

Measuring Dietary Intake in Studies of the Determinants of Overweight among Children

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Types of Diet Data Collected

- **Prevalence of healthy or unhealthy eating**
 - Eating ≥ 5 servings of fruits & vegetables
 - Eating a high fat diet
- **Estimated mean nutrient intake per day**
- **Exposure to unhealthy eating influences**
 - Fast food
 - Vending machines

Methods for Assessing Intake

- **24-hour recalls**
- **Diet Records or Food Diaries**
- **Short Diet Screeners**
- **Food Frequency Questionnaires**

- **Inability or unwillingness to recall dietary intake is a limitation of *all* methods**

24-Hour Recalls

- **Most widely used method and considered a “gold standard”**
- **Assessments are conducted by trained interviewers using visual cues, such as food models, to estimate portion size**

Strengths of 24-Hour Recalls

- **Considered an accurate method**
- **Portion sizes are estimated for all foods**
 - Valuable information to collect
- **Contextual information can be collected**
 - Important information for better understanding *why* TV is associated with weight gain
- **Probing by interviewer minimizes the chance of foods being forgotten**

Limitations of 24-Hour Recalls

- **Requires a highly trained interviewer who skillfully uses memory aids and probing questions**
- **Requires face-to-face or phone interviews, thus may not be time efficient due to scheduling issues**
 - **Logistical difficulties if sample is spread out**

Limitations of 24-Hour Recalls

- **Dietary intake tends to differ on weekdays and weekends**
 - **Best to collect multiple 24-hour recalls, including both weekdays and weekend days**
- **Labor intensive, so expensive**
- **Not a good measure of long-term intake**

Dietary Records or Food Diaries

- **Subjects are asked to keep a diary of the foods, including beverages, they have consumed**
 - **Components of mixed dishes**
 - **Amounts (e.g., 3/4 cup of mashed potatoes)**
- **Subjects are sometimes asked to report on context in which food was eaten**
- **Diaries are kept for multiple days**

Strengths of Records and Diaries

- **Detailed information on dietary intake over multiple consecutive days gives a better indicator of usual diet than does a single 24-hour recall**
- **Can be used in dietary interventions, including weight loss programs, to make participants more aware of their diet, a helpful teaching tool**

Limitation of Records and Diaries

- Large respondent burden
- Subjects may change their eating pattern to make it easier to report (e.g., limit mixed dishes) or underreport foods (e.g., 1 cookie instead of 3 cookies) that they consider to be unhealthy (demand characteristics)

Limitation of Records and Diaries

- **Although subjects are instructed to report food immediately, they may wait to complete the record until the end of the day or the reporting period, thus recall errors are possible**
- **Expensive**
 - **Subjects should be compensated**
 - **Data must be entered into a database**

Short Diet Screeners

- **Brief set of questions to assess 1 or more components of diet**
 - fruits and vegetables
 - high fat foods
- **Used in large studies where diet is not the primary focus:**
 - YRBSS
 - Add Health

Strengths of Short Diet Screeners

- **Data suggests that screeners validly measure intake of fruits and vegetables**
- **An option when space is very tight and the decision is between no questions or a short list of questions...but one set of fairly inaccurate questions is worse than no questions at all...**

Limitations of Diet Screeners

- **Probably generate inaccurate estimates of macronutrients, particularly fat since it is contained in many foods**
 - **Are we underestimating true associations?**
 - **Are we seeing spurious associations?**

Food Frequency Questionnaires (FFQ)

- **A less expensive alternative to the 24-hour recalls and food diaries**
- **A “checklist” of foods that measures long-term dietary intake (e.g., intake during the past month, past year...) that is more substantial than a brief screener**

Reasons that FFQs Were Developed...

