The Household Food Insecurity Access Scale and an Index-Member Dietary Diversity Score Contribute Valid and Complementary Information on Household Food Insecurity in an Urban West-African Setting

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Abstract
The number of urban poor is increasing quickly in West Africa, yet food security early warning systems still do not include urban areas. One reason is the lack of appropriate and internationally agreed-upon indicators to measure urban household food insecurity. Our objective was to assess the performance of the household food insecurity access scale (HFIAS) and an index-member’s dietary diversity score (IDDS) to approximate the adequacy of urban households’ diets. A survey was performed on a random cluster sample of 1056 households in Ouagadougou, Burkina Faso. Data on HFIAS and IDDS and 2 nonconsecutive household quantitative 24-h recalls were collected twice, in June-July and in November-December 2007. Diet adequacy was assessed through the household’s mean adequacy ratio (MAR) using energy and 11 micronutrients. Structural equation modeling was used to quantify the association of each candidate indicator with the MAR and receiver-operating characteristic (ROC) analyses were performed to assess their targeting performance in predicting low or high MAR. HFIAS was negatively associated with the MAR \( \beta = -7.95 \times 10^{-3} \pm 1.45 \times 10^{-3}; P < 0.001 \), whereas IDDS was positively associated with it \( \beta = 5.19 \times 10^{-2} \pm 1.27 \times 10^{-2}; P < 0.001 \). Areas under the ROC curves ranged from 0.585 to 0.661 for HFIAS and from 0.536 to 0.629 for IDDS. In conclusion, HFIAS and IDDS performed well in approximating adequacy of urban households’ diets. They are informative indicators about urban food insecurity, promising for evaluation and monitoring but not for household targeting given their insufficient predictive power. J. Nutr. 140: 2233–2240, 2010.

Introduction
Historically, because food security was envisioned at the regional and national level and was considered synonymous with national food self-sufficiency, it was principally measured at the macro level by assessing national food production and supply (1). However, aggregated means often mask major disparities at the micro level, and to help policy planning and effective allocation of resources, food security must also be considered at the household or individual level. In addition, not only food availability but also access to food has to be taken into account (2) as well as the subjective perception of food security. It is now well acknowledged that food security is a composite concept supported by 3 pillars: availability, access, and utilization of foods (3), which should result in food sufficient in quantity and quality. The temporal aspect constitutes a 4th, crosscutting dimension: a household is food secure when it has reliable access to food.

Associations between food insecurity and adverse physical or mental health effects, including underweight, obesity, poor growth, micronutrient inadequacy, anxiety, and depression, have been evidenced among adults or children in developed and/or developing settings (4–7). These impacts of food insecurity result from both nutritional and nonnutritional pathways. Because information drives action, identifying food-insecure households and being able to measure changes in food insecurity over time at a disaggregated level is important for evaluation,
targeting of interventions, and monitoring (8). However, because of the many facets of the concept, today there is no universal gold standard for measuring food insecurity, particularly food access, at the household or individual level in developing countries (9,10). Various indicators have been used to measure different facets, determinants, or outcomes of food (in)security (10,11), e.g. simple derived measures such as assets or nutritional status (12,13); indicators based on food availability, food expenditure, or food consumption; dietary diversity scores at the household level (14–16); food insecurity experience-based indicators using coping strategies and behaviors (17,18); and household food insecurity scales on the model of the Radimer/Cornell scale (19–23).

Among these indicators, 2 are promising tools to provide important information about household food security with a view to driving action: the household food insecurity access scale (HFIAS)7 (23), which formally measures several dimensions of household food insecurity, and the dietary diversity score of an index-member (IDDS) (24), which complements this measure by the assessment of household dietary adequacy, a central notion in the definition of food security. For both indicators, data collection methods are neither time nor resource consuming and require only basic technical skills to derive operational indicators. In particular, these indicators are promising for the assessment of household food security in urban areas. In West Africa, cities are not yet included in existing food security early warning systems, although poor urban households are increasing in number (25) and are highly vulnerable to food insecurity, as highlighted by the recent food, fuel, and financial crises (26).

As household food insecurity and household dietary adequacy indicators, both HFIAS and IDDS still need to be externally validated, even if this term is ambiguous, because there are no agreed-upon gold standard indicators. Most often, the benchmark indicators used to externally validate household food security indicators in developing countries have been based on food or energy expenditure, availability, or consumption (17,27,28). The objective of our study was to assess the performance of the 2 indicators to approximate the adequacy of households’ diets in a West African urban setting.

