Journal of Applied Research in Intellectual Disabilities 2008, **21**, 168–173

Food on Film: Pilot Test of an Innovative Method for Recording Food Intake of Adults with Intellectual Disabilities Living in the Community

Kathleen Humphries, Meg Ann Traci and Tom Seekins

The University of Montana Rural Institute, Research and Training Center on Disability in Rural Communities, Missoula, MT, USA

Accepted for publication *22 June 2007*

Background Adults with intellectual or developmental disabilities need dietary monitoring but are not likely to be able to provide accurate dietary intake data via traditional methods. Pilot study efforts to meet their support needs with a novel and practical approach to dietary intake data collection are described in this brief report.
Materials and Method Still photography kits were used by nine adult volunteer participants with intellectual disabilities who lived in group homes or in semi-independent living arrangements to capture images of the food they consumed over 24 h.
Results Use of photographs during dietary intake interviews improved the reliability of the participants' responses. Mean reliability ratings improved from 'Indiscernible/Poor' (mean range 1.0–1.7) to 'Good/Excellent' (mean range 3.6–5.0).
Conclusions Our preliminary data imply that *Food on Film* is an effective and appropriate tool for use in community settings and warrants further testing.

Keywords: developmental disabilities, diet, learning disorders, mental retardation, nutrition, nutrition surveys

Introduction

Nutrition education and counselling are keys to successful independent living for people with intellectual or related developmental disabilities (I/DD). In the past, nutrition services for persons with I/DD were targeted to those residing in institutional settings (American Dietetic Association 2004). Today, most people with I/DD in USA live in the community, either with family or other small communal arrangements. In 2005, about 84% of people with I/DD who received residential services from either state or nonstate agencies lived in places with 15 or fewer residents. About 45% lived in residences with three or fewer people. The large, institutional settings are closing down, with every year fewer people with I/DD living in them (Prouty & Lakin 2006).

The U.S. Surgeon General (2002) declared improved nutrition for this population to be a national priority, partly because of their nutritional vulnerability. Accomplishing this objective depends on our ability to measure the nutritional status of the population as well as to test the efficacy of health promotion interventions. These are measured by testing individuals' dietary intake.

There are a variety of traditional and novel approaches to measuring dietary intake in individuals. In general, there are two types of dietary intake collection methods: retrospective approaches (e.g. 24-h recall, food frequency questionnaires and diet histories) and prospective approaches (e.g. weighed or estimated food records) (Gibson 2005). Retrospective approaches rely on the individual's memory of what was eaten, when and how much. Prospective methods, where a person records what and how much he ate at the time of consumption, tend to be a more accurate reflection of what was actually eaten, though reactivity in the diet as a result of measuring and recording can be a problem.

The ability to remember, record and accurately describe what one eats varies from person to person. Various supports have been developed to assist individuals in either recalling or recording their dietary intake. Some of these include newer methods where data

 10.1111/j.1468-3148.2007.00392.x

collection is assisted by electronic devices such as still photographs (Bird & Elwood 1983a,b; Williamson *et al.* 2003, 2004), videotaped food records (Brown *et al.* 1990), audio-taped food records (Lindquist *et al.* 2000) and telephone recalls (Godwin *et al.* 2004). These supports have been explored with varying degrees of success among adults without disability, but they have limited applicability to this population and/or are not practical for non-research settings, including nutritionists working in communities.

There is no validated method for dietary intake assessment for adults with I/DD. Nutrition researchers have suggested that adults with I/DD are unlikely to provide accurate dietary intake data via traditional prospective or retrospective methods, even though they are a nutritionally vulnerable population who could benefit from dietary monitoring (Smith 1993; van Staveren *et al.* 1994; Kumanyika *et al.* 1997; Lindquist *et al.* 2000; Braunschweig *et al.* 2004). Problems with memory, comprehension, dexterity, literacy skills and communication make recalling, recording and estimating quantities of food and the time the food is eaten a challenge in the population. Some individuals have unique communication skills and styles that limit their ability to relay information to the interviewer, and healthcare providers, dieticians and nutritionists may not have experience in working with adults with I/DD or the skills to understand unique communication styles. In some cases, proxy reporters are able to assist with food records. However, for most adults living independently in the community, a 24-h proxy reporter is neither realistic nor desirable. We hypothesized that the 24-h diet recall method could be refined and supported effectively by combining it with still photographic food records, creating a practical and appropriate tool for use in community settings.

Materials and Methods

Participants

The nine adult volunteer participants were served by the Montana (USA) Developmental Disabilities Program, and lived in group homes or in semi-independent living arrangements. The four men and five women participants represented different types of intellectual and developmental disabilities, including Down syndrome, cerebral palsy, Prader-Willi syndrome and idiopathic intellectual disability. The participants had mild to moderate intellectual disabilities without additional chronic conditions affecting cognition, such as dementia. Their ages averaged 49 years for men (range 39–61) and 45 years for women (range 35–51). All participants communicated verbally, without assistive devices. This study was approved by the Institutional Review Board at the University of Montana and all participants signed a consent/assent form, as did their legal guardians when required.

Materials

Each *Food on Film* research kit (Figure 1) contained a laminated instruction/prompt card and a 35 mm Olympus TRIP AF 50 automatic camera with time/date stamp (Olympus Inc., Center Valley, PA, USA). The camera was loaded with Kodak GOLD 100/24-exposure film (Eastman Kodak Company, Rochester, NY, USA). To provide a standard background for measurement of food pictured in the photographs, each kit also contained five large place mats and five small place mats marked with 1-in. grids. Kits were stored in insulated lunch bags to protect the camera and film from direct heat and accidental damage. After the interviews, participants kept the lunch bags as a study incentive.

Procedure

Participant interviews followed the 24-h dietary recall standard method from the U.S. Centers for Disease Control and Prevention, National Health and Nutrition Examination Study (NHANES) Multiple-Pass Method (Moshfegh *et al.* 1999) procedures with minor modifications that simplified participants' response burden. The NHANES 24-h recall method uses a five-step

Figure 1 Contents of the Food on Film research kit.

multiple-pass approach, whereby trained interviewers work with the participant to recall all food and drink consumed, including quantities, for the previous 24 h. The five steps are:

1 Collect a 'quick list' of foods and beverages consumed the previous day.
2 Probe for foods forgotten during the quick list.
3 Collect time and eating occasion (e.g. breakfast, lunch) for each food.
4 For each food, collect detailed description, amount and additions. Review 24-h day.
5 Final probe for anything else consumed.

In some cases, support persons were present during interviews, but they did not provide dietary intake information. The result of each of the recall interviews is a food list, with all food and beverages consumed, their quantities, and the time consumed.

Preliminary testing (Interview 1) of the 24-h recall showed poor reliability in this sample. Based on these results, the *Food on Film* method was developed and pilot-tested with the same study sample. Development of the method and planning and executing the pilot meant there was a 1-year span between the initial 24-h recall (Interview 1) and the pilot test of *Food on Film* (Interviews 2 and 3). Rather than compare the two methods 1 year apart, where intervening variables and events could account for the improvement or lack of improvement using the new method, we conducted another standard 24-h recall interview (Interview 2) with each participant.

The *Food on Film* dietary intake recording protocol began with an evening training session. The field researcher taught the protocol and use of the camera and kit to participants and distributed kits. Participants practised taking photographs of food. On the following day, for a 24-h period, participants photographed food before and after each eating occasion. At the end of the day, the researcher collected the kits and had the film processed.

Participants completed a 24-h diet recall (Interview 2) using the identical NHANES protocol as Interview 1 on the day after they took the photographs. Interview 2 was conducted both to account for intervening variables during the previous year that might explain differences between what were ultimately called Interview 1 and Interview 3, and to use an Interview 1 versus 2 comparison to gauge whether the act of taking the photographs itself improved dietary intake recall.

Interview 3 was conducted immediately after Interview 2. Here, the individual's photographs, arranged chronologically, were used as communication supports and memory prompts for the participant to recall all foods and beverages consumed during the previous 24 h. Each photograph had a time/date stamp, and hence in Interview 3 it was unnecessary to ask when the participant had eaten the foods shown. Photographs were not part of the dietary intake recall in Interviews 1 and 2.

Data analysis

The NHANES reliability criteria were applied to each of the three interviews from all participants. The reliability criteria for the NHANES are based on the interviewer's assessment of the interviewee's participation and judgement whether the participant was 'very confused or confused with the 24-hour recall period, or (subject) had a very difficult time remembering and not giving a reasonable effort or changed their mind several times' (National Center for Health Statistics 2002). Interviews in this study were judged as unreliable if they met those criteria as assessed by the researcher conducting the interview.

A qualified [Registered Dietician (RD)] independent rater, analysing blinded food lists from Interviews 1, 2 and 3 (three for each participant) assessed the reliability of interview data using a five-point Likert scale, on which 1 = no answer (unreliable/indiscernible answer) and 5 = excellent (reliable/clear answer), for three questions: (1) What food did the participant eat? (2) How much did the participant eat? (3) When did the participant eat the food item? Question (3) was answered for the Interview 3 data by recording the time/date stamp on the photograph.

The score differences between the interviews for each variable for each participant were compared using descriptive statistics. A mean score for the nine participants' responses to each question for each interview was calculated and differences described.

Results

One hundred per cent of Interviews 1 and 2 produced 24-h recalls that were rated 'unreliable' based on the NHANES criteria. Problems included participants' inability to orient their responses to the previous 24 h inclusive and only that time period, and difficulty remembering and changing their responses. No participant was considered to be 'not giving a reasonable effort'.

Comparisons of respondents' answers between Interview 1 and Interview 2 indicated that taking photo-

graphs in itself did not improve their ability to recall either what was eaten, how much or when. Ratings by the RD showed an overall <0.2 point difference between each participant's Interview 1 and Interview 2 scores. Therefore, we used the scores for only Interview 2 to compare with Interview 3 to test the effect of using the photographs.

Table 1 shows the scores of each participant for Interviews 2 and 3 on each of the three variables. Figure 2 is a visual description of those data, showing changes in each variable for each participant with a standard 24-h recall (Interview 2) and with the photographic support (Interview 3).

Results of comparing Interviews 2 and 3 (Table 2) showed that use of photographs during interviews improved the reliability of the participants' responses. Mean reliability ratings improved from 'Indiscernible/Poor' (mean range 1.0–1.7) to 'Good/Excellent' (mean range 3.6–5.0) on the three variables tested.

Discussion

Food on Film yielded useful information about dietary adequacy and variety across food groups. The resulting data could describe daily servings of food groups, food habits, diet patterns (meal and snack timing), characteristics of eating occasions and food preferences.

However, *Food on Film* could not reliably measure all aspects of food intake, such as 'invisible' nutrients (e.g. table salt, dietary fats) or visually identical foods (e.g. whole versus low-fat milk). It is possible that it could be combined with food disappearance data, recipe and menu reviews, interviews with primary food preparers, and/or dietary logs kept by support persons to provide more detailed dietary data.

Table 1 Individual participants' scores on Interview 2 and Interview 3 food intake variables

Participant	*What foods eaten? (Int. 2/Int. 3)*	*How much food? (Int. 2/Int. 3)*	*When eaten? (Int. 2/Int. 3)*
1	2/5	2/5	1/5
2	1/3	1/4	1/5
3	1/3	1/4	1/5
4	1/4	1/3	1/5
5	1/3	1/4	1/5
6	4/5	2/5	1/5
7	3/3	2/4	1/5
8	1/2	1/2	1/5
9	2/4	1/5	1/5

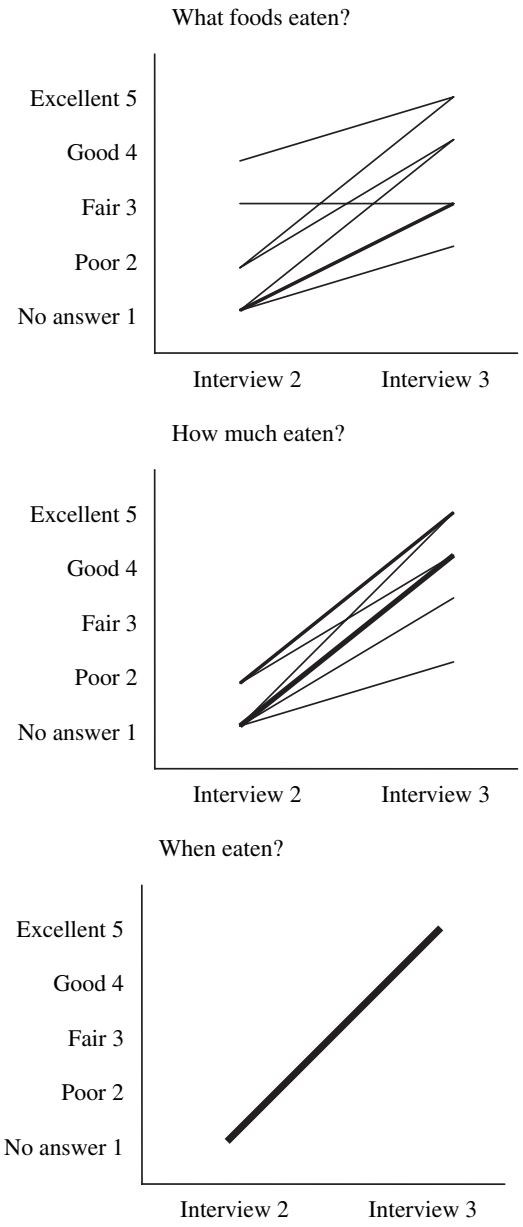

Figure 2 Differences between 24-h recall interview without (Interview 2) and with (Interview 3) photographic supports on three test variables.

At times, the photographs not only appeared to operate as memory aids, but they also functioned as communication supports. For example, in Interview 2, some participants described what they ate, but the interviewer was unable to understand the response. In Interview 3, the interviewer was then able to use the photograph to correctly interpret the participant's description and

Table 2 Mean ratings of reliability

	Interview 2 μ (range)	*Interview 3 μ (range)*	*Difference μ2 − μ3*[1]
What food?	1.7 (1–4)	3.6 (2–5)	+1.9
How much?	1.2 (1–2)	4.0 (2–5)	+2.8
When?	1.0 (1)	5.0 (5)	+4.0

[1]Difference between Interview 2 and Interview 3 mean values.

some participants responded by pointing to their food items in the photograph.

While we show that using the photographic images of the foods consumed improved the 24-h recalls, we did not test whether using the photographs as the exclusive data source was reliable. That is, the use of the photographs was always coupled with an interview with the participant. A study is currently underway to test the hypothesis that the *Food on Film* photographic method can produce reliable data without the need for additional interviews or records.

Taking the photographs itself did not appear to affect the participants' ability to recall what, when or how much they ate, as evidenced by the similar scores from Interviews 1 and 2. Cognitive decline among participants over the 1 year between the interviews is certainly possible and would be difficult to rule out entirely. However, staff indicated that no major health or chronic conditions changes were evident in the 12 months between the recall interviews.

The similarity in individuals' scores from Interview 1 to 2 supports the notion that, in this population, additional training or prompting will not help individuals to recall at a later date what they ate previously or how much. Additionally, it was found that the participants were very cooperative and appeared to be trying to remember. They need material support to be able to generate the data needed for an accurate dietary analysis. *Food on Film* appears to provide that support.

Nutrition plays an important role in creating greater independence in living setting and in keeping individuals with I/DD healthy enough to maintain their independence. Nutrition-related health maintenance, such as keeping blood sugar within normal range or maintaining a healthy weight, are factors that can either make it possible to live with maximum independence or to require more dependent settings, which is not desirable.

As a scientific community, we believe that individuals need nutrition interventions and supports that have been evaluated for population-specific effectiveness and for efficacy in preventing and managing secondary conditions. Evaluating nutrition interventions and supports requires that we measure an individual's dietary intake. To date, there have been no convenient, inexpensive and reliable methods for conducting dietary intake assessments for this population of adults with I/DD living independently in the community. *Food on Film* has the potential to fill this gap.

Food on Film may have applications beyond use with adults who live in the community and who have intellectual disabilities. It may also be appropriate for use with adults who have other cognitive impairments such as traumatic brain injury or dementia. The methodology has potential for use in multi-cultural populations where participants and interviewers (e.g. dieticians, health educators) have significant communication barriers because of language or unfamiliar food items or customs. In rural areas where regular face-to-face access to healthcare professionals is difficult, *Food on Film* could be used as an important telemedicine application.

Further testing of the reliability and validity of the new method is warranted. This modification to food records may provide a useful tool to community-based nutritionists working with vulnerable populations.

Acknowledgments

The information provided in this manuscript was supported by Cooperative Agreement Number U59/CCU821224 from the Centers for Disease Control and Prevention (CDC). The contents are solely the responsibility of the authors and do not necessarily represent the official views of the CDC. Special acknowledgment and appreciation are extended to the participants, their support persons and service providers.

Correspondence

Any correspondence should be directed to Kathleen Humphries PhD, The University of Montana Rural Institute, Research and Training Center on Disability in Rural Communities, Missoula, MT 59812, USA [Tel: (406) 243-2515; e-mail: khumphries@ruralinstitute.umt.edu].

References

American Dietetic Association (2004) Position of the American Dietetic Association: providing nutrition services for infants, children and adults with developmental disabilities and

special health care needs. *Journal of the American Dietetic Association* **104**, 97–107.

Bird G. & Elwood P. (1983a) The dietary intakes of participants estimated from photographs compared with a weighed record. *Human Nutrition: Applied Nutrition* **37A**, 470–473.

Bird G. & Elwood P. (1983b) A photographic method of diet evaluation. *Human Nutrition: Applied Nutrition* **37A**, 474–477.

Braunschweig C., Gomez S., Sheean P., Tomey K., Rimmer J. & Heller T. (2004) Nutritional status and risk factors for chronic disease in urban-dwelling adults with Down syndrome. *American Journal on Mental Retardation* **109**, 186–193.

Brown J., Tharp T., Dahlberg-Luby E., Snowdon D., Ostwald S., Buzzard I., Rysavy D. & Wieser M. (1990) Videotape dietary assessment: validity, reliability, and comparison of results with 24-hour dietary recalls from elderly women in a retirement home. *Journal of the American Dietetic Association* **90**, 1675–1679.

Gibson R. (2005) *Principles of Nutritional Assessment* 2nd edn. Oxford University Press, Oxford.

Godwin S., Chambers E. & Cleveland L. (2004) Accuracy of reporting dietary intake using various portion-size aids in-person and via telephone. *Journal of the American Dietetic Association* **104**, 585–594.

Kumanyika S., Tell G., Shemanski L., Martel J. & Chinchilli V. (1997) Dietary assessment using a picture-sort approach. *American Journal of Clinical Nutrition* **65**, 1123S–1129S.

Lindquist C., Cummings T. & Goran M. (2000) Use of tape-recorded food records in assessing children's dietary intake. *Obesity Research* **8**, 2–11.

Moshfegh A., Borrud L., Perloff B. & LaComb R. (1999) Improved method for the 24-hour dietary recall for use in national surveys. *FASEB Journal* **13**, A603.

National Center for Health Statistics (2002) *National Health and Nutrition Examination Survey (NHANES)*. Centers for Disease Control and Prevention, Atlanta, GA.

Prouty R. & Lakin K. (2006) *Residential Services for Persons with Developmental Disabilities: Status and Trends through 2005*. University of Minnesota, Institute on Community Integration, Minneapolis, MN.

Smith A. (1993) Cognitive psychological issues of relevance to the validity of dietary reports. *European Journal of Clinical Nutrition* **47** (suppl. 2), S6–S18.

van Staveren W., de Groot L., Blauw Y. & van der Wielen R. (1994) Assessing diets of elderly people: problems and approaches. *American Journal of Clinical Nutrition* **59**, 221S–223S.

U.S. Surgeon General (2002) *Closing the Gap: A National Blueprint to Improve the Health of Persons with Mental Retardation*. U.S. Surgeon General, Washington DC.

Williamson D., Allen H., Martin P., Alfonso A., Gerald B. & Hunt A. (2003) Comparison of digital photography to weighed and visual estimation of portion sizes. *Journal of the American Dietetic Association* **103**, 1139–1145.

Williamson D., Allen H., Martin P., Alfonso A., Gerald B. & Hunt A. (2004) Digital photography: a new method for estimating food intake in cafeteria settings. *Eating and Weight Disorders* **9**, 24–28.