- The goal of diet assessments in nutritional epidemiology studies of adults is to *rank* subjects in terms of diet and to be able to *discriminate between* subjects
- The FFQs were *not* developed to precisely estimate caloric intake

Selecting Foods to Include on a FFQ

- Sufficient variation in nutrient or food of interest
- Sufficient quantity of the nutrient in the food
- Foods assessed should be the ones “that most discriminate between individuals rather than those that contribute most to absolute intake”

Walter Willett, *Nutritional Epidemiology*, 1990

Food Frequency Questionnaires (FFQ)

- **Portion size may be included as part of the assessment, but errors in estimation of portion size may limit utility of assessing the information**
 - **People are best at estimating portion sizes that are well recognized servings: bottle of beer, can of Coke, etc.**
 - **Estimation of other portion sizes (e.g., 4 oz of meat, 8 oz of soda) is poor**

Portion Size Estimation on FFQs

- **Some FFQs collect no information on portion sizes**
- **Semiquantitative FFQs specify a portion size as part of the question**
 - **Milk (8 oz glass)**
 - **Bacon (2 slices)**
- **Quantitative FFQs include assess frequency of consumption and usual portion size of the food (e.g., Block FFQ)**

Mixed Dishes

- **Some FFQs do not include mixed dishes. Instead, subjects are expected to report the components of mixed dishes**
- **The Youth/Adolescent Questionnaire, assesses mixed dishes and assume the components and size of the mixed dishes do not vary across subjects**

Mixed Dishes

- **Expecting subjects to remember to report the components of mixed dishes may result in underestimating intake**
- **There are a wide variety of mixed dishes, no questionnaire could include them all and still be a manageable length**
 - **Which ones should be included?**
 - **Asian mixed dishes may be the most difficult to capture**

Mixed Dishes

- **Burrito**
- **Chicken teriyaki wrap**
- **Beef chow mein**
- **Pot stickers**
- **Fast food breakfast sandwich**

Strengths of FFQs

- **Self-administered, so well suited for large studies**
- **Provides an estimate of long-term intake**
- **Adequate to good ability to rank subjects in terms of macro and micronutrient intake**
- **Inexpensive**

Limitations of FFQs

- **Portion size issues:**
 - Minimal information on portion size
 - Portion size information may have considerable measurement error
- **Better at ranking subjects than assessing absolute intake**
- **Correlation between FFQ and 24-hour recalls or diet records is only modest for total calories**

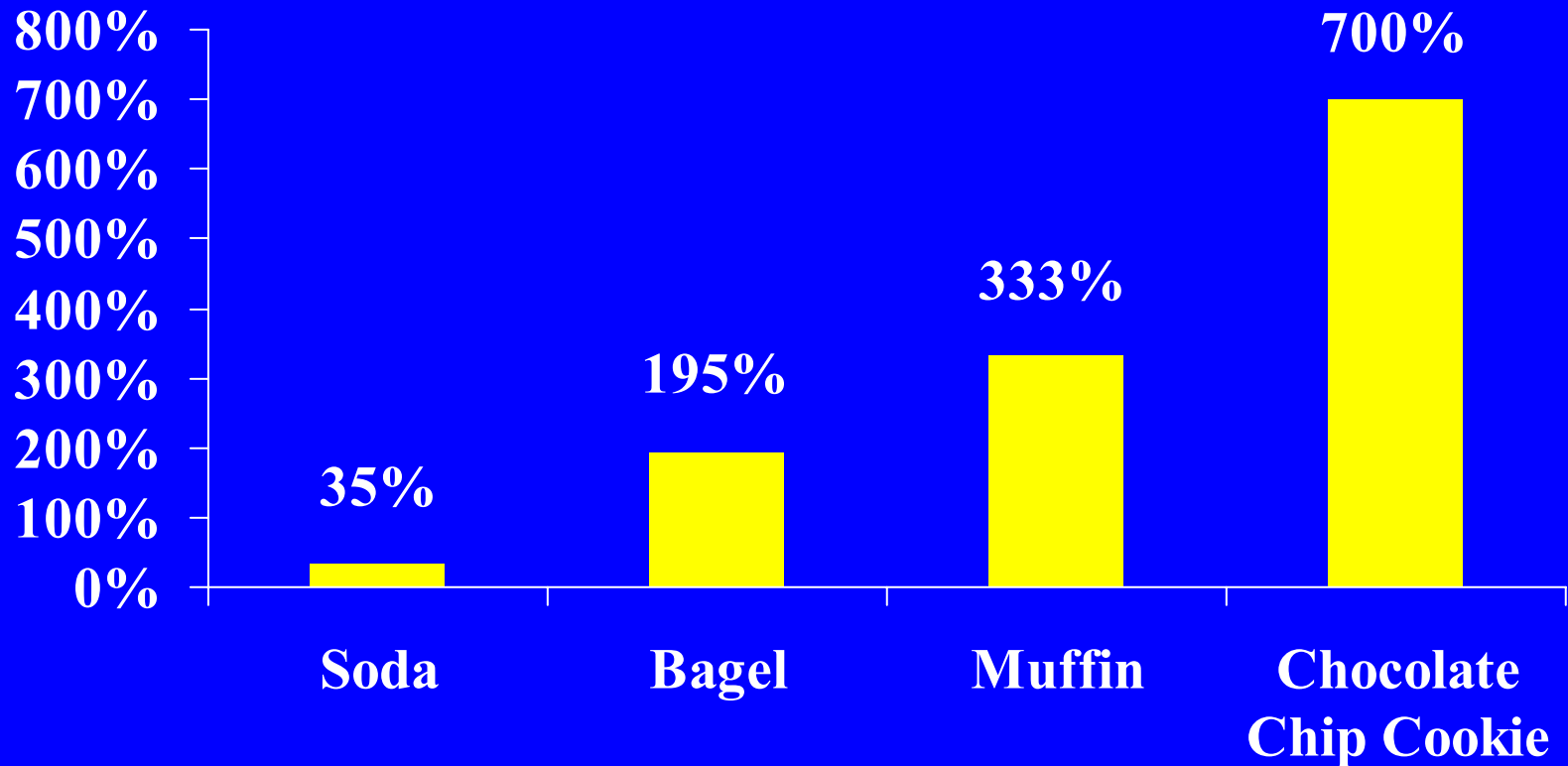
The Difficulty of Assessing Diet Regardless of the Method

