


 Graduate & PhD Course
Measuring Dietary Behaviour the intelligent way
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Dietary assessment methods in adolescents – traditional and an overview of new ones

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Adolescents

FROM 10 to 19 YEARS OLD




Adolescence

Intense changes

- Physical, emotional, affective, cognitive, intellectual, social
- Affect every aspect of life
- Assessing the diets of adolescents may be challenging

Traditional methods applied in the dietary assessment of adolescents

FOOD RECORDS

Prospective

Information on current intake

- Record all foods and beverages eaten during one day
- Foods, preparations, cooking methods, ingredients, amounts, time, brands, types etc

Habitual eating patterns may be influenced by the recording process

Reliability decreases over time

Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

FOOD RECORDS

High participant burden

participants need to be highly motivated
literate and cooperative

Post record interview: very important for data quality

Children must:

To be able to recognize names and brands of foods, ingredients of preparations, amounts, measurements

Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

24-HOUR DIETARY RECALL

Retrospective

Information on current intake

Structured interview (in person or by phone)

Trained interviewer asks to recall all food and drink consumed in the day before (last 24h)

Lower participant burden

No literacy required

Standardization of data collection may be a problem

- Improved: Multiple pass method (USDA)

Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

24-HOUR DIETARY RECALL

Details on food are required:

- Amount
 - Kind
 - Brands
 - Preparations, ingredients
- Depends on memory
Needs trained interviewer
Underreport is common
Resources to reduce underreport
- Photos, models, kitchenware
 - New technology (mobile phones, software)



Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

For both: dietary records, 24-h recall

- Must include weekdays and weekends
- Nutritional database needed for analysis
- Updating database is always a problem
- Data treatment and analysis requires nutrition expertise
 - Coding foods and preparations requires skill

Burrows et al., 2012; Collins et al., 2010; Bouhey et al., 2009; Gibson, 2005

FOOD FREQUENCY QUESTIONNAIRE (FFQ)

- Retrospective
- Information on long-term intake in recent (or remote) past
- Designed to capture usual food intake
- Long-term food patterns
- Respondents are asked to report usual frequency of consumption of specific foods
- Time frame: 1, 3, 6 or 12 months
- Self-administered or interview-administered
- Usually higher estimates than food records and recalls

Burrows et al., 2012; Collins et al., 2010; Bouhey et al., 2009; Gibson, 2005

FOOD FREQUENCY QUESTIONNAIRE (FFQ)

- Less detail regarding food consumed, cooking methods and portion size
 - Quantification is not accurate
- Used for ranking: high, intermediate, low intake
- Less expensive to administer
- Practical for analysis, but
- Needs intense work for design, validation

Burrows et al., 2012; Collins et al., 2010; Bouhey et al., 2009; Gibson, 2005

FOOD FREQUENCY QUESTIONNAIRE (FFQ)

- Low respondent burden?
 - Not really!
 - Can be time repetitive and time-consuming
 - Needs cognitive ability to understand [mean or usual] frequency of consumption [during a specific time frame]
 - Report is influenced by recent food consumption
- Highly dependent on memory and cognition

FFQ for adolescentes (Brazil): vertical design

Com que frequência você comeu estes alimentos nos últimos 3 meses?

| | |
|---|--|
| <p>1) Carne bovina com osso ou sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>2) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>3) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>4) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>5) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>6) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>7) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>8) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> | <p>9) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>10) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>11) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>12) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>13) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>14) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>15) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>16) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>17) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> <p>18) Carne bovina sem osso, cozida, assada ou grelhada, com ou sem molho</p> |
|---|--|

Options to report frequency of consumption are different according to the use of food

To reduce overreport

The FFQ is supported by food pictures

FOOD FREQUENCY QUESTIONNAIRE (FFQ)

- Quantification may not be valid
 - Poor estimation for portions
 - Food specification is limited
- Can be useful in longitudinal studies
 - Case-control
 - Cohort
- Useful in statistical modelling to estimate habitual intake with replicates of 24-h recall and food records
- Elaboration can be demanding (validation)

Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

Error in adolescents' dietary assessment

Dietary intake cannot be estimated without error
 Attempts to reduce error are important

- to measure the magnitude of the error
- to evaluate its effect on the estimates

- Two kinds of error
- Bias
 - random error

Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

Bias in adolescents' dietary assessment

- Over- or underestimation of intake
- The direction and magnitude of the bias varies between-subjects
 - Some participants may under-report, others over-report
 - or all individuals systematically over or under-report (usually related to the instrument in use)
 - Bias may be associated with a characteristic
 - Weight status, physical activity, gender

Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

Bias when assessing dietary intake in adolescents

Alteration of habitual intake because of the dietary assessment (common in food records)
Recall bias and influence of recent food consumption

- Improve interview techniques / use of new technology

Burrows et al., 2012; Collins et al., 2010; Boushey et al., 2009; Gibson, 2005

Reducing error and participant burden in dietary assessment of adolescents: **enhancing motivation, improving estimates**

Using devices in dietary assessment of adolescents

- Computer (software) / PDA (palm top)
- Mobile phone / Camera

Boushey et al., 2009

Improving dietary assessment of adolescents

- Standardization of data collection
- Strategies to improve portion size estimation
- Data analysis: global estimates of the diet (dietary patterns)

Collins et al., 2014

Computer-assisted dietary assessment

Very detailed data

Interactive

Self-administered or interviewer-administered

Standardized data collection

Examples

- Global Diet Initiative: LA-Dieta – Latin America Dietary Assessment

Simari, 2015; Bloch et al., 2015; Karafidi et al., in press

Global Diet Initiative:
LA-Dieta – Latin America Dietary Assessment

GloboDiet initiative: An international research-policy maker framework

PAHO
LA-Dieta project
Possible extension to other countries

EURO
European
Europe
consortium

WPRO
S. Korean version
Possible extension in other countries (Japan)

