Recent Developments in Nutrition Surveys: Self-Report-Based Assessment Tools Are Still Invaluable

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Summary Accurate measurement of diet is a prerequisite for nutrition research of all kinds, including surveillance and observational and intervention studies with regard to nutrition-related outcomes, but remains a big challenge. It is well acknowledged that no dietary assessment methods are free from measurement errors. Nevertheless, self-report dietary assessment tools are still invaluable not only because the study of nutrition cannot be isolated from the reality of food intake but also because objective biomarkers are available for only a few dietary components, without providing any insights into what people actually eat or drink or related contextual factors. Here, the author provides a brief introduction of selected novel techniques of self-report-based dietary assessment tools: Intake24 (an online dietary recall system), FoodNow (a smartphone food diary application), and Food Combination Questionnaire and Meal-based Diet History Questionnaire designed for assessing eating behaviors and meal patterns. Despite their inherent limitations, self-report-based dietary assessment tools are still useful and indispensable for, particularly, eating behaviors and meal patterns. For each study, the most appropriate dietary assessment method should be selected based on its purpose, design, population, and resources. Continuous efforts should also be made to develop and evaluate new dietary assessment tools.

Key Words dietary assessment, self-report, dietary recall, dietary record, questionnaire

Intake24, an online self-report 24-hour dietary recall

Intake24 is an online, self-administered 24-h dietary recall system developed at Newcastle University, UK (5). The basis of Intake24 is a well-established multiple-pass 24-h recall method (6) where the respondent recalls all foods and drinks consumed in the preceding 24 h. A series of food photographs (over 2,400 in total) are used for portion size estimation. The food composition databases cover more than 2,500 food items. Intake24 was developed through four cycles of user-testing and feedback (7). A study of 180 participants aged 11–24 y found that the accuracy of Intake24 was comparable to that of interviewer-administered 24-h dietary recall (8). Further, the accuracy of energy intake estimated by Intake24 was validated using doubly labeled water (9). Taken together, Intake24 offers a low-cost, low-burden alternative for collecting dietary information in large-scale dietary surveys. The system has been used or is currently used in a number of studies in the UK, and has been adapted for introduction in the UK National Diet and Nutrition Survey Rolling Programme from October 2019. Additionally, Intake24 is being translated into other languages for international use, with versions available for Portugal, Denmark, New Zealand, and the United Arab Emirates and with those for India and Australia under development.

FoodNow, a smartphone food diary application

FoodNow is a smartphone food diary application developed at Deakin University, Australia (10). For measuring dietary behaviors, FoodNow has unique characteristics including the ability to capture an image of the eating occasion, record a text description of the eating occasion, and record a voice message describing the foods and drinks consumed. Thus, FoodNow allows the participants to record all foods and drinks consumed at an eating occasion, using their own smartphones (iPhone or Android). FoodNow also asks a number of questions relating to food acquisition and preparation (e.g., who prepared and purchased the food items, cook-
ing methods, and meal preparation time) and situational factors (e.g., persons present while eating, activity while eating, location of eating, and location of food purchase). An evaluation of FoodNow comparing energy intake and energy expenditure assessed by a motion sensor has shown good agreement between these methods (10). Thus, FoodNow is useful for collecting information on actual dietary behaviors and related contextual factors. Using FoodNow, research found that factors associated with meal skipping varied according to the specific meal skipped (11) and sugar-sweetened beverages were often consumed with other foods and the amount consumed was associated with individual and situational factors (12).

**Food Combination Questionnaire and Meal-based Diet History Questionnaire**

The Food Combination Questionnaire (FCQ) is a 4-page, self-administered questionnaire designed for distinguishing food combinations at each meal type (13). The basis of the FCQ is a food combination database developed using 16-d dietary records from 242 Japanese adults. An analysis showed that daily dietary intakes estimated by FCQ were comparable with those estimated by a well-established diet history questionnaire (14). Based on the FCQ, the most common food combinations consisted of rice, vegetables, and noncaloric beverages for all main meals (breakfast, lunch, and dinner) among Japanese adults, while those for snacks consisted of confectioneries and noncaloric beverages. The FCQ may be useful in capturing the complex nature of food combinations.

The Meal-based Diet History Questionnaire (MDHQ) is a self-administered questionnaire designed for estimating food and nutrient intakes for each meal type separately (15). The MDHQ consists of three different parts: consumption frequency of generic food groups for each meal type, relative consumption frequency of sub-food groups within one of the generic food groups, and general eating behaviors. Because the development of MDHQ is based on comprehensive information on actual food consumption, this innovative tool may be promising for future chrononutrition research. A rigorous evaluation of the effectiveness of the MDHQ is currently underway (16).

**Conclusions**

Despite their inherent limitations, self-report-based dietary assessment tools, including those described here, are still useful and indispensable for, particularly, eating behaviors and meal patterns, mainly because of a lack of objective measurements for what people actually eat or drink and related contextual factors. For each research project, the most appropriate dietary assessment method should be selected based on its purpose, design, population, and resources. Continuous efforts should also be made to develop and evaluate new dietary assessment tools.

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