Food Composition Tables and Database

Issues and Challenges

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- The only academically-funded Palestinian research institute that addresses the fundamental science of Food and Health

ANAHRI addresses the challenges of:
- Food Security
- Diet and Health
- Food Composition Tables/Data Base
Where we are today

- **Double burden of malnutrition.**
  - Obesity *is* endemic.
  - Non-communicable diseases *are* increasing in both the West Bank and Gaza.
  - Undernutrition *and* micronutrient deficiencies *are* persisting.

- **Increased consumption of animal products and of processed foods**

- **Simplification of diets and shift towards westernized diets**

- **Medicalised approach** *(fortification and supplementation)* is favored instead of food-based for nutrition
Where we are today cont..

- Limited **natural resources**: Energy, water and agricultural land. Loss of land (occupation) and soil fertility.

- **Environment** is deteriorating. Erosion and climate change is continuing which threaten agriculture.

- **Food security** is threatened in the West Bank and Gaza, worsened through occupation, increased food prices and financial crisis.
Needs and role of food composition data

- Compositional data which is
  - up-to-date
  - of high quality
  - Accessible
  - according to international standards
  - documented
  - in user-friendly format
What food composition data are available in the region

No more than 5 food composition tables and databases

- **National** and **not** regional or international (International Network of Food Data Systems INFOODS: for 110 countries, regions or international use their printed and on-line FCT/FCDB or LanguaL: for 54 countries/regions on-line FCT/FCDB)

- **Mainly printed** and **not** on-line

- **Relatively old/outdated** and **not** updated

- **Restricted** and **not** comprehensive coverage of foods and components

- **Covering specific** components and **not** a wide range ones

- **According to local standards** and **not** international

- **Compiled/estimated** and **not** imputed or solely analytical data

- **With fee** and **not** free-of-charge

- **Badly documented** or black box and **not** properly validated

- **Limited in purpose** and **not** for labeling, research, consumers
Food composition programs need

- Motivated people
- Standard procedures, in line with international guidelines
- Integrated in international network
- Steering committee between users, stakeholders and compilers
- Government support
- Funding for data generation, compilation and dissemination
Issues for FCDB  Food level:

- number of foods covered
- language
- food identification-classification-description systems,
- level of detail in the food description
- brand name coverage
- representativeness of nationally consumed foods including unique foods
- food numbering (indicating food group and sequential numbering within)
Issues for FCDB  Component Level:

- component coverage
- identification
- definitions
- units and denominators
- modes of expression
- sampling scheme

At Value Level

- extent and treatment of missing
- documentation (source, analytical methods, definition, fortification, food sampling, statistical data etc)
What is needed to analyse nutrients?

- list of foods and nutrients to be analysed (e.g. keyfood approach)
- technical equipment and trained personal, preferable accredited laboratories OR outsourcing to good laboratory
- to produce high quality data we used USDA Evaluation criteria into account:
  - Sample plan
  - Sampling handling
  - Number of samples
  - Analytical method
  - Analytical quality control
Principles about Sampling

Source Y, canned
Source X, raw different cultivars

Carrots
Universe

Source Z, frozen
Experimental Cultivars
Population of consumed carrots

Food Samples

Individual analysis
n=4 as 4 analytical samples

Composite analysis
n=1 as 1 analytical sample
Recipe calculation systems

1. **Summing of raw ingredients** (not recommended)

2. **Ingredient method** (Sum weight of each ingredient as in consumed recipe (edible, yield and retention factors applied at ingredient level); The nutrient values of the recipe will be calculated based on the weight of the relative proportion of each ingredient; Check that yield factors are applied to fluids; **Advantages**: weight loss is measured, therefore more precise)

3. **Total recipe method** (Sum weight of each raw ingredient as in recipe; Measure fat and water change; Apply yield and retention factors at recipe level based on food group of main ingredient. Advantages: need to know weight loss at ingredient level; no need to decide to which category recipe belongs; unequal weight loss of ingredients taken into account)

4. **Mixed method** (yield at recipe level and nutrient retention at ingredient level)
Steps for recipe calculations

Collect recipes
- Decide on recipe calculation system
- Enter all necessary NVs of all ingredients into your system
- Run calculation program
- Document

- **Yield factor (YF):** % weight change in foods or recipes due to cooking.
- **Nutrient retention factor (RF):** % retention of nutrients, especially vitamins and minerals, in food or dish after, e.g. storage, preparation, processing, warm holding or reheating.
- **Edible coefficient (ED):** % weight loss when discarding inedible weight from a food.

We computed ED and YF
Palestinian Food Composition Tables/Database

- It includes data on macro/micro nutrients (160 in total); for 5109 Palestinian food items (raw food items around (1100) and cooked composite dishes (3213).
- It also includes 1138 from the MENA region.
- We used after adaptation and modification of the USDA nutrient database version 9 software as the primary nutrient data source for the study because it is regularly updated, comprehensive and, the data are freely available.
- To ensure that the nutrient content of the foods were appropriate for the local countries, we referred to other sources such as the INFOODS food composition tables, or other regional food composition tables (Lebanon, Egypt, Bahrain, Israel).
Palestinian Food Composition Tables/Database

- Our website will be active in 6 months time

It has several search features:
- Recipes by Course: (salad, soup recipes etc..)
- Recipes by Diet: (Vegan; Vegetarian recipes etc..)
- Recipes by Allergy: (Dairy-free; Gluten-free recipes etc…)
- Recipes by Cuisine: (Palestinian, Lebanese recipes etc..)
- Recipes by taste preference: (salty; sweet; savory; sour; bitter; spicy)
- Recipes by nutrition preference: cholesterol; fat; calories; carbs.
- Recipes by time preference
### Examples (Per 100g Edible Portion)

<table>
<thead>
<tr>
<th></th>
<th>MAKLOUBEH (CAULIFLOWER)</th>
<th>MAKLOUBEH (CAULIFLOWER &amp; CHICKEN)</th>
<th>MAKLOUBEH (EGGPLANT &amp; CHICKEN)</th>
<th>MUSSAKHAN (CHICKEN, TABOUN)</th>
<th>MANSEF (RICE &amp; SHRAK)</th>
<th>KHIEDRA (LAMB CUT)</th>
<th>SALAD (Arabic)</th>
<th>VEGETABLE &amp; VERMICELLI SOUP</th>
<th>SPINACH TRIANGLES</th>
<th>KUNAFA (CHEESE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>133.92</td>
<td>162.45</td>
<td>169.63</td>
<td>250.21</td>
<td>203.49</td>
<td>223.61</td>
<td>18.87</td>
<td>50.85</td>
<td>183.85</td>
<td>282.59</td>
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<tr>
<td>Protein (g)</td>
<td>2.09</td>
<td>10.48</td>
<td>10.65</td>
<td>14.39</td>
<td>3.7</td>
<td>11.9</td>
<td>0.78</td>
<td>1.49</td>
<td>4.81</td>
<td>9.35</td>
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<tr>
<td>Carbohydrates (g)</td>
<td>20.51</td>
<td>12.54</td>
<td>13.57</td>
<td>16.22</td>
<td>32</td>
<td>16.41</td>
<td>4.12</td>
<td>8.04</td>
<td>33.68</td>
<td>20.87</td>
</tr>
<tr>
<td>% Calories</td>
<td>61.15</td>
<td>31.27</td>
<td>32.43</td>
<td>25.29</td>
<td>63.53</td>
<td>29.37</td>
<td>77.25</td>
<td>62.92</td>
<td>72.88</td>
<td>29.37</td>
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<tr>
<td>Dietary Fiber (g)</td>
<td>0.63</td>
<td>0.43</td>
<td>0.38</td>
<td>3.12</td>
<td>1.54</td>
<td>0.24</td>
<td>1.23</td>
<td>0.6</td>
<td>1.09</td>
<td>0</td>
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<tr>
<td>Fat (g)</td>
<td>4.86</td>
<td>7.59</td>
<td>7.83</td>
<td>14.91</td>
<td>6.52</td>
<td>12.25</td>
<td>0.19</td>
<td>1.45</td>
<td>3.43</td>
<td>18.03</td>
</tr>
<tr>
<td>% Calories</td>
<td>32.61</td>
<td>42.59</td>
<td>42.1</td>
<td>52.28</td>
<td>29.14</td>
<td>49.33</td>
<td>8.2</td>
<td>25.43</td>
<td>16.7</td>
<td>57.07</td>
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<td>SAT (g)</td>
<td>0.71</td>
<td>1.72</td>
<td>1.78</td>
<td>2.84</td>
<td>0.72</td>
<td>2.18</td>
<td>0.03</td>
<td>0.21</td>
<td>0.49</td>
<td>9.22</td>
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<tr>
<td>MUFA (g)</td>
<td>1.37</td>
<td>2.63</td>
<td>2.73</td>
<td>8.86</td>
<td>1.77</td>
<td>3.96</td>
<td>0.02</td>
<td>0.37</td>
<td>2.61</td>
<td>4.83</td>
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<tr>
<td>PUFA (g)</td>
<td>2.73</td>
<td>2.67</td>
<td>2.74</td>
<td>2.14</td>
<td>3.35</td>
<td>5.01</td>
<td>0.05</td>
<td>0.71</td>
<td>0.28</td>
<td>28.47</td>
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<tr>
<td>Cholesterol (mg)</td>
<td>0</td>
<td>36.33</td>
<td>37.73</td>
<td>43.25</td>
<td>0</td>
<td>31.86</td>
<td>0</td>
<td>0.06</td>
<td>0</td>
<td>0</td>
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<tbody>
<tr>
<td>Vit-A (mcg_RAE)</td>
<td>0.27</td>
<td>65.36</td>
<td>67.98</td>
<td>82.36</td>
<td>0.04</td>
<td>0.06</td>
<td>113.27</td>
<td>32.8</td>
<td>206.08</td>
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<tr>
<td>Thiamine (mg)</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
<td>0.04</td>
<td>0.03</td>
<td>0.07</td>
<td>0.04</td>
<td>0.03</td>
<td>0.07</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>0.03</td>
<td>0.09</td>
<td>0.09</td>
<td>0.11</td>
<td>0.02</td>
<td>0.12</td>
<td>0.03</td>
<td>0.01</td>
<td>0.11</td>
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<tr>
<td>Niacin (mg)</td>
<td>0.38</td>
<td>2.26</td>
<td>2.36</td>
<td>3.38</td>
<td>0.47</td>
<td>2.67</td>
<td>0.41</td>
<td>0.28</td>
<td>0.33</td>
</tr>
<tr>
<td>Total Folate (mcg)</td>
<td>13.33</td>
<td>19.09</td>
<td>13.5</td>
<td>15.66</td>
<td>2.86</td>
<td>11.05</td>
<td>16.22</td>
<td>5.69</td>
<td>66.06</td>
</tr>
<tr>
<td>Vit-C (mg)</td>
<td>12.06</td>
<td>8.41</td>
<td>0.39</td>
<td>1.12</td>
<td>0.03</td>
<td>0.37</td>
<td>18.93</td>
<td>6.09</td>
<td>4.88</td>
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<tr>
<td>Vit-E (IU)</td>
<td>0.99</td>
<td>0.6</td>
<td>0.62</td>
<td>0</td>
<td>0.72</td>
<td>1.04</td>
<td>0</td>
<td>0.25</td>
<td>0</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>5.19</td>
<td>8.69</td>
<td>6.87</td>
<td>23.27</td>
<td>1.76</td>
<td>8.61</td>
<td>15.2</td>
<td>8.57</td>
<td>55.65</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>7.86</td>
<td>12.06</td>
<td>12.48</td>
<td>43.54</td>
<td>16.18</td>
<td>28.2</td>
<td>11.51</td>
<td>5.97</td>
<td>35.08</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>30.99</td>
<td>73.37</td>
<td>72.32</td>
<td>164.95</td>
<td>47.78</td>
<td>125.49</td>
<td>23.22</td>
<td>12.29</td>
<td>25.36</td>
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<tr>
<td>Potassium (mg)</td>
<td>56.26</td>
<td>98.06</td>
<td>93.38</td>
<td>216.8</td>
<td>43.61</td>
<td>172.06</td>
<td>199.77</td>
<td>65.21</td>
<td>195</td>
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<tr>
<td>Sodium (mg)</td>
<td>262.9</td>
<td>145.1</td>
<td>147.92</td>
<td>409.28</td>
<td>306.51</td>
<td>128.68</td>
<td>186.92</td>
<td>461.19</td>
<td>330.1</td>
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<tr>
<td>Iron (mg)</td>
<td>0.22</td>
<td>0.72</td>
<td>0.72</td>
<td>1.6</td>
<td>0.71</td>
<td>1.16</td>
<td>0.32</td>
<td>0.27</td>
<td>1.43</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>0.32</td>
<td>0.94</td>
<td>0.96</td>
<td>1.45</td>
<td>0.56</td>
<td>2.43</td>
<td>0.18</td>
<td>0.08</td>
<td>0.33</td>
</tr>
</tbody>
</table>
Limitations in use of FCDB

- variability in the composition of foods (Foods are biological material, therefore NVs vary in natural variation; species differences; soil and climate; plant and animal husbandry; storage)

- partial or limited coverage of foods (different foods consumed per country; impossible to cover all)

- partial or limited coverage of nutrients (nutrients and/or nutrient values are missing; new requirements due to new standards or new research questions)

- inappropriate data base (changes in food over time which should be reflected in FCDB)

- errors arising in data base use (Failure to record sufficient details regarding the food (e.g. cooking or processing method); Failure to note whether the total food or edible portion only was weighed; Use of nutrient data for raw instead of cooked foods; Failure to adjust for water, vitamin and mineral loss when calculating nutrient intake from a recipe; weight) Error in matching nutritionally-different foods when substituting for missing foods in the tables/database. Mistakes in conversions (volume to weight, portion description to weight)

- incompatibility of data bases (even analytical values)

- differences in software packages (often black box; users do not have knowledge to use data adequately)

- limitations of methods for measuring food intake (Errors and variations in food consumption (method, underreporting, day-to-day variation, seasonal variation) Limitations in use of FCDB)
International Consultations and Collaborations

- Standards for food composition (food and component nomenclature, data quality, interchange, FCDBMS)
- Reference materials
- Interlaboratory trials
- Capacity development: training courses and material,
  assistance to countries, Examples of networks
  - INFOODS with its regional data centers in collaboration with FAO/UNU
  - EuroFIR