Methods
Setting, sampling, and design. The study took place in Ouagadougou, the capital of Burkina Faso. Our survey unit was the household, which was defined as a group of persons sharing housing and meals, managing a common budget, and led by a head of household. Households were randomly selected through a 2-stage cluster sampling design (29). First, 60 enumerator areas among the 1069 covering the whole city of Ouagadougou were randomly selected proportionally to their size in number of households according to the most recent census performed 6 mo earlier (30). Then, in each area, 50 households were randomly selected using the random-walk method from 5 starting points determined by way of a randomly numbered grid placed on the map of the area (31). This paper presents results for 2 rounds of data collection on a random subsample of 1036 households from this larger self-weighted sample representative of Ouagadougou (Fig. 1). Based on our experience with HFIAS in rural Burkina Faso and with IDDS in Ouagadougou, the sample size of 1000 households was calculated with the aim of being able to conclude that observed differences of 1.5 points for HFIAS and 0.4 food groups for IDDS were significant between 2 time periods or 2 groups with a level of significance set at 5%, a power set at 90%, and a 2.0 design effect, given that we could reasonably expect 70% of complete and reliable data about food consumption and 15% of participants lost to follow-up between rounds. The first round of data collection took place at the beginning of the rainy season (end of May to mid-August) and the second round took place at the beginning of the dry season (mid-October to mid-December). All data were collected by trained enumerators in face-to-face interviews.

HFIAS. The standardized HFIAS questionnaire, which consists of a list of 9 specific questions about worry and availability of and accessibility to foods for the household during the previous 30 d, was translated into Moore and Dioula (main local languages) and French and field tested before use as recommended (23). The standard procedure for scoring was used: zero was attributed if the event described by the question never occurred, 1 point if it occurred 1 or 2 times during the previous 30 d (rarely), 2 points if it occurred 3–10 times (sometimes), and 3 points if it occurred >10 times (often). For each household, the HFIAS score corresponded to the sum of these points and could range from 0 (food security) to 27 (maximum food insecurity) (23). The respondent was preferably the spouse in charge of food provisioning and cooking in the household or the head of the household.

IDDS. An individual open qualitative recall of all foods consumed during the previous 24 h was performed with 1 respondent in the household, preferably a woman. If there was no woman available or no woman at all in the household, the respondent was the head of household. From this open qualitative recall, the enumerator, with the assistance of the respondent, checked which food groups were consumed from a list of 21 locally adapted food groups. A final prompt was offered for food groups that were not cited. The IDDS was constructed according to FAO recommendations by recompiling the 21 food groups in 14 food groups and attributing 1 point for each group consumed in the previous 24 h (24). For each individual, the IDDS was the sum of these points and could range from 0 (no food intake in the previous 24 h) to 14 (maximum diversity).

Dietary data collection. Following adaptation of the multiple-pass method (32), quantitative dietary recalls were performed at the household level on 2 nonconsecutive days at each round. First, the person in charge of food in the household was asked to recall all foods consumed in the household at each eating occasion. Then, using household measures or prices, the person in charge of preparation gave a qualitative and quantitative description of all ingredients used in recipes. Third, the quantity of each food consumed in the household was estimated in household measures, prices, or standard portion sizes. Leftovers were also estimated. A final check was made to ensure that no food was forgotten. Food consumption at the individual level, inside or outside the household, was not recorded. Enumerators were equipped with domestic scales with a precision of 1 g and a maximum capacity of 3 kg (Tanita or Philips scales). Food prices, household measures, and portion sizes were calibrated at market places and in households and were used to estimate the weight of foods and ingredients recorded in households.

Data entry and data management. Data were entered by experienced workers with the Epi-Data Software, version 3.1 (The EpiData Association) and controlled by automatic checks and double data entry. Data cleaning, management, and analysis were performed using the SAS System version 9.1 (SAS Institute).

Dietary data management. When possible, individual household recipes were used to estimate the composition of individual household dishes. Yield after cooking was based on locally collected data on dry matter according to the type of dish and locally collected yield according to the type of dish. Retention of micronutrients due to preparation or cooking was also taken into account (33). For dishes not prepared in households or dishes for which a description was not useable, average seasonal recipes compiled from all available recipes were used. Some

7 Abbreviations used: AUC, area under the receiver-operating characteristic curve; CFI, comparative fit index; CR, composite reliability; HFIAS, household food insecurity access scale; IDDS, dietary diversity score of an index-member; MAR, mean adequacy ratio; NNFI, non-normed fit index; P, path coefficient; ROC, receiver-operating characteristic; VEE, variance extracted estimate.
average recipes collected in 2006 in small restaurants in Ouagadougou were also used.