- **Memory and/or willingness to report intake**
- **Trends in food intake change**
 - **Low and no fat items**
 - **Low carb craze**
- **Prepared foods are becoming more common**
 - **Do people know what they are eating when they consume prepared foods?**
 - **Portion sizes of prepared foods vary widely**

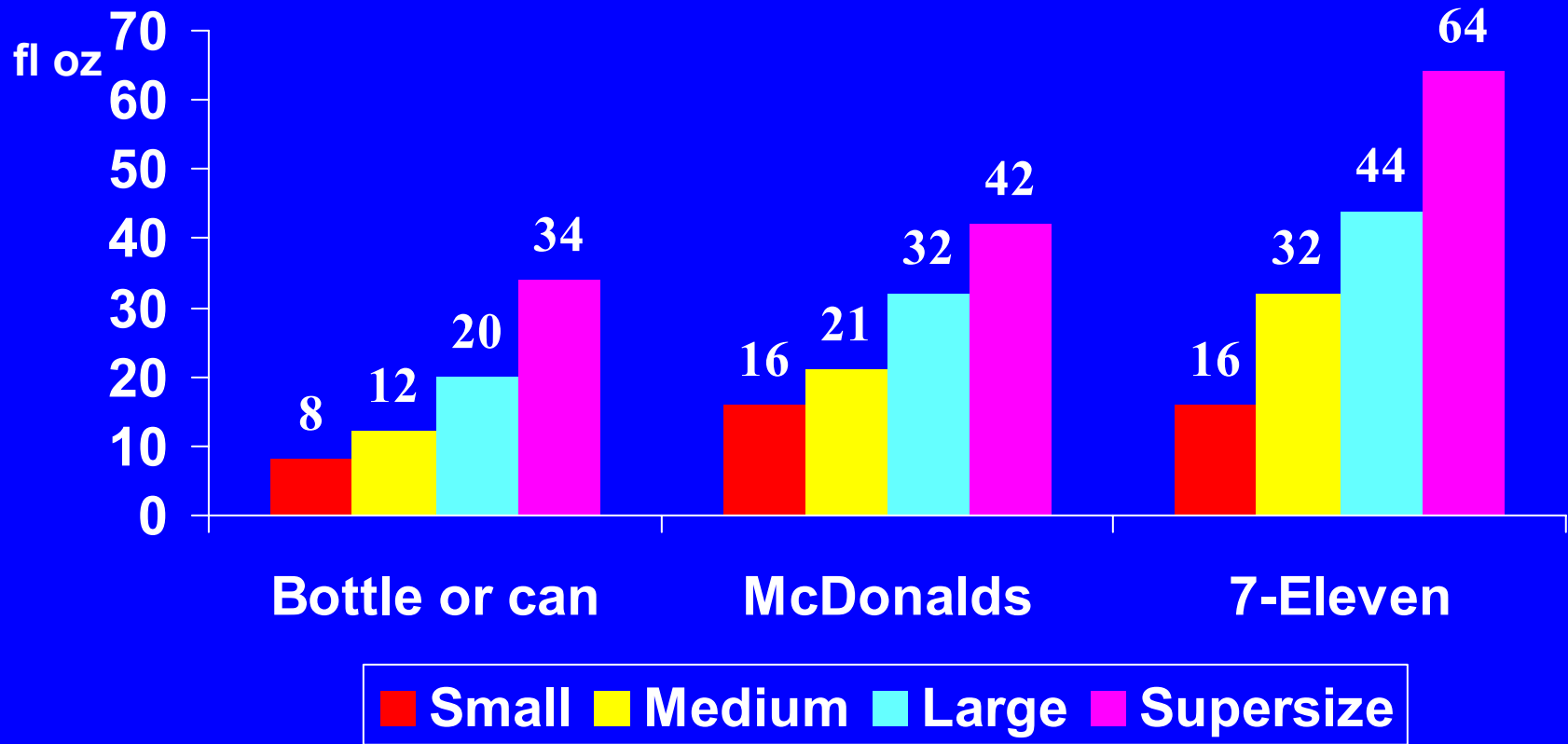
Impact of Food Prepared Away From Home

