

A Data Entry System for Dietary Surveys Based on Visual Basic for Applications Programming



COMPUTER-BASED INTAKE collection and nutrient analysis systems have been used to manage dietary intake information obtained from large groups of individuals.¹⁻⁴ Some can automatically classify foods into food groups.^{3,4} However, these diet analysis systems were largely designed to collect short-term intake data by food record and 24-hour dietary recall. When used with a standardized diet assessment protocol, bias and incomplete information can be minimized.^{1,5}

Few systems used for collecting information on food intake contain an extensive list of cultural and local food from around the world, nor do they allow documentation of unusual eating habits. In the United States, the Nutrition Data System for Research (NDSR) is a dietary data collection software program developed primarily for research by the Nutrition Coordinating Center, University of Minnesota. It includes an extensive list of foods, recipes, and nutrients, and it can accommodate recipes specific to individuals.^{6,7} NDSR uses the standardized dietary data collection protocol, the automated multi-pass

method, which guides the process of the 24-hour recall with five sequential steps to reduce incomplete information. The steps are as follows: 1) asking the participants to list all of the food items consumed in the previous day; 2) asking the participants for potentially forgotten food items by listing the nine most frequently neglected foods; 3) probing for the time and occasion in which each food item was consumed; 4) probing for detailed information on each food item; and 5) probing for potentially forgotten details of each food item.^{1,2,5}

In Europe, the EPIC-SOFT software was developed by the EPIC Software Corporation for the European Prospective Investigation on Cancer (EPIC) study to collect and analyze food intake, recipes, nutrient intake, and food groups assessed with the 24-hour dietary recall or the food record.³ In Brazil, a dietary data entry system and nutrient composition tables were developed for the Brazilian Household Budget Survey (HBS), a large periodic survey starting in 2000.⁸ In 2009, the evaluation of 7 days of individual dietary intake was initiated by using the food record method, in addition to the HBS method used in previous surveys.⁸ The HBS method documents household expenses for food and beverages in a given period, but it does not collect information on how foods were prepared and consumed, what foods were eaten out of the home, and which foods were consumed by each family member.⁹

Each aforementioned system has built-in nutrient composition tables and serving portions; furthermore, some systems allow for insertions of customized recipes that consider specific geographical areas, dietary practices, and foods. In countries in which the diet analysis software does not have a comprehensive list of local food items, recipes, and serving sizes, users of these systems must rely on nutrient composition and recipe

information from other regions or countries, assuming that the dietary information from other countries is similar to the local information. Therefore, the creation of dietary data collection and analysis software that can be used and adapted easily by users from any region in the world would facilitate collection and analysis of dietary data in many parts of the world. For a borderless dietary data system to be practical to use in situations with few resources, it needs to be a quick, versatile, and low-cost system.

This article describes the development of a dietary data entry system for research that is user-friendly, multipurpose, and adaptable to different lists of food items, recipes, and serving portions for any region of the world, based on the Visual Basic for Application (VBA) in Excel (version 2010, Microsoft).

RATIONALE AND DESIGN

In situations in which available commercial software is not suitable for specific population settings and the nutrient composition of local foods must be manually entered to include local food information, an alternative system for data entry for dietary surveys is needed. Without an alternative system, dietary data entry of population surveys involves repetitive entry of food items and recipes, time-consuming calculations of nutrient and serving size amounts, and matching dietary with nondietary data.