A food composition table for Burkina Faso was compiled mainly from 3 food composition tables (34–36). Missing values were filled in using other similar foods or a value from the other food composition tables, taking into account yield and micronutrient retention factors.

Total energy, macronutrients, and micronutrients consumed were calculated for each household and each recall and constituted the observed nutrient intakes. To enable comparability between households in which number of members, age, and gender were very different, observed nutrient intakes were expressed as adult-equivalents in the household by dividing the total nutrient intakes by the total number of adult-equivalents in the household, based on energy requirements (37). The reference adult was a male aged 30–59 y with light physical activity. All members were attributed an adult-equivalent by dividing their own energy requirement (depending on gender, age, weight, presence in the household at the main meals, and assuming light physical activity) by the energy requirement for the reference adult.

Observation days evidencing overreporting were excluded from the data set according to the Goldberg cut-off method, considering the 95% confidence limit (38). However, we kept all observation days reporting low energy intakes, because it was not possible to distinguish between low intra-household intakes due to large individual extra-household, extra-meal intakes and low intra-household intakes due to underreporting.

Finally, usual nutrient intakes per adult-equivalent were calculated for each household using the Nusser method (39,40). Usual nutrient intakes correspond to mean nutrient intakes that would result from many repeated recalls over a long period of time. For each nutrient, the calculation of the usual intake was performed by C-side software (41), which, using observed intakes per adult-equivalent from all available recalls, took into account both intra- and inter-individual variability of these nutrient intakes.

**Nutrient adequacy ratios and mean adequacy ratio.** Energy requirements and recommended nutrient intakes for 11 micronutrients (vitamin A, thiamin, riboflavin, niacin, vitamin B-6, folate, vitamin B-12, vitamin C, calcium, iron, and zinc) were considered for each individual based on his/her age and gender (37,42). The recommended nutrient intake corresponds to the daily intake for which an individual would have a 97.5% probability of covering (reaching or exceeding) his/her needs for this nutrient. The 11 micronutrients were chosen based on public health relevance (43,44) and availability of data on nutrient contents in foods. Absence of members during a main meal (breakfast, lunch, or dinner) was taken into account by subtracting a part of their energy and micronutrient requirements according to the meal they skipped based on the observed share of energy intake by meal in the whole population. In each household, all requirements were summed and divided by the total number of adult-equivalents.

The energy adequacy ratio was calculated as the ratio of energy intake:energy requirement by an adult-equivalent, truncated to one, meaning that the requirement was globally met (reached or exceeded) at the household level (45). A similar calculation was performed for each of the 11 micronutrients (ratio of nutrient intake:nutrient requirement) and resulted in 11 individual micronutrient adequacy ratios. The mean adequacy ratio (MAR) for each household was calculated as the average of the energy adequacy ratio and the 11 micronutrient adequacy ratios. The MAR was used as a composite indicator of the energy and micronutrient adequacy of the households’ diets and constituted our benchmark indicator. For each household, 1 usual MAR was obtained from usual nutrient intakes and 4 observed MAR were obtained from the 4 d of observed nutrient intakes.

**Statistical analyses.** Usual nutrient intakes were described by simple descriptive statistics taking the sampling design into account. Local polynomial smooth plots with CI were drawn to graphically represent the relationships between each of the candidate indicators (HFIAS or IDDS) and the usual MAR. To complete this first approach, Spearman rank correlation coefficients between the usual MAR and each round of HFIAS or IDDS were also calculated.

We used structural equation modeling to analyze the relationships among HFIAS, IDDS, and the MAR to take into account the effects of measurement error. We performed these analyses using the CALIS procedure of the SAS system with the weighted least squares method of parameter estimation (46) to account for non-normality in the data. Both

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**FIGURE 1** Design and sampling process of the survey.
for HFIAS and IDDS, a measurement model assessed the latent indicator from the 2 rounds of observation and the latent MAR from 3 of the 4 observed MAR. Indeed, as the analysis model required working on a complete case subsample, the latent MAR was based on only 3 measurements instead of 4, because in our sample, only 36% of households had complete data for the 4 recalls of dietary consumption. Therefore, for households with complete data, 1 observed MAR of 4 was randomly selected and dropped. A linear structural equation was added to the model to assess the relationship between the latent HFIAS or IDDS and the latent MAR. As recommended in the literature (47–49), the fit of the combined model was assessed globally by several indicators, including chi-square Probability, comparative fit index (CFI), and non-normed fit index (NNFI). The composite reliability (CR), which summarizes the percentage of variance in each observed variable that was accounted for by the latent variable and the variance extracted estimate (VEE), which corresponds to the percentage of variance captured by the latent variable compared with the variance due to measurement error, were also calculated.

