

Developing a computer-assisted personal interviewing tool for food and nutrition surveys based on the food frequency questionnaire in Iran

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ABSTRACT

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Abstract

Development of instruments to measure habitual dietary intake in large epidemiological studies has been investigated extensively. The purpose of this study was to develop a computer-assisted personal interview system (CAPI) system for conducting dietary assessment. A 168-item food frequency questionnaire (FFQ), originally developed for the Tehran Lipid and Glucose Study, is used widely in food and nutrition studies in Iran. In addition to measurement errors at data recording and entry levels, the printed form is time-consuming and costly, both financially and environmentally. This technical report introduces a computer-assisted personal interviewing (CAPI) program to collect food and nutrition data using the Iranian 168-item FFQ. The U.S. Census Bureau's CSPro software was used to construct the CAPI application. The application runs on Android devices and computers with Microsoft Windows operating systems. The language of the CAPI is Farsi. This easy-to-use CAPI tool attempts to reduce time, cost, and human error in nationwide and local nutrition research.

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Introduction

Development of instruments to measure habitual dietary intake in large epidemiological studies has been investigated extensively [1]. A food frequency questionnaire (FFQ) is a practical and widely used tool for dietary assessment [2]. FFQs are used for ranking individuals based on their usual intake of foods and nutrients. Accurate estimation of nutrient intakes is, therefore, crucial for accomplishing such a task [3]. A frequently

used FFQ questionnaire in Iranian food and nutrition studies consists of 168 food items. The questionnaire, originally developed for Tehran Lipid and Glucose Study (TLGS), is similar to the questionnaire developed by Willett [4, 5]. It contains questions about intake frequency and the average consumption of each of the 168 food items during the past year [2]. Food items consumed more frequently according to the Iranian National Food Consumption Survey [5] were included in the questionnaire. Food items, rather than dishes, were used in the FFQ because of variability in the recipes used for food preparation.

In the first step of collecting food consumption

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data, subjects indicate the frequency of consumption for each item, if any, on a daily, weekly, monthly, or yearly basis. For season-specific items, seasonality is also taken into consideration. The next step is to record the amount of each item consumed every time. For each food item on the FFQ, portion size is specified using USDA serving sizes wherever possible. Otherwise, household measures are used. The questionnaire constructed in this way allows for the estimation of average daily intake of each food item measured in grams (after some conversions, of course). Daily consumption could then be used for further analysis (e.g., food pattern identification or macro- and micro-nutrient intake assessment).

One of the major limitations of the FFQ is its reliance on the respondent's memory for collecting information for as far back as 12 months. When interviewer errors in data recording and entry are added, the validity of information collected is compromised. This technical report introduces a computer-assisted personal interviewing (CAPI) program to collect food and nutrition data using Iranian 168-item FFQ. CAPI tools are widely used in surveys around the world. The first nationwide survey using similar tools was conducted in 1987 in the Netherlands [6]. Potential benefits of CAPI include saving time and costs, reducing potential errors, and increasing data quality through consistency checks [7, 8]. As printing and data entry costs are eliminated in CAPI, it is a more viable option for larger surveys budgetwise [9]. Some limitations of CAPI include requiring basic programming skills, pretesting the tablet/mobile set for CAPI (to get the right codes), and running into technical problems during data collection [7].

The CAPI

The U.S. Census Bureau's CSPro software (version 6.2) is used to make the CAPI application [10]. The application runs on Android phones and tablets and computers with Microsoft Windows operating systems (OS). The language of the CAPI is Farsi. For devices with Android OS, one needs to install CSEntry application. Devices with Windows OS use CSPro software itself. A basic familiarity with CSPro software is needed to export the data to third-party software, including R, SAS, Stata, and SPSS.

