Measurement of Dietary Diversity for monitoring the impact of food based approaches¹, ²

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Abstract

Monotonous diets based mainly on energy dense, but micronutrient poor starchy staples are common in food insecure areas and contribute to the burden of malnutrition, particularly inadequate micronutrient intake. Food-based strategies have been recommended as the first priority to meet micronutrient needs. An essential element to food-based approaches involves dietary diversification or consumption of a wide variety of foods across nutritionally distinct food groups. Increasing dietary diversity is associated with increased household food access as well as individual probability of adequate micronutrient intake. Dietary diversity is measured as the number of individual food items or food groups consumed over a given reference period. FAO has developed a standardized tool for measuring dietary diversity which can be administered at either the household or individual level. The tool uses an open recall method to gather information on all the foods and drinks consumed by the household or individual over the previous 24 hours. The food and drinks mentioned by the respondent are then recorded into one of 16 standardized food groups. Information from the dietary diversity tool can then be analyzed in many different ways to provide a picture of dietary patterns within the community as well as among vulnerable groups. Examples of analytical approaches and programmatic uses are drawn from studies in Mozambique and Tanzania. These examples illustrate how information collected from the dietary diversity tool can be used to inform baseline assessment, programme design and monitoring and evaluation.

¹ This paper was produced as part of the published proceedings of the International Symposium on Food and Nutrition Security: Food-based approaches for improving diets and raising levels of nutrition 7-9 December, 2010, Rome Italy.
² Part of the work was funded by the European Union through the EC-FAO Programme on "Linking Information and Decision Making to Improve Food Security"
Introduction

Micronutrient malnutrition, i.e. vitamin and mineral deficiencies, affects one third of the population worldwide (Mason et al., 2001). Monotonous diets based on starchy staples lack essential micronutrients and contribute to the burden of malnutrition and micronutrient deficiencies. Food-based strategies have been recommended as the first priority to meet micronutrient needs (Allen, 2008). An essential element of food-based approaches involves dietary diversification - consumption of a wide variety of foods across nutritionally distinct food groups - as a way to meet recommended intakes of nutrients.

Because conventional quantitative dietary assessment surveys are costly and cumbersome to conduct and analyze, there is great interest in using simple proxies of intake that can be measured quickly and easily and that validly reflect nutrient intake. This was the rationale for developing dietary diversity measurement tools as proxies of quantitative dietary intake.

Definition and measurement of dietary diversity

Dietary diversity is defined as the number of individual food items or food groups consumed over a given period of time (Ruel, 2003). It can be measured at the household or individual level through use of a questionnaire. Most often it is measured by counting the number of food groups rather than food items consumed. The type and number of food groups included in the questionnaire and subsequent analysis may vary, depending on the intended purpose and level of measurement. At the household level, dietary diversity is usually considered as a measure of access to food, (e.g. of households’ capacity to access costly food groups), while at individual level it reflects dietary quality, mainly micronutrient adequacy of the diet. The reference period can vary, but is most often the previous day or week (FAO, 2011; WFP, 2009).

Scientific evidence for use of dietary diversity scores

Over the past decade there have been three large multi-country validation studies and many smaller studies which have looked at the association between dietary diversity and food security and/or micronutrient adequacy of the diet.

Hoddinott and Yohannes (2002) studied the association between household dietary diversity scores and dietary energy availability in ten countries. Increasing household dietary diversity significantly improved energy availability. The study results suggest that dietary diversity scores have potential for monitoring changes in dietary energy availability, particularly when resources are lacking for quantitative measurements.

A second multi-country study of diets of children 6-23 months from ten sites was undertaken to test the association between dietary diversity and mean micronutrient density adequacy of complementary foods. Significant positive correlations were observed in all age groups and in all countries except one (Working Group on Infant and Young Child Feeding Indicators, 2006).

Recently the association between dietary diversity and micronutrient adequacy of diets of women of reproductive age was assessed in five countries. Dietary diversity was significantly associated with micronutrient adequacy in all sites (Arimond et al., 2010).
Studies carried out in individual countries and across diverse age groups showed correlations of 0.36 to 0.66 between dietary diversity scores and micronutrient adequacy ratios (Kennedy et al., 2007; Mirmiran et al., 2004; Mirmiran, Azadbakht and Azizi, 2006; Steyn et al., 2006; Hatloy, Torheim and Oshaug, 1998).