Complementary, receiver-operating characteristic (ROC) analyses were performed to assess the performance of HFIAS and IDDS to predict a low or a high usual MAR (50). Three low cutoffs for the usual MAR were set at MAR < 0.35, MAR < 0.45 and MAR < 0.45 and 3 high cutoffs were set at MAR > 0.60, MAR > 0.65, and MAR > 0.70. The area under the ROC curve (AUC) was calculated for each round of each candidate indicator and each cutoff. A rule of thumb of AUC > 0.70 was chosen to identify good prediction.

Ethics. The study protocol received the approval of the National Committee of Ethics (Ministry of Health). Written informed consent was obtained from all heads of household.

Results

Of the 1056 households surveyed, respondents for 884 (i.e. 84%) were present at both the first and the second round of data collection. Most households comprised a male head of household with 1 spouse (69%). The median number of members was 5 (range 1–24). At least 1 regular income was declared by the majority of households (91%), but only 27% of households could rely on a salary. The most common food supply practice was to buy and store cereals (64%) while buying ingredients for the accompanying sauce on a daily basis. Meals were mainly prepared at home (89%).

The mean energy intake per adult-equivalent covered, on average, 77% of the recommendation (Table 1). The balance of macronutrients was in the range of recommended values (51).

TABLE 1 \(\text{Usual energy, macronutrient, and micronutrient intakes and energy and micronutrient adequacies of households’ diets}^1\)

<table>
<thead>
<tr>
<th>Recommendation(^2)</th>
<th>Usual energy and nutrient intakes by adult-equivalent, (n = 1005)</th>
<th>Energy and micronutrients adequacy ratios, (n = 996)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean SE Median</td>
<td>Mean SE Median</td>
</tr>
<tr>
<td>Energy, kJ/d</td>
<td>10,150 8079 106 7915</td>
<td>0.77 8.56 (\times) 10(^{-3}) 0.77</td>
</tr>
<tr>
<td>Protein, % energy</td>
<td>10–15 11 0.0 11</td>
<td>– – –</td>
</tr>
<tr>
<td>Fat, % energy</td>
<td>15–30 19 0.3 19</td>
<td>– – –</td>
</tr>
<tr>
<td>Carbohydrates, % energy</td>
<td>55–75 70 0.3 70</td>
<td>– – –</td>
</tr>
<tr>
<td>Sugar, % energy</td>
<td>&lt;10 6 0.1 6</td>
<td>– – –</td>
</tr>
<tr>
<td>Vitamin A, RE/d</td>
<td>600 368 7.1 336</td>
<td>0.52 9.64 (\times) 10(^{-3}) 0.48</td>
</tr>
<tr>
<td>Vitamin B-6, mg/d</td>
<td>1.3 1.1 0.02 1.1</td>
<td>0.72 9.23 (\times) 10(^{-3}) 0.71</td>
</tr>
<tr>
<td>Niacin, mg/d</td>
<td>16 8 0.1 8</td>
<td>0.49 6.56 (\times) 10(^{-3}) 0.47</td>
</tr>
<tr>
<td>Folate, (\mu)g/d</td>
<td>400 208 2.9 200</td>
<td>0.46 6.37 (\times) 10(^{-3}) 0.44</td>
</tr>
<tr>
<td>Riboflavin, mg/d</td>
<td>1.3 0.5 0.01 0.5</td>
<td>0.39 6.52 (\times) 10(^{-3}) 0.37</td>
</tr>
<tr>
<td>Thiamin, mg/d</td>
<td>1.2 0.9 0.01 0.9</td>
<td>0.67 7.47 (\times) 10(^{-3}) 0.66</td>
</tr>
<tr>
<td>Vitamin C, mg/d</td>
<td>45 44 1.3 38</td>
<td>0.71 1.26 (\times) 10(^{-2}) 0.72</td>
</tr>
<tr>
<td>Zinc,(^3) mg/d</td>
<td>14.0 8.7 0.10 8.4</td>
<td>0.56 6.98 (\times) 10(^{-3}) 0.55</td>
</tr>
<tr>
<td>Iron,(^4) mg/d</td>
<td>27.4 17.4 0.22 16.9</td>
<td>0.44 6.96 (\times) 10(^{-3}) 0.41</td>
</tr>
<tr>
<td>Calcium, mg/d</td>
<td>1000 371 4.9 358</td>
<td>0.31 4.40 (\times) 10(^{-3}) 0.29</td>
</tr>
<tr>
<td>Vitamin B-12, (\mu)g/d</td>
<td>2.4 0.7 0.06 0.3</td>
<td>0.20 1.25 (\times) 10(^{-2}) 0.12</td>
</tr>
</tbody>
</table>