- **Between the 1970s and 1990s, there was an increase in the number of calories consumed away from home**
 - **How aware are people of what they are eating?**
- **Servings sizes may be bigger at restaurants and convenience stores than at home**
 - **Time to revisit the portion size question...**

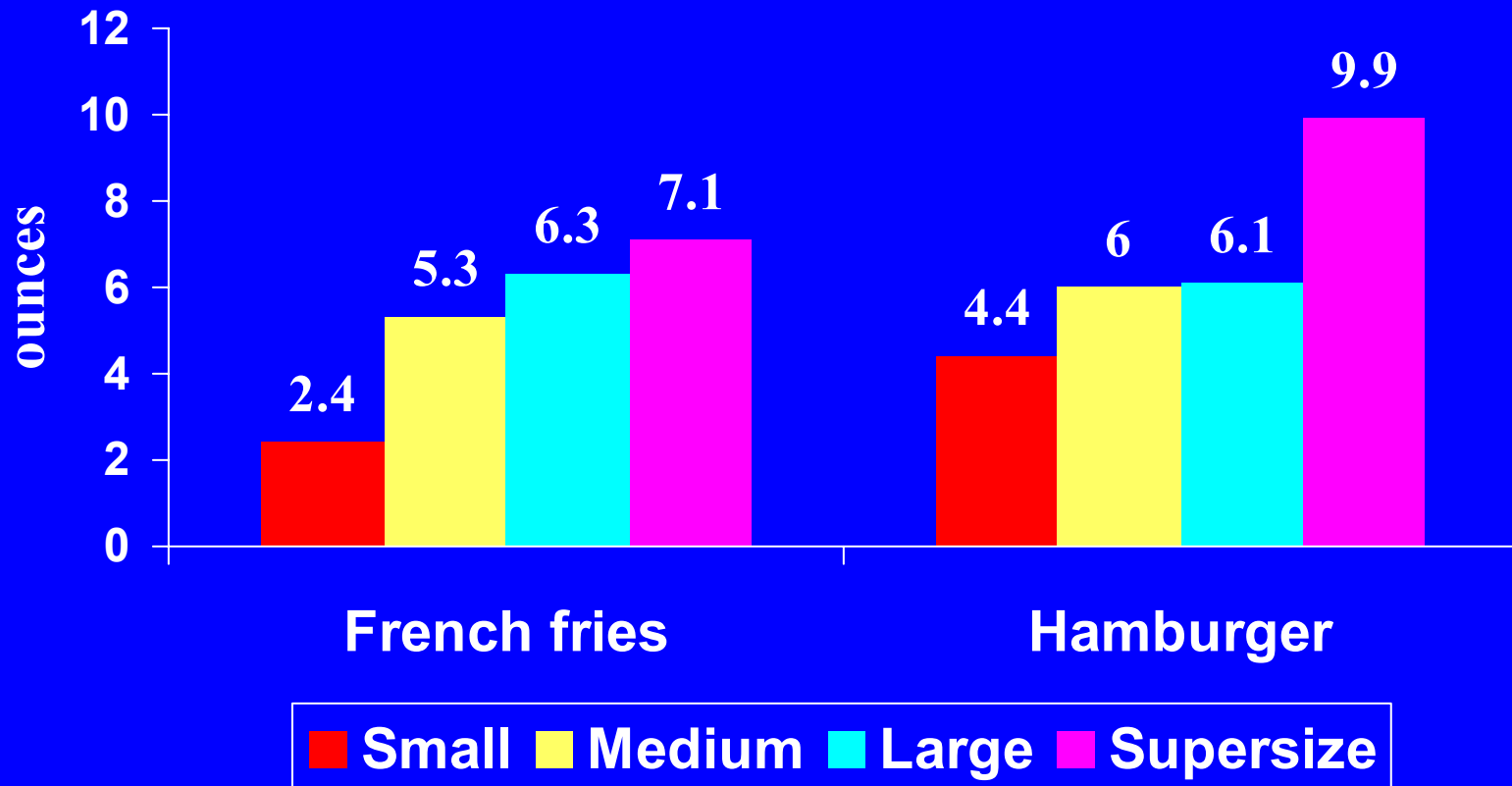
Difference between actual portion sizes of ready-to-eat foods and USDA portion sizes