In conclusion dietary diversity scores have been shown to be valid proxy indicators for dietary energy availability at household level and micronutrient adequacy of diets of young children and women of reproductive age.

*FAO’s dietary diversity guidelines*

FAO has published operational guidelines for measuring dietary diversity in a standardized way, based on a tool originally developed by FANTA (FAO, 2011; Swindale and Bilinsky, 2006). The FAO data collection tool uses an open recall method to gather information on all food and drinks consumed by the household or individual over the previous 24 hours. The foods and drinks recalled by the respondent are then recorded into one of 16 standardized food groups. Probing is used to capture consumption of any food groups not mentioned in the open recall. The FAO guidelines describe how to adapt the tool to local food systems.

The FAO guidelines recommend the following ways of reporting information collected on dietary diversity.

- Dietary diversity scores are simple counts of the number of food groups consumed at individual or household level. The two dietary diversity scores recommended by FAO are the Household Dietary Diversity Score (HDDS) based on twelve food groups and the Women’s Dietary Diversity Score (WDDS) based on nine food groups. Mean scores can be compared across population sub-groups and over time.
- Dietary profiles based on food groups consumed by a majority of individuals/households can be compared to provide insights on consumption patterns across population sub-groups
- The percentage of individuals or households consuming food groups or combinations of nutrient dense food groups (such as food groups rich in Vitamin A) can be analyzed.

*Case studies that illustrate potential uses of dietary diversity as a food and nutrition security indicator*

Examples of analysis drawn from Mozambique and Tanzania show the potential uses of dietary diversity to inform the design, targeting, monitoring and evaluation of food and nutrition security interventions and programmes.

The dietary diversity questionnaire was included in a baseline and follow-up assessment of a food and nutrition project carried out in Central Mozambique in Manica and Sofala provinces (FAO, 2008). The baseline assessment was conducted in November/December 2006 during the pre-harvest season and the follow up in July 2007, after the maize harvest. The assessments covered 300 households. Dietary diversity scores were low across both seasons and districts (mean 3.9 food groups out of 12). Figure 1 shows food consumption patterns by dietary diversity tertile during the pre-harvest season in both districts combined. In the lowest tertile (households consuming fewer than 4 food groups) the majority of households consumed “cereals”, “green leafy vegetables” and “vitamin A rich fruit”.

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3 the survey was carried out in the mango season
while in the highest tertile the majority of households also consumed items from the food groups “other vegetables”, “fish” and “legumes, nuts and seeds”.

Figures 2 and 3 show data from the two surveys for the district of Chibabava in the province of Sofala, Mozambique. These figures illustrate how measurement of dietary diversity can be used to monitor changes in dietary patterns over time. Figure 2 shows percent of households consuming legumes for both survey periods stratified by food security status as measured by the FANTA Household Food Insecurity Access Scale (HFIAS) (Coates, Swindale and Bilinsky, 2007). During the first survey, which corresponded to the pre-harvest period, percent of households consuming legumes was higher in the food insecure households compared to others. The percent of food insecure households consuming legumes dropped by 80% between seasons, while in the food secure households it increased slightly. This indicates that economic access to legumes was most likely the cause of decline in overall consumption in the food insecure households. Figure 3 shows percentage of households consuming fish over the two survey periods, similarly stratified by food security status. The percentage of households consuming fish dropped in both food secure and insecure groups, although the decline was greater in the food insecure group, indicating a problem of availability and not only of access to this food group. The severe floods that Chibabava experienced prior to the second survey round caused a decline in fish stocks.

Dietary diversity was measured in a baseline assessment survey of 628 households in slum areas of urban Tanzania in 2008. Mean household dietary diversity scores (HDDS) varied by tertile of household food insecurity (as measured by HFIAS), ranging from a mean of 6.0 in the most food insecure to a mean of 7.2 in the most food secure group (Razes and Dop, 2010) (Figure 4).

