	12.3	87.7	0	87.7
130	≥2	100	0	12.3	87.7	0	87.7
130	≥3	100	0	12.3	87.7	0	87.7
129	≥4	100	0.9	12.4	86.9	0	86.9
116	≥5	100	12.3	13.8	76.9	0	76.9
99	≥6	93.8	26.3	15.2	64.6	0.8	65.4
64	≥7	81.3	55.3	20.3	39.2	2.3	41.5
31	≥8	31.3	77.2	16.1	20	8.5	28.5
7	≥9	6.3	94.7	14.3	4.6	11.5	16.2
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
130	≥1	100	0	3.1	96.9	0	96.9
130	≥2	100	0	3.1	96.9	0	96.9
130	≥3	100	0	3.1	96.9	0	96.9
129	≥4	100	0.8	3.1	96.2	0	96.2
116	≥5	100	11.1	3.4	86.2	0	86.2
99	≥6	100	24.6	4	73.1	0	73.1
64	≥7	75	51.6	4.7	46.9	0.8	47.7
31	≥8	25	76.2	3.2	23.1	2.3	25.4
7	≥9	0	94.4	0	5.4	3.1	8.5
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

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Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A14 - 4. Burkina Faso, rural (BF2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
134	≥1	100	0	43.3	56.7	0	56.7
134	≥2	100	0	43.3	56.7	0	56.7
127	≥3	96.6	6.6	44.1	53	1.5	54.5
97	≥4	84.5	36.8	50.5	35.8	6.7	42.5
53	*≥5*	*51.7*	*69.7*	*56.6*	*17.2*	*20.9*	*38.1*
20	≥6	22.4	90.8	65	5.2	33.6	38.8
5	≥7	6.9	98.7	80	0.7	40.3	41
1	≥8	0	98.7	0	0.7	43.3	44
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
134	≥1	100	0	30.6	69.4	0	69.4
134	≥2	100	0	30.6	69.4	0	69.4
127	≥3	95.1	5.4	30.7	65.7	1.5	67.2
97	≥4	85.4	33.3	36.1	46.3	4.5	50.7
53	*≥5*	*53.7*	*66.7*	*41.5*	*23.1*	*14.2*	*37.3*
20	≥6	19.5	87.1	40	9	24.6	33.6
5	≥7	7.3	97.8	60	1.5	28.4	29.9
1	≥8	0	98.9	0	0.7	30.6	31.3
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
134	≥1	100	0	17.9	82.1	0	82.1
134	≥2	100	0	17.9	82.1	0	82.1
127	≥3	100	6.4	18.9	76.9	0	76.9
97	≥4	87.5	30.9	21.6	56.7	2.2	59
53	*≥5*	*54.2*	*63.6*	*24.5*	*29.9*	*8.2*	*38.1*
20	≥6	20.8	86.4	25	11.2	14.2	25.4
5	≥7	8.3	97.3	40	2.2	16.4	18.7
1	≥8	0	99.1	0	0.7	17.9	18.7
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A14 - 5. Mali, urban (Mali)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
102	≥1	100	0	41.2	58.8	0	58.8
102	≥2	100	0	41.2	58.8	0	58.8
102	≥3	100	0	41.2	58.8	0	58.8
101	≥4	100	1.7	41.6	57.8	0	57.8
93	≥5	95.2	11.7	43	52	2	53.9
75	≥6	85.7	35	48	38.2	5.9	44.1
46	***≥7***	***69***	***71.7***	***63***	***16.7***	***12.7***	***29.4***
22	≥8	35.7	88.3	68.2	6.9	26.5	33.3
5	≥9	9.5	98.3	80	1	37.3	38.2
1	≥10	2.4	100	100	0	40.2	40.2
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
102	≥1	100	0	20.6	79.4	0	79.4
102	≥2	100	0	20.6	79.4	0	79.4
102	≥3	100	0	20.6	79.4	0	79.4
101	≥4	100	1.2	20.8	78.4	0	78.4
93	≥5	95.2	9.9	21.5	71.6	1	72.5
75	≥6	85.7	29.6	24	55.9	2.9	58.8
46	*≥7*	*71.4*	*61.7*	*32.6*	*30.4*	*5.9*	*36.3*
22	≥8	33.3	81.5	31.8	14.7	13.7	28.4
5	≥9	4.8	95.1	20	3.9	19.6	23.5
1	≥10	0	98.8	0	1	20.6	21.6
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
102	≥1	100	0	8.8	91.2	0	91.2
102	≥2	100	0	8.8	91.2	0	91.2
102	≥3	100	0	8.8	91.2	0	91.2
101	≥4	100	1.1	8.9	90.2	0	90.2
93	≥5	100	9.7	9.7	82.4	0	82.4
75	≥6	88.9	28	10.7	65.7	1	66.7
46	≥7	77.8	58.1	15.2	38.2	2	40.2
22	≥8	22.2	78.5	9.1	19.6	6.9	26.5
5	≥9	11.1	95.7	20	3.9	7.8	11.8
1	≥10	0	98.9	0	1	8.8	9.8
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A14 - 6. Mozambique, rural (Moz)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
97	≥1	100	0	60.8	39.2	0	39.2
97	≥2	100	0	60.8	39.2	0	39.2
94	≥3	100	7.9	62.8	36.1	0	36.1
74	≥4	84.7	36.8	67.6	24.7	9.3	34
44	*≥5*	*61*	*78.9*	*81.8*	*8.2*	*23.7*	*32*
17	≥6	22	89.5	76.5	4.1	47.4	51.5
6	≥7	10.2	100	100	0	54.6	54.6
1	≥8	1.7	100	100	0	59.8	59.8
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
97	≥1	100	0	43.3	56.7	0	56.7
97	≥2	100	0	43.3	56.7	0	56.7
94	≥3	100	5.5	44.7	53.6	0	53.6
74	≥4	83.3	29.1	47.3	40.2	7.2	47.4
44	*≥5*	*64.3*	*69.1*	*61.4*	*17.5*	*15.5*	*33*
17	≥6	19	83.6	47.1	9.3	35.1	44.3
6	≥7	9.5	96.4	66.7	2.1	39.2	41.2
1	≥8	0	98.2	0	1	43.3	44.3
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
97	≥1	100	0	17.5	82.5	0	82.5
97	≥2	100	0	17.5	82.5	0	82.5
94	≥3	100	3.8	18.1	79.4	0	79.4
74	≥4	82.4	25	18.9	61.9	3.1	64.9
44	*≥5*	*70.6*	*60*	*27.3*	*33*	*5.2*	*38.1*
17	≥6	17.6	82.5	17.6	14.4	14.4	28.9
6	≥7	11.8	95	33.3	4.1	15.5	19.6
1	≥8	0	98.8	0	1	17.5	18.6
0	≥9	-	-	-	-	-	-
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