1 Usual intakes were calculated for each household from all recall days available (1–4 recall d).

2 Energy requirement (37) and recommended macronutrient intakes (42) for 1 adult-equivalent and macronutrient intake recommendations (51) at the population level.

3 Low-level bioavailability of zinc was assumed (25%).

4 Low-level bioavailability of iron was assumed (5%).
and NNFI = 1.000; n = 586). The measurement model revealed that, compared with the MAR, HFIAS had a lower variability from 1 round to the other and a lower measurement error, illustrated by a higher CR and a higher VEE (CR = 0.659 and VEE = 0.543 for HFIAS; CR = 0.469 and VEE = 0.227 for the MAR). As for the structural part of the model, the path coefficient (P) between the MAR and HFIAS was negative and significant ($P = -2.795 \times 10^{-3} \pm 1.45 \times 10^{-3}$, $P < 0.001$; standardized $P = 0.447$). On the other hand, in the model between IDDS and the MAR, the variability from one round to the other was similar for IDDS and for the MAR (CR = 0.405 and VEE = 0.333 for IDDS; CR = 0.472 and VEE = 0.230 for the MAR); the coefficient between IDDS and the MAR was positive and significant ($P = 5.19 \times 10^{-2} \pm 1.27 \times 10^{-2}$, $P < 0.001$; standardized $P = 0.406$).

As for ROC analyses, whatever the cutoff for the usual MAR, all but 2 of the AUC were significantly different from the area under the reference curve (Table 2). However, they all ranged from 0.585 to 0.661 for HFIAS and from 0.536 to 0.629 for IDDS, which was less than the rule-of-thumb that was set (AUC > 0.70). For IDDS, the best AUC at each round were those concerning the prediction of the highest MAR, whereas the pattern tended to be the reverse for HFIAS but was less clear.

**Discussion**

Our purpose in this study was to assess the external validity of HFIAS and IDDS to measure household food insecurity and household diet adequacy in an urban area. In our study, structural equation modeling underlined that HFIAS and IDDS were both associated with the MAR in the expected directions ($P < 0.001$); there was a decreasing association between the HFIAS and the MAR and an increasing association between the IDDS and the MAR. This suggests that HFIAS and IDDS are good indicators of the adequacy of households’ diets. One interesting result was that for both indicators, AUC did not reach the rule of thumb of 0.70 to be considered as satisfying in predicting a low or a high MAR. Consequently, the use of one or the other of the indicators for individual household targeting would lead to poor sensitivity and/or specificity and to a quite large proportion of misclassified households regarding their MAR status.

HFIAS has rarely been tested for external validation in the field (52,53) and to our knowledge this study represents, in an urban setting, the first validation of HFIAS against any quantitative indicator of diet adequacy. As far as dietary diversity is concerned, it is usually recommended to rely on indicators at the household level to approximate diet adequacy at the same level. Nevertheless, we hypothesized that the IDDS, which has been shown to be a good indicator of the micronutrient adequacy of the individual diet in Ouagadougou (54), would also be a good indicator of the adequacy of the diet at the household level. In addition, such an indicator would also account for meals eaten outside the home by the index member, which may play a non-negligible role in the food security status of members of the household. Our results, which showed a strong relationship between IDDS and the MAR, were consistent with these hypotheses.

We have to acknowledge some limitations of our study. First, the calculation of a MAR at the household level did not allow food consumption at the individual level to be taken into account. This may partly explain the relatively low coverage of energy needs we observed. A second limitation is that the most recently recommended indicator to assess micronutrient adequacy of the diet, i.e., mean probability of adequacy (55), cannot...
be measured at the household level. We consequently used the MAR, which includes not only quantity but also quality of the diet, because it accounts for energy and micronutrient intakes compared with requirements. The MAR is thus more informative than the simpler measurement of energy intake or energy availability used as benchmark indicators at the household level in other validation studies (15,16,27). Nevertheless, while interpreting these results, it should be kept in mind that good adequacy at the household level does not mean that each individual member can meet his/her needs (56). Finally, the choice of the MAR as benchmark indicator did not allow us to take into account the food insecurity forms that have adverse health effects through non-nutritional pathways and do not result in diet inadequacy, such as anxiety or depression (5).

