Diet Quality Index - International (DQI-I)

Overview

Diet quality is an important measure in understanding food security because of the synergistic nature of micro- and macronutrients (Gerber, 2001 [1]) and the association of healthy diet patterns with reduced risk for diet-related disease and illness (Kant, 1996 [2]). The Diet Quality Index ? International (DQI-I) is a composite, individual-level diet quality indicator. It was created in 2003 to enable cross-cultural diet quality comparisons, something that had previously not been done using diet quality composite indicators (Kim et al., 2003 [3]). The DQI-I built off existing indicators, such as the Healthy Eating Index [4] (HEI) and the Diet Quality Index (DQI), but was formulated to incorporate the many aspects of a diet which contribute to its quality, including diversity, adequacy, moderation, and balance.

Method of Construction

This indicator is created using scores from four components of diet quality, each calculated separately. The table below outlines basic information on how the components are defined, and the criteria for scoring each.

<table>
<thead>
<tr>
<th>Diet Quality Component</th>
<th>Grouping of diet quality component</th>
<th>Scoring criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety - food groups</td>
<td>5 food groups: meat/poultry/fish/egg, dairy/beans, grains, fruits, and vegetables</td>
<td>Each food group awarded 0 or 3 pts. 3 points awarded if at least 1 item from that group was consumed</td>
<td>0-15</td>
</tr>
<tr>
<td>Variety - protein sources</td>
<td>6 sources: meat, poultry, fish, dairy, beans, eggs</td>
<td>3 or more sources consumed: 5 pts 2 sources consumed: 3 pts 1 source consumed: 1 pts 0 sources consumed: 0 pts</td>
<td>0-5</td>
</tr>
<tr>
<td>Adequacy</td>
<td>8 groups: vegetables, fruit, grain, fiber, protein, iron, calcium, vitamin C</td>
<td>Between 0 and 5 points awarded for each of the 8 adequacy groups, depending on percentage of RDA met</td>
<td>0-40</td>
</tr>
<tr>
<td>Moderation</td>
<td>6 groups: total fat, saturated fat, cholesterol, sodium, empty calorie foods</td>
<td>Between 0 and 6 points awarded for each of the 5 moderation groups, depending on percentage of RDA met</td>
<td>0-30</td>
</tr>
</tbody>
</table>
Balance | 2 groups: macronutrient ratio, fatty acid ratio | Between 0 and 6 points awarded, depending on ratio of macronutrients and between 0 and 4 points awarded depending on ratio of fatty acids | 0-10

Once a score has been calculated for each of the components, the DQI-I is calculated by summing each of the four scores together, producing a number between 0 and 100. For a more detailed explanation on the process and the specific scoring criteria, please refer to the ?Construction of the DQI-I? section of the paper published in The Journal of Nutrition (Kim et al., 2003 [3]).

Uses

DQI-I is used to assess the diet quality of individuals, and can be used in a variety of cross-cultural settings, making it useful in comparing diets across regions (Kim et al., 2003 [3]). Additionally, this indicator includes specific nutrients associated with chronic, diet-related illnesses and includes particular food groupings, such as empty calorie foods, that make it an especially useful tool in assessing changing diet quality associated with the nutrition transition (Kim et al., 2003 [3]). As an individual-level indicator, it can be paired with individual health outcomes or demographic information, such as religion, age, sex, education, or any other characteristics of interest (Yun et al., 2009 [5]). However some studies have found that the DQI-I may not be sufficiently robust for use with all diets (Tur et al., 2005 [6]).

Strengths and Weaknesses

The main strength of the DQI-I is that it offers greater richness in its definition and evaluation of diet quality than other composite diet quality indices. For example, the HEI is based solely on food group consumption (USDA, 2006 [7]), and the DQI, the indicator on which the DQI-I is based, touches upon the same four diet quality components, but it employs fewer measures and quantifies fewer micronutrients (Newby et al., 2003 [8]).

However, both a strength and a weakness, the DQI-I uses weights to proportionally score food based on its assumed nutritional importance and researchers have found that standardized weights may not be applicable in all scenarios (Tur et al., 2005 [6]). Additionally, because of the large amount of information required to calculate this indicator, it is necessary to have multiple days of diet recall information from each respondent, which would be resource and time intensive.