The DietSys system is a surrogate application developed by Sinara L. Rossato, MSc, PhD, a dietitian from Brazil, who has experienced the manual dietary data entry as part of her studies for masters and doctoral degrees.¹⁰⁻¹² The DietSys was created to facilitate incoming dietary data entry and is designed for entering intake information collected with 24-hour recall or food record methods. It also can collect nondietary information along with dietary information. DietSys also enables the calculation of the

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Table. Computational procedures involved in a manual data-entry and nutrient intake assessment when specific software are not suitable for a diet survey; number of files created for a diet survey data entry; number of spreadsheet in the file; and time consumed using the DietSys and the manual system^a

Procedure	File	Spreadsheet	Time in Months	
			DietSys	Manual system
Enter nondietary information	A	1	0.4	0.5
Enter individual dietary information	B	1	2.0	1.4
Review records for accuracy	B	1	0.7 ^b	1.3 ^b
Simplify the multiple food items spellings	B	1	0 ^c	0.5
Encode food item for servings table	B	1	0 ^d	1.8
Convert serving portions into weight and volume	B	2	0 ^d	0 ^e
Check for inconsistency by revising outlier information	B	1	0 ^d	1.1 ^b
Break down recipes into ingredients	C	1	0 ^d	2.0
Revise every new recipe and check for inconsistency	C	1	0 ^d	0.7 ^b
Insert recipes in the original file	B+C	1	0 ^d	1.9
Classify food items into food groups (optional)	B	1	0 ^c	0.5
Estimate nutrient composition by encoding every food item	B	3	0 ^d	2.0
Insert lookup function to search nutrient information in other spreadsheets	B	1	0 ^d	0 ^e
Check for inconsistency in nutrient contents	B	1	0.9 ^b	0.9 ^b
Create a pivot table to arrange information in a nested scheme	B	4	0 ^e	0 ^e
Merge nondietary and dietary information	B+A	5	0 ^d	0.1
Export to the statistical software	D	6	0 ^e	0 ^e
Total time consumed in months			4.0	14.6

^aThe time was estimated based on previous data collection/entry in surveys of 130 to 160 individuals who had the diet assessed by applying four 24-hour dietary recalls,¹⁰⁻¹² considering that one investigator worked around 20 days/mo, 5 h/day in data entry and nutrient intake estimation.

^bFinal procedure consists of revising the data entered and comparing the database with the original questionnaires for capture errors and inconsistencies as a quality control procedure.

^cThe system had the food items and the food groups standardized beforehand.

^dThe system leads to the completion of this step automatically during the data entering.

^eLess than 1 hour is required to execute these procedures.

nutrient composition of diet surveys, using local nutrient composition, serving size, and recipe tables. Using Microsoft Excel resources, the DietSys was programmed to merge both the dietary and nondietary information at the time of data entry, and the data bank was arranged to facilitate the calculations and statistical analysis.

DietSys may be an alternative approach for registered dietitian nutritionists involved in data collection and analysis. In previous studies on populations of healthy adults and adolescents in Brazil,^{10,11} data were manually entered from the 24-hour recall into Excel, using the steps described in the [Table](#).

DietSys reduces the number of steps in the [Table](#) from 17 to the following five:

1. Enter data.
2. Review inconsistency and revise the data entered.
3. Insert the LOOKUP function to bring from the database the information of interest, such as grams or milliliters, and energy or nutrients.
4. Create a pivot table to rearrange data for calculation, such as organize the data per participant, per day, or per meal.
5. Export food and nutrient data to statistical software for analysis.

VBA was used to address three issues involved in the rationale of this system:

1. to manage repetitive data entry, such as to insert one food group or item for several participants using different options for serving sizes, and to identify erroneous calculation of recipe ingredients by allowing the user to review the recipe before recording in the databank;
2. to compel users to interact with different forms and arrangements of foods, recipes, and serving sizes from the respective tables; and
3. to execute procedures that are not available in Excel, such as recording and formatting the data in the data bank, converting serving sizes to amounts of food items or ingredients, revising ingredient proportions from recipes before depositing the data in the data bank, and filling out empty data cells in the final database after data were recorded if information was missing.

The VBA programming is a built-in resource for Microsoft Office software that consists of added codes that execute specific procedures not originally built into the Excel software. To enable the user to activate the procedures, one may insert new buttons linked to sequences of codes. For the DietSys system, we added a few new buttons to trigger specific tasks. For example, the button “Record data in

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