The method itself also presented some limitations. The need for complete data for a household to be taken into account in the analysis was somewhat limiting. We consequently tried to preserve the sample size by setting the latent MAR as the result of 3 measurements instead of 4. However, we also reran the 2 structural equation models on the 383 households with complete data. Similar estimates were obtained and the analysis led to the same interpretation as the one performed on the larger dataset (results not shown).

One key issue in dietary studies is measurement error. For IDDS, the large variability from one round to the other for the same household, illustrated by a poor CR and a poor VEE, can be partly explained by the day-to-day variability in dietary intake, because this indicator focused on a 1-d period (57). Additionally, the 2 recalls were performed at 2 different seasons, which is known to influence such indicators (58). The VEE for IDDS was similar to the one for the MAR, which is also subject to day-to-day variability and seasonality. On the other hand, the HFIAS demonstrated a much larger VEE than IDDS and the MAR, suggesting that this indicator is more stable. This is not surprising, because the recall period for HFIAS was the last month and not the last day.

The assessment of the 2 indicators together is informative, because each provides different information on food insecurity. The rationale for our choice to evaluate both HFIAS and IDDS was that IDDS is more suited to information about dietary quality, whereas HFIAS includes not only perceptions of food quality but also of food deprivation. The results showed that both indicators were linked to the MAR, including quantitative and qualitative aspects of the diet. Performing the analyses separately on the energy adequacy ratio and on a MAR averaging only micronutrient adequacy ratios did not lead to any clear difference between indicators in terms of their association with the quantitative or the qualitative dimension of the diet (results not shown). However, IDDS provides specific information about household dietary diversity, its changes over time, and food groups that differ between households (24), whereas HFIAS informs dietary strategies used by households to cope with food insecurity in 3 domains: anxiety about food, quality, and quantity (23). In addition, the disaggregation of the 2 indicators, item by item for HFIAS and food group by food group for IDDS, provides very helpful additional information to understand and analyze the observed food insecurity. Moreover, given their distributions, IDDS allowed the whole population studied to be assessed, whereas HFIAS provided less information about the whole population but was more helpful in discriminating food-insecure households. The 2 indicators also have contrasted meanings: HFIAS is a negative indicator indicating the absence of food security, whereas IDDS is a positive indicator indicating the presence of dietary diversity. Finally, by capturing different dimensions of food security, HFIAS and IDDS together provide a more complete vision of the situation, potentially enabling reduction of the risk of biased intervention, which can happen when prioritization is driven by a single indicator rather than by the underlying, multidimensional concept of food security (8).

In our study, respondents to the HFIAS or IDDS questionnaires differed across households and across rounds, but the influence of the characteristics of the respondents on HFIAS has rarely been tested (21) and the influence of characteristics of the index-member for IDDS was unknown. Consequently, we used linear regression to check that the respondent’s age and gender had neither a principal nor a modification effect on the relationships of the 2 candidate indicators with the usual MAR (results not shown). Because the respondent was often the head of household, the above analysis was controlled for age and gender of the head of household to avoid potential confounding effect. The absence of evidence of an effect is very interesting for operational purposes: it suggests that in the field, if the initially chosen respondent is missing, it may be possible to change the respondent without the results being adversely affected. However, other studies evidenced intra-household disparities in individual nutrient needs coverage or individual food insecurity experience (59,60). An individuals’ situation could influence his or her assessment of their household’s situation and the effect of the respondent needs to be investigated in more detail.

HFIAS and IDDS have other important operational properties. They can be obtained in a cost-effective way and are well accepted by respondents. Given this and their promising results in approximating the adequacy of the diet, the performance of HFIAS and IDDS in other urban contexts should now be assessed. Building time series of HFIAS and IDDS data in such contexts should also be encouraged to assess the changes in household food insecurity characteristics in cities over time and thus the potential of the 2 indicators for early warning. Finally,
given their insufficient predictive power and inability to account for day-to-day variability, both indicators should be used only at the population level. Particular attention should be paid to sample size, which must be large enough to ensure a stable estimation at the population level. If these requirements are met, both indicators should provide valuable information for evaluation and monitoring purposes.

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