Data Source

Individual level dietary data can obtained from a Food Frequency Questionnaire [9] (FFQ) or 24-hour dietary recall survey [10]. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture?s (FAO) International Network of Food Data Systems (INFOODS [11]) or the International Life Science Institute?s (ILSI) CatFCDB. Finally, to calculate the adequacy, moderation, and balance scores, RDAs based on age and sex must be obtained from the Institute of Medicine (Institute of Medicine, 2006 [12]).
Links to guidelines


Links to validation studies


Links to illustrative analyses

- Mariscal-Arcas et al. (2007). "Diet quality of young people in southern Spain evaluated by a Mediterranean adaptation of the Dietary Quality Index-International (DQI-I)." [16]

PDF [17]

Data Sources

- 24-Hour Dietary Recall (24HR)
- Food Frequency Questionnaire (FFQ)

Unit of Observation

- Individual

Food Security Components

- Quality

Food Composition Database Required?

- Yes

24-Hour Dietary Recall (24HR)

Open this information in a new window [10]
The 24-hour dietary recall (24HR) method provides comprehensive, quantitative information on individual diets. It is one of the most frequently used methods for gathering quantitative dietary information at the individual level. In literate populations, 24HR can be self-administered; however in populations with low levels of literacy enumerators are responsible for conducting the dietary assessment. The approach taken in the 24HR involves the respondent recalling the type and quantity of each food or beverage consumed during the previous 24-hour periods. Typically, a four-stage, multiple pass approach is used which includes 1) recalling all food and drink consumed in the past 24-hours, 2) describing in more detail the food and drink consumed and how it was prepared, 3) estimating the portion size of each food or mixed dish, and 4) reviewing the recall data with the respondent to make sure that the information is correct.

A single 24HR is sufficient to calculate the mean intake of a group, but in order to estimate usual intake the 24HR must be repeated on at least two non-consecutive days. In general nutrients that are present throughout the diet and consumed on a daily basis across many foods (e.g. folate) will have less variability compared to other foods that are found in few foods (e.g. vitamin D). For this reason between-subject variation (also referred to as inter-subject variation) in nutrient intakes will generally be smaller than within-subject variation (also referred to as intra-subject variation). Therefore the mean intake of the group can confidently be calculated provided that the sample size is sufficient and representative of the population of interest. However if the researcher is interested in determining the usual intake distribution of a group to assess the proportion of individuals with inadequate, or excessive, intakes then repeated 24HR must be collected.

The 24HR can serve multiple purposes, in addition to collecting data on food intake to determine mean (or median) daily consumption or to assess the prevalence of high and low intake of specific micronutrients. Some additional examples include developing a better understanding of typical household food preparation and cooking methods and identification of the brand names of foods consumed within the household. Furthermore, if individual level dietary data are collected in conjunction with data on socio-economic status and health status, the data can be particularly useful in understanding linkages between income levels and dietary choices, as well as dietary patterns and health outcomes.

**Strengths:**

- Offers a high degree of accuracy in assessing nutrient intake relative to food frequency questionnaires or estimates derived from household consumption and expenditure surveys
- Provides quantitative estimates of individual food consumption and nutrient intake
- Captures food eaten inside and outside the home (full diet)
- Provides quantitative estimates of individual food consumption and nutrient intake
- Can be structured to take account of food sources, preparation methods, and the effect on nutrient content
- Can account for foods consumed together that may enhance or inhibit micronutrient absorption

**Weaknesses:**

- Relatively expensive for the user compared to freely accessible data sources such as Food Balance Sheets and Household Consumption and Expenditure Survey data
• Given relative complexity of surveys, significant training is required to minimize errors in
data collection and enumerators are required in low-literacy populations
• Due to time and cost frequently associated with 24HR, data are frequently collected
from small samples that are not nationally representative
• To capture seasonal variation, the survey must be repeated in multiple seasons

Key take-away points: Methods and types of indicators that can and cannot be derived
with these data:

There are a number of ways that 24HR data can be leveraged for food security and nutrition
analyses. Some specific examples of how they can be used include:

• Indicators can be constructed that measure individual intake in order to assess nutrient
adequacy can be measured with 24HR
• A single 24HR provides an estimate of the mean intake of a group, but at least two non-
consecutive surveys from the same respondents are required to estimate usual intake
• When collected in conjunction socio-economic data, health status, or origin of the foods
consumed (i.e. purchased, own production, in kind transfer) these data can be
particularly useful for policy and programmatic purposes

Sources:

1) Gibson and Ferguson, (2008), An interactive 24-hour recall for assessing the adequacy of
iron and zinc intakes in developing countries:
https://assets.publishing.service.gov.uk/media/57a08bac40f0b64974000cd6/tech08.pdf

2) Coates et al. (2012), Applying Dietary Assessment Methods for Food Fortification and
Other Nutrition Programs:

Food Frequency Questionnaire (FFQ)

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FOOD FREQUENCY QUESTIONNAIRES

Food Frequency Questionnaires (FFQ) are a type of dietary assessment instrument that
attempts to capture an individual’s usual food consumption by querying the frequency at
which the respondent consumed food items based on a predefined food list. Given that food
lists are culturally specific, FFQs need to be adapted and validated for use in different
contexts.

FFQs are the most common method of measuring dietary patterns in large epidemiological
studies of diet and health. FFQs are often limited to the food items that are a source of
nutrients related to the particular dietary exposures under study, for example fruit and
vegetable consumption or foods with high levels saturated fat. Dietary diversity indices are a
type of FFQ, as are many types of food consumption modules included in household
consumption and expenditure surveys, which are frequently based on food lists.

FFQ recall periods vary greatly, but typically range from 7 - 30 days (though some are as long as 1 year). In general, FFQs rely on a longer recall period in order to capture foods that are not consumed every day but are still part of the individual’s typical diet. These measures of usual intake are a more valid indicator of the relationship between diet and health outcomes than those capturing only a single 24-hour snapshot of the diet. (However 24-hour dietary recalls can provide information on the usual intake if data are collected on two non-consecutive days from respondents.)

While FFQs typically collect information on the frequency of consumption they do not typically collect information on the quantity consumed. A semi-quantitative food frequency questionnaire (SQFFQs), a variant of the FFQ, does include questions about portion sizes consumed. However, because foods are not typically weighed or measured using household utensils, SQFFQs are not as accurate as other quantitative dietary assessment methods (e.g. 24 hour recall), but have the benefit of providing quantitative information on usual intake.

**Strengths:**

- Estimates the usual diet by using a longer recall period
- Captures individual-level dietary patterns
- FFQs can be easier and less time-consuming to implement than a 24-hour recall, if the food list is relatively short (i.e. <100 items)

**Weaknesses:**

- FFQs require substantial up-front investment to develop and validate the instrument for a given context
- In the case of FFQs and SQFFQs, usual frequency of intake is prone to measurement error, particularly with recall periods longer than 7 days (and usual portion size questions are prone to measurement error in the case of SQFFQs)
- Long FFQs (i.e. those with 100+ items) can take longer to administer than a standard 24-hour recall
- FFQs do not provide a precise quantitative measure of nutrient intake
- To capture seasonal variation, the survey must be repeated in multiple seasons (unless FFQ is based on consumption over the past year)

**Key take-away points: Methods and types of indicators that can and cannot be derived with these data**

There are a number of ways that FFQ data can be leveraged for food security and nutrition analyses. Some specific examples of how they can be used include:

- Particularly good for estimating the usual diet and for understanding the relationship between certain consumption patterns and health outcomes
- Useful for assessing suitable vehicles and fortificant levels, as the food list can be tailored to include all significant sources of micronutrients
- Useful for monitoring reach and coverage, as FFQs can specify brand names of fortified foods
- Major limitation is that they need to be created and validated for use in different countries/contexts
Sources:

1) Coates et al. (2012), Applying Dietary Assessment Methods for Food Fortification and Other Nutrition Programs: