Title: A Manual for Using Digital Image Food Records

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Outline of manual

- Intro and purpose for manual and method
  - Challenges in diet assessment
  - Why use this method
  - Recap our study
  - Lessons learned
- Materials needed
- Instructions for taking an image of food/meal
- Instructions for analyzing images of food
  - Example (with figure) of analyzing a meal image
- Additional resources
  - Papers that describe the method well
    - Matthiessen
    - Boushey
    - Small
    - Swanson
  -
- Appendices
  - Placemat
  - Food log

Purpose for manual:

The purpose of this manual is to describe how to use the digital image of food record method to assess dietary patterns. If dietary patterns are assessed over a time period, it is possible to look for changes in the pattern. Such changes may be a result of nutrition programs, and it is important to assess changes in dietary patterns when evaluating the effectiveness of these programs. This manual provides guidelines on how to use a new method to capture changes in dietary behavior. Training people to use this method will improve the development of evidence-based programs based on nutrition education messages that have been proven to show changes.

Nutrition education messages that encourage eating a balanced meal based on MyPyramid can be evaluated by looking at changes in intake of food groups. A group of researchers recently validated the use of this method to assess the intake of the MyPyramid food groups (grains, fruits, vegetables, milk, and meat and beans) for foods eaten after 5pm by children aged 9-12 years. However, the study was not done as part of a nutrition program, so changes over time could not be analyzed. The study also found that the person who analyzes the images of meals needs to be trained in the method. Further research needs to be done properly using this method in conjunction with a nutrition program.

There are many different adaptations that could be made to this method, but this manual focuses on that procedure that was used by Matthiessen et al. and includes small changes based on strong recommendations.

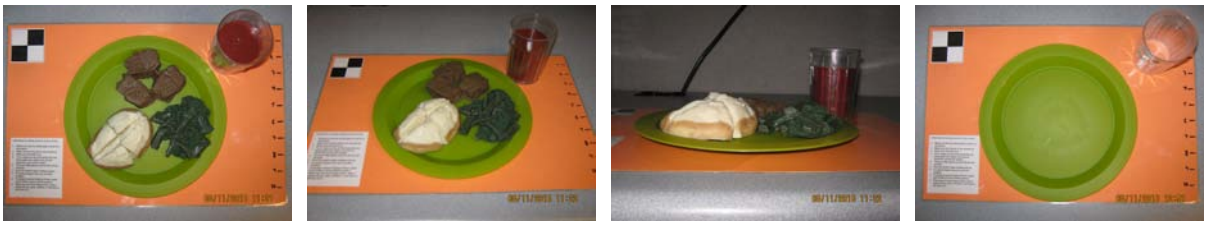
Materials needed for DIFR

- Digital cameras
  - One per participant
    - Some subjects may already have a camera they can use
  - "Point and shoot" style
  - Canon PowerShot A470 worked well, but check *Consumer Reports* or other sources for latest reviews
    - ~$100 each
  - Preferably with a rechargeable battery
- Memory cards (SD cards)
  - 1GB is enough for 1 month of 3 meals/day
- Placemats (Appendix XX)
  - Laminated poster board
    - Cut card-stock quality poster board to 11" x 17" to fit into Menu Size (12"x18") laminating pouches
  - Inch-marks on one side to help quantify foods
  - Instructions for taking images of foods included on placemat for easy reference
- Food log sheets (Appendix XX)
  - Have enough space to include date, meal type (if applicable), and food details
- Pouches/binders to help organize food log and camera
- Computer to view images
- Additional materials to help estimate food amounts
  - Measuring cups/spoons
  - 2-D portion size handouts
  - 3-D food models
    - Nasco© Food Replica Models, www.enasco.com/nutrition
  - MyPyramid.gov
  - *Portion Photos of Popular Foods*
    - Mary Abbott Hess
    - Published by American Dietetic Association, 1997
    - ISBN: 088091162X

Instructions for taking images of meals/snacks

In this section, some considerations for researchers are described. Depending on the aims of assessment, the instructions may differ from study to study. These points are not intended to be used directly by the subjects but rather as a guide for the researchers. From this list, researchers should develop their own simplified subject instructions.

- Make sure that the whole plate, bowl, cup or dish is in the image. To do this:
  - Put all food and drinks on the placemat, including condiments and water.
  - Frame the borders of the placemat with the camera
- Make sure the photo is readable by the researcher. To do this:
  - Make sure that the inch-marks on the placemat are not covered
  - Make sure the flash is on
  - Make sure all of the foods that are being eaten are visible in the image. To do this:
    - Uncover items. Foods such as sandwiches and burritos need to be opened up or unrolled before the photo is taken.
    - For items like lasagna or taquito where opening the food is not possible, be sure details are written in the food log about the food on the placemat. If food is eaten out of a large multi-serving bag, like chips or pretzels, a handful of the food should be taken out of the bag. An image of the food should be taken before and after it is eaten. Repeat for every handful. In the food log, record how many handfuls were eaten.
- Hold the camera directly above the food, framing the placemat in the viewfinder. Push the button and review the screen to be sure the image was captured. Take a second snap-shot of the food from a 45° angle and a third shot from a 0° angle (See figure X). This will give depth to the images and allow the height of foods to be evaluated. Repeat after the completion of the meal. If not food is left, only a 90° shot needs to be taken.
- Encourage subject to take multiple images. If an image doesn't turn out well, it's easy to just take another.
- Make sure additional helpings are recorded. To do this:
  - Take a picture of the plate before adding the additional food.
  - Take another picture after adding the additional food.
  - Take a final picture before you clear your dishes.
- When the meal is done, take an image of the plate, whether or not there is still food on it.
- If a subject forgets to capture the meal, he/she can do their best to re-create it with leftover foods.



(a) 90° angle view (b) 45° angle view (c) 0° angle view (d) 90° angle view after meal

Figure X. Pre-meal images from (a) 90°, (b) 45°, and (c) 0°, and a post-meal image from (d) 90°.

Methods for analyzing images of food

- Collect cameras/SD cards from subjects
- Transfer images to computer
- Organize images into folders by subject, then by day
  - Folder: Subject 129
  - Image files: (day)1-(image)1, 1-2, 1-3, 2-1, 2-2, 3-1, 3-2, etc….
- View all images by day to get a sense of how each eating episodes went (meal, snack, etc.)
  - Pay special attention to the time between images
- View food log to identify the foods in the image
- Go through the meal, food item by food item, looking at the before/after images, and estimate how much of each food was consumed
  - Use measuring cups and food models to help estimate quantities
  - Use inch-marks to help figure out actual size of foods
- Enter food and amount into food analysis software system (Food Processor®, FoodWorks©, NDSR©, MyPyramid Tracker, etc.)
  - Choose food type that best represents the food that is in the image
    - For mixed dishes, either select the dish itself, or each of the ingredients
    - Make sure that the foods that are selected have food group values associated with them (i.e. pepperoni pizza should have values for the grain, vegetable, milk, and meat and bean groups)
  - Enter food amount
- Calculate food group intake values
  - Will be different for each software system
  - Can either calculate by meal, day, week, etc.
- Establish some general rules for coding to be consistent
  - The following are rules that other researchers have used:
    - any food that cannot be seen is not coded
    - if there is no post-meal image, assume all foods were eaten
    - if multiple images were taken within five minutes and look the same, assume it is the same serving
      - this may work better for meals than for snacks
    - if images are more than five minutes apart and it is not clear whether or not it is the same food as in the “before” image, assume it is a separate serving
  - Develop other rules as necessary for research design

DATE	DAY OF WEEK	FOODS (include a brand name if possible)
(example) 10/31	Tuesday	Mashed potatoes Green beans Fish – mahi mahi Milk Pumpkin pie

Instructions for taking a picture of your dinner
Make sure that the whole plate or bowl is in the picture
Make sure that the grid is not covered up
Make sure the flash is on
Try to make sure all of the foods that are being eaten are visible in the picture (sandwich and burrito insides)
Time and date stamp must be ON and set correctly
Don't be afraid to take multiple pictures
If a picture doesn't turn out, just take another!
If you get a second helping of food, make sure to take a picture before eating it.
When you are done eating dinner, take a picture of your plate, whether or not there is still food on it.