Figure 5 shows the percentage of Tanzanian households consuming micronutrient rich food groups by wealth tertile. In the best off wealth group, twice as many households consumed “meat/offals”, “milk” and “fruit” than in the worst off wealth group.

These two case studies show how dietary diversity can be used to assess diets in terms of mean dietary diversity and percentage of households consuming nutritionally important food groups. Analysis of dietary diversity by sub-groups of a population allows setting measurable targets for improvement for the group with the lowest dietary diversity. For example, in Mozambique the dietary profile of the higher tertile can be used as a target to be reached by all households. For urban Tanzania, a target would be to increase the percentage of poorest households consuming micronutrient rich food groups to reach the level of the better-off households. In particular, an important objective of programmes could be to increase consumption of animal foods in poor households.

When consecutive assessments have been conducted, it is possible to assess seasonal differences with the objective of developing agricultural and food security interventions to compensate for lower dietary diversity during the lean season. Moreover, information on dietary diversity at two or more time periods is useful for decision makers to understand the effect of both normal seasonal variation and shocks on dietary consumption. This information will enable them to define and plan actions to improve access to important food groups such as legumes and fish, as shown in the Mozambican example.

Use of the dietary diversity scores has several statistical limitations. Both the household and the women’s dietary diversity scores are based on a small number of food groups (twelve food groups for HDDS and nine food groups for WDDS). This narrow range in the scores limits the ability to detect
changes or differences in the mean score, particularly when the sample size is small. Another limitation is that there is no universally recognized cut point above or below which households or individuals can be classified as having adequate or inadequate dietary diversity. Additionally, at household level the tool does not capture out of home food consumption, potentially leading to an underestimate of household dietary diversity in urban areas and among populations where out of home food consumption is common. Given these limitations, it is strongly recommended not to use the dietary diversity measure as a standalone tool. It should be integrated into broader survey instruments and the results triangulated with other characteristics of interest such as wealth or food security status in order to obtain a holistic picture of the food and nutrition security situation in a community.

Collecting information on dietary diversity should be of interest to any programme or initiative where a primary or secondary objective is to improve the diet of the beneficiary population. Dietary diversity data are useful for evaluating the impact of food and nutrition security programmes. Other sectors that could usefully incorporate this information into their monitoring and evaluation systems include agriculture, fisheries and forestry. Dietary diversity can also be used to help evaluate programmes that address cross-cutting issues such as biodiversity, gender equality, HIV/AIDS or the Right to Food where improving the quality of diets is an important outcome.

References


Working Group on Infant and Young Child Feeding Indicators. 2006. *Developing and validating simple indicators of dietary quality and energy intake of infants and young children in Developing Countries: Summary of findings from analysis of 10 data sets*. Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development (AED) Washington DC.

Food groups consumed by > 50% of households by DD tercile (Mozambique hungry season)

<table>
<thead>
<tr>
<th>Lowest DD &lt;4</th>
<th>Medium DD 4-5</th>
<th>High DD &gt;5</th>
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<tbody>
<tr>
<td>Cereals</td>
<td>Cereals</td>
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<tr>
<td>Green leafy vegetables</td>
<td>Green leafy vegetables</td>
<td>Green leafy vegetables</td>
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<tr>
<td>Vitamin A rich fruit</td>
<td>Vitamin A rich fruit</td>
<td>Vitamin A rich fruit</td>
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<tr>
<td>Oil</td>
<td>Oil</td>
<td>Other vegetables</td>
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<td></td>
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<td>Fish</td>
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<td></td>
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<td>Legumes, nuts and seeds</td>
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Figure 2: Monitoring legume consumption in Chibabava
Figure 3: Monitoring fish consumption in Chibabava
Figure 4: Tanzania: Mean HDDS by food insecurity tertile (measured by HFIAS)
Figure 5: Tanzania: household consumption of micronutrient rich food groups differs by wealth tertile

Proportion of Tanzanian households consuming micronutrient rich food groups by wealth tertile

- **Meat/Offals**
  - Worse off: 13%
  - Medium: 14%
  - Better off: 33%

- **Milk**
  - Worse off: 14%
  - Medium: 18%
  - Better off: 28%

- **Fruits**
  - Worse off: 18%
  - Medium: 25%
  - Better off: 31%