Bold font indicates rate of misclassification ≤ 30%;
Italic font indicates ≥ 10 women reaching the MPA level;
Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no “best” cutoff was selected.

Table A14 - 7. Philippines, peri-urban (Phi)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
723	≥1	100	0	54.5	45.5	0	45.5
723	≥2	100	0	54.5	45.5	0	45.5
702	≥3	98.2	4.3	55.1	43.6	1	44.5
636	≥4	92.9	17.9	57.5	37.3	3.9	41.2
499	≥5	77.4	41	61.1	26.8	12.3	39.1
356	≥6	57.9	61.1	64	17.7	23	40.7
233	≥7	39.8	76.9	67.4	10.5	32.8	43.3
128	≥8	24.4	90.3	75	4.4	41.2	45.6
66	≥9	12.7	95.1	75.8	2.2	47.6	49.8
24	≥10	4.8	98.5	79.2	0.7	51.9	52.6
4	≥11	0.8	99.7	75	0.1	54.1	54.2
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
723	≥1	100	0	34.3	65.7	0	65.7
723	≥2	100	0	34.3	65.7	0	65.7
702	≥3	98.4	3.6	34.8	63.3	0.6	63.9
636	≥4	94	15.2	36.6	55.7	2.1	57.8
499	≥5	77.8	35.6	38.7	42.3	7.6	49.9
356	≥6	60.5	56.6	42.1	28.5	13.6	42
233	≥7	44	73.9	46.8	17.2	19.2	36.4
128	≥8	27	87.2	52.3	8.4	25	33.5
66	≥9	13.7	93.3	51.5	4.4	29.6	34
24	≥10	4.8	97.5	50	1.7	32.6	34.3
4	≥11	1.2	99.8	75	0.1	33.9	34
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
723	≥1	100	0	17.3	82.7	0	82.7
723	≥2	100	0	17.3	82.7	0	82.7
702	≥3	98.4	3.2	17.5	80.1	0.3	80.4
636	≥4	97.6	14	19.2	71.1	0.4	71.5
499	≥5	83.2	33.9	20.8	54.6	2.9	57.5
356	≥6	67.2	54.5	23.6	37.6	5.7	43.3
233	*≥7*	*52.8*	*72.1*	*28.3*	*23.1*	*8.2*	*31.3*
128	≥8	34.4	85.8	33.6	11.8	11.3	23.1
66	≥9	16	92.3	30.3	6.4	14.5	20.9
24	≥10	5.6	97.2	29.2	2.4	16.3	18.7
4	≥11	2.4	99.8	75	0.1	16.9	17
0	≥12	-	-	-	-	-	-

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Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
When either sensitivity or specificity was < 50% or rate of misclassification was above 40%, no "best" cutoff was selected.