AFRO
African
Africa
initiative

EMRO
Saudi Arabia, Qatar (?)
and other countries from Africa/Middle East

International Agency
Research on Cancer
World Health Organization

Simani, 2015

Advanced GloboDiet versions –
Brazilian preliminary version

Quantification using photos

Simani, 2015

NCI (US) ASA24 <http://asa24demo.westat.com/default.aspx>

Automated Multiple Pass Method

Journal of Human Nutrition and Dietetics

REVIEW

Food Intake Recording Software System, version 4 (FIRS5t4): a self-completed 24-h dietary recall for children

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The Food Intake Recording Software System, version 4 (firs5t4), is a webbased 24-h dietary recall (24 hr) self-administered by children based on the Automated Self-Administered 24-h recall (ASA24)

Journal of Human Nutrition and Dietetics
Journal of Human Nutrition and Dietetics

RESEARCH PAPER

Reducing the cost of dietary assessment: Self-Completed Recall and Analysis of Nutrition for use with children (SCRAN24)

E. Foster, A. Hawkins, J. Delve & A. J. Adamson
Human Nutrition Research Centre, Institute of Health & Society, Newcastle University, Newcastle upon Tyne, UK

Background: Self-Completed Recall and Analysis of Nutrition (SCRAN24) is a prototype computerised 24-h recall system for use with 11–16 year olds. It is based on the Multiple Pass 24-h Recall method and includes prompts and checks throughout the system for forgotten food items.

Journal of Human Nutrition and Dietetics
Journal of Human Nutrition and Dietetics

RESEARCH PAPER

WebDASC: a web-based dietary assessment software for 8–11-year-old Danish children

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Using mobiles in dietary assessment of adolescents

Challenges for using mobiles in dietary assessment

1. Different kinds of food have similar appearance that is hard to distinguish from a camera's point of view. The diversity of foods makes it impossible to recognize all of them
2. A meal usually has more than one food items. It is hard to segment those foods with irregular shapes. The varying lighting conditions make this problem even harder.
3. The amount of food is another factor affecting the calorie assessment. Sometimes people will not eat the whole meal. It is necessary to estimate the portion consumed.
4. How practical is to implement these algorithms on a mobile phone?

Kong & Tan, 2012

Considerations about the use of mobiles in dietary assessment

- *Easy and fast collection of daily food images:* potentially a more accurate way to record meals in comparison to methods of recalling or written record
- *Minimum user interaction:* User interface should be easy to use and the interaction needed to record or review eating occasions should be minimal.
- *Flexible eating patterns:* The system should be flexible enough so that various eating patterns in real life, such as multiple eating occasions per day and the addition of foods during an eating occasion can be collected.

Kim et al.m 2010

Considerations about the use of mobiles in dietary assessment

- *Protection of personal data:* Users' food images and additional private data should be kept private. Hence, food images on the mobile telephone should be hidden from other people.
- *Automatic data processing:* Data is sent to a server and users do not know details of data processing.
- *Exceptional situations:* Additional methods should provide users with tools to manually save or modify eating occasions.

Kim et al.m 2010

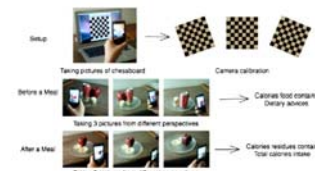
Using mobiles



DietCam: Automatic dietary assessment with mobile camera phones
 Fanyu Kong*, Jindong Tan
 Department of Electrical and Computer Engineering, Michigan Technological University, 1400 Townsend Drive, Houghton, MI, 49931, United States

Kong & Tan. DietCam: Automatic dietary assessment with mobile camera phones. 2012

a mobile phone based system, DietCam, to help assess food intakes with few human interventions. DietCam only requires users to take three images or a short video around the meal, then it will do the rest. The experiments of DietCam in real restaurants verify the possibility of food recognition with vision techniques.



Nutrients 2015, 7, 5375-5395; doi:10.3390/nu7075226

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Article
A Novel Dietary Assessment Method to Measure a Healthy and Sustainable Diet Using the Mobile Food Record: Protocol and Methodology

Amelia J. Hurray ^{1,2,3,*}, Carol J. Boushey ^{2,3,4,5}, Christina M. Pollard ^{1,4}, Edward J. Delp ⁶, Ziad Ahmad ⁷, Satvinder S. Dhallwaj ¹, Syed Aqif Mukhtar ⁸ and Deborah A. Kerr ^{1,2}

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Development of a dietary assessment method to accurately assess key indicators of a healthy and sustainable diet that are not measured during traditional dietary assessment methods.

Kerr et al. BMC Public Health 2015, 15:417
 http://www.biomedcentral.com/1471-2458/15/417

BMC Public Health

STUDY PROTOCOL **Open Access**

Connecting Health and Technology (CHAT): protocol of a randomized controlled trial to improve nutrition behaviours using mobile devices and tailored text messaging in young adults

Deborah A. Kerr^{1,2}, Christina M. Pollard^{1,4}, Peter Howat^{1,5}, Edward J. Delp⁶, Mark Pickering⁷, Katherine R. Kerr¹, Satvinder S. Dhallwaj¹, Ian S. Pratt^{1,8}, Jarine Wright¹ and Carol J. Boushey^{2,3}

Development of the mobile device food record (MDFR)
 Participants will take images of all food and drinks consumed over a continuous 3 day period
 TADA - Mobile Phone Food Record to assess dietary intake – Boushey et al., 2009

Thank you!

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