For each food item in the FFQ, usually, 3 or 4 related questions are developed. For example, to assess lentil consumption (depicted in Figure 1), the frequency of use is asked first (i.e., never,

daily, weekly, monthly, or yearly). Then, the CAPI asks how often the item is consumed at each time unit. Next, the CAPI asks the quantity of lentil consumed each time. For those food items with two or more common portion sizes, another question determines the portion size. For items usually available/consumed at a specific season, a seasonality question is asked before the frequency- and quantity-related questions.

Installing the CAPI

All necessary files to use the CAPI are included in the supplementary ZIP file, FFQ.ZIP. CSPro for Windows-based machines and CSEntry (APK file) for Android devices should be downloaded from the U.S. Census Bureau website.

There are two files in the unzipped supplementary folder, which are the main CAPI files for Android devices: FFQ.PEN and FFQ.PFF. After installing CSEntry, one needs to copy these two files into the application folder (CSEntry). Once these two files are copied, the CAPI will be listed in the application. One needs to provide an operator ID to enter data or start a new interview. The ID could be the operator's name or a unique number.

All interview data will be stored in a data file named FFQ.DAT within CSEntry folder. The application will create the data for the first interview and will append new interviews to this file. It is recommended that you back up this file regularly. Once all interviews are finished, one needs to transfer this data file to a computer system which has the CSPro software installed.



Data Exportation

The FFQ.DAT file could be read, modified, and even completed (i.e., new interviews) on a computer system. The data file should be transferred to the unzipped supplementary folder, FFQ. To export the data file to another statistical software (e.g., SPSS, R, SAS), one needs to open

the FFQ project by double-clicking on FFQ.ENT file in FFQ folder. It should be reminded that the complete FFQ.DAT file, which contains the interviews, should be transferred to the unzipped folder at this stage. To export data using CSPro go to:

TOOLS → EXPORT DATA

Locate FFQ.DCF file in the unzipped folder when “Open data dictionary file” window appears. Tick the box atop the left side of the CSExport window to select all variables. From the “Export Format” box of the window, select the data format (e.g., SPSS). Tick the “Unicode Output” option from the right side of the window as well. Then click on “RUN” in the file menu to create the desired format. A new window will appear that asks for CSPro data file to export. Locate the FFQ.DAT file in the unzipped folder and click “open.” Click “open” when a new window opens to specify names. This procedure creates two new files in the FFQ folder: EXPORTED.DAT and EXPORTED.SPS. The second file contains SPSS syntax. Running this file will read the EXPORTED.DAT file into SPSS.

Data Management

The FFQ folder contains another SPSS syntax file (CONVERT.SPS) that converts all items to average daily consumption (in grams). Once the data is exported to an SPSS data file following the procedure illustrated above, run the CONVERT.SPS file. After running the syntax code, a new variable containing the average daily consumption for the last year will be created for each food item. One could use these variables for further analysis.

Discussion

As the printed FFQ needs extra time and cost for data entry and is prone to more human errors, this electronic form of FFQ was developed. This is the first tool of its kind that could be used for collecting food and nutrition data in Iran using a valid 168-item FFQ. The tool is designed with CSPro, a software package developed and supported by the U.S. Census Bureau. Among large-scale surveys using CSPro are the Demographic and Health Surveys (DHS) program conducted by Macro International in various developing countries [11], the Living Standards Measurement Study (LSMS) by the World Bank, and the Multiple Indicator Cluster Survey (MICS) by UNICEF [7]. The existing

literature shows that data collected with CAPI tools are as valid as paper questionnaires. CAPI tools even help to reduce human error in data collection and entry. For example, a randomized survey experiment among 1840 households, designed to measure household consumption (of goods) using both pen-and-paper interviewing (PAPI) and computer-assisted personal interviewing (CAPI) found that PAPI dataset contained a large number of errors, which could be avoided through CAPI [9].

This easy-to-use CAPI tool attempts to reduce time, cost, and human error in nutrition research at national and local levels. The SPSS syntax saves research time as well by converting the raw data into a single average daily consumption variable for each food item. CAPI can be used for all age group as long as the FFQ is valid.

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Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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