Serving Sizes of Soda



Portion Sizes at Fast Food Restaurants



The Need to Study Options for Addressing Portion Size

- **Increase the default serving size from the USDA portion sizes to portion sizes reported by Young and Nestle (2002)?**
- **Include questions on where food was purchase (e.g., bag of package cookies from the grocery store vs. baked in a bakery) and use the information to assign average portion size?**

Portion Size Estimation

- **If children and adolescents cannot estimate portion size, would a quantitative FFQ add more error than using default portions?**
- **Preliminary data from a pilot study suggests that adolescents felt confused if they consumed a portion size different from that specified in the question**
 - **Large fries instead of medium**
 - **1 slice of pizza instead of 2**

The Need to Study Options for Addressing Portion Size

- **Studies are needed to**
 - **Assess how well children can report on portion size**
 - **Assess how children answer questions when they consume a serving size that is different from the one specified**
 - **Compare the validity of questionnaires with portion size information to semiquantitative questionnaires**

Assessing Portion Size

Usual serving size of soda?

- **Can of soda**
- **20 oz bottle with a twist off top**
- **Glass of soda from other size bottle**
- **Purchased from a fast food restaurant or 7-11**
 - **Small**
 - **Medium**
 - **Large**
 - **Super size/Big Gulp**

Assessing Portion Size

- **Should we combine serving size with source information?**

Usual serving size at home:

- **Can**
- **20 oz bottle with twist off top**

Usual serving size of soda bought at food court, restaurant, movie theater, or 7-11:

- **Small**
- **Medium**
- **Large**
- **Supersize or big gulp**

Estimating Calories

- **Although it is true that a slight inequality in the ratio of energy intake to energy expenditure should result in weight change, none of the diet assessment tools currently used in epidemiological studies is accurate enough to detect modest difference between dietary intake and energy expenditure**

Unhealthy Eating Influences

- **Exposure to unhealthy eating influences**
 - **Fast food**
 - **What counts as fast food?**
 - **Pizza Hut? Chinese take-out?**
 - **Taquerias?**
 - **Vending machines**
 - **Removing them or replacing what is in them?**

Unhealthy Eating Influences

- **To better understand dietary intake we need to assess context**
- **Easiest to assess with diet records or 24-hour recalls, but those aren't practical methodologies for many studies**
- **Questions need to be crafted and tested that could be include on surveys**

Summary

- **Dietary assessment tools commonly used are most appropriate for predicting health outcomes & assessing dietary patterns**
- **Dietary assessments that are valid for ranking people, may not be sufficiently accurate for estimating prevalence or precisely estimating energy intake**

What Does this Mean?

- **FFQs may need to be updated to capture**
 - **Portion size**
 - **Eating context**
 - **Mixed dishes**
- **At a minimum, validated questionnaires should be validated again to make sure they still capture the diets of children and adolescents**

Where Do We Go From Here?

- **Recalls can provide useful data on serving sizes and context**
- **FFQs are the most practical assessments, but they may not be sufficiently precise to predict the development of obesity**
- **Questions on where and why people eat may be better predictors of weight gain than dietary information per se.**
 - **Surveys should assess these domains**