Table A14 - 8. Uganda, rural (Ug1)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
				MPA > 0.50			
197	≥1	100	0	78.7	21.3	0	21.3
197	≥2	100	0	78.7	21.3	0	21.3
197	≥3	100	0	78.7	21.3	0	21.3
192	≥4	98.7	7.1	79.7	19.8	1	20.8
173	≥5	91	23.8	81.5	16.2	7.1	23.4
126	*≥6*	*68.4*	*52.4*	*84.1*	*10.2*	*24.9*	*35*
74	≥7	40	71.4	83.8	6.1	47.2	53.3
29	≥8	16.8	92.9	89.7	1.5	65.5	67
7	≥9	3.9	97.6	85.7	0.5	75.6	76.1
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.60			
197	≥1	100	0	56.9	43.1	0	43.1
197	≥2	100	0	56.9	43.1	0	43.1
197	≥3	100	0	56.9	43.1	0	43.1
192	≥4	99.1	4.7	57.8	41.1	0.5	41.6
173	≥5	93.8	20	60.7	34.5	3.6	38.1
126	≥6	73.2	48.2	65.1	22.3	15.2	37.6
74	≥7	45.5	72.9	68.9	11.7	31	42.6
29	≥8	19.6	91.8	75.9	3.6	45.7	49.2
7	≥9	5.4	98.8	85.7	0.5	53.8	54.3
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-
				MPA > 0.70			
197	≥1	100	0	25.9	74.1	0	74.1
197	≥2	100	0	25.9	74.1	0	74.1
197	≥3	100	0	25.9	74.1	0	74.1
192	≥4	100	3.4	26.6	71.6	0	71.6
173	≥5	96.1	15.1	28.3	62.9	1	64
126	≥6	78.4	41.1	31.7	43.7	5.6	49.2
74	≥7	47.1	65.8	32.4	25.4	13.7	39.1
29	≥8	25.5	89	44.8	8.1	19.3	27.4
7	≥9	5.9	97.3	42.9	2	24.4	26.4
0	≥10	-	-	-	-	-	-
0	≥11	-	-	-	-	-	-
0	≥12	-	-	-	-	-	-

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Green highlighting indicates both sensitivity and specificity ≥ 60%;
Orange highlighting indicates specificity ≥ 60% and sensitivity < 60% but still ≥ 50%;
Yellow highlighting indicates sensitivity ≥ 60% and specificity < 60% but still ≥ 50%;
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Table A14 - 9. Uganda, urban and rural (Ug2)

N	Food group cutoffs	Sensitivity	Specificity	Positive predictive value	Proportion of false positives	Proportion of false negatives	Total proportion of misclassified
MPA > 0.50							
610	≥1	100	0	72.5	27.5	0	27.5
610	≥2	100	0	72.5	27.5	0	27.5
606	≥3	100	2.4	72.9	26.9	0	26.9
582	≥4	98.6	13.1	74.9	23.9	1	24.9
505	≥5	91	38.7	79.6	16.9	6.6	23.4
410	***≥6***	***76.7***	***57.7***	***82.7***	***11.6***	***16.9***	***28.5***
248	≥7	48	78.6	85.5	5.9	37.7	43.6
98	≥8	20.1	94.6	90.8	1.5	57.9	59.3
31	≥9	5.9	97	83.9	0.8	68.2	69
5	≥10	0.7	98.8	60	0.3	72	72.3
1	≥11	0.2	100	100	0	72.3	72.3
0	≥12	-	-	-	-	-	-
MPA > 0.60							
610	≥1	100	0	55.1	44.9	0	44.9
610	≥2	100	0	55.1	44.9	0	44.9
606	≥3	100	1.5	55.4	44.3	0	44.3
582	≥4	99.1	9.1	57.2	40.8	0.5	41.3
505	≥5	92.9	29.6	61.8	31.6	3.9	35.6
410	*≥6*	*82.7*	*51.8*	*67.8*	*21.6*	*9.5*	*31.1*
248	*≥7*	*54.2*	*75.9*	*73.4*	*10.8*	*25.2*	*36.1*
98	≥8	24.1	93.8	82.7	2.8	41.8	44.6
31	≥9	7.7	98.2	83.9	0.8	50.8	51.6
5	≥10	0.9	99.3	60	0.3	54.6	54.9
1	≥11	0.3	100	100	0	54.9	54.9
0	≥12	-	-	-	-	-	-
MPA > 0.70							
610	≥1	100	0	33.6	66.4	0	66.4
610	≥2	100	0	33.6	66.4	0	66.4
606	≥3	100	1	33.8	65.7	0	65.7
582	≥4	100	6.9	35.2	61.8	0	61.8
505	≥5	96.1	24	39	50.5	1.3	51.8
410	≥6	89.3	44	44.6	37.2	3.6	40.8
248	*≥7*	*64.9*	*71.6*	*53.6*	*18.9*	*11.8*	*30.7*
98	≥8	30.2	91.1	63.3	5.9	23.4	29.3
31	≥9	9.3	97	61.3	2	30.5	32.5
5	≥10	1	99.3	40	0.5	33.3	33.8
1	≥11	0.5	100	100	0	33.4	33.4
0	≥12	-	-	-	-	-	-

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Nutrition Division
Economic and Social Development Department
Food and Agriculture Organization of the United Nations
Via delle Terme di Caracalla
00153 Rome, Italy
www.fao.org/nutrition/assessment/

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