

measurement ERROR webinar series

Introduction to the problem of measurement error in dietary data

(Webinar 1)

Objectives:

- Define concepts related to usual dietary intake.
- Identify random and systematic errors that may occur in dietary assessment and their impact on estimates of dietary intakes.
- Describe statistical concepts underpinning approaches to correcting for measurement error in self-report dietary intake data.

Recommended resources:

- Dodd KW, Guenther PM, Freedman LS, Subar AF, Kipnis V, Midthune D, Tooze JA, Krebs-Smith SM. Statistical methods for estimating usual intake of nutrients and foods: a review of the theory. J Am Diet Assoc. 2006;106(10):1640-50.
- National Cancer Institute usual intakes web pages: <http://riskfactor.cancer.gov/diet/usualintakes/>

Key terms:

Attenuation factor	The multiplicative factor by which an estimate of a regression coefficient is shrunk due to measurement error in a covariate.
Between-person variance	A measure of the spread of values among persons.
Biomarker	For the purposes of the webinar series, a biological (usually biochemical) indicator or measure of dietary intake or nutritional status.
Constant additive error	A component of systematic error that consists of a constant value that is added to the true value for each person.
Food frequency questionnaire (FFQ)	A dietary instrument that asks respondents to report their usual frequency of consumption of each food in a list of foods over a specific period of time.
Intake-related bias	Systematic deviation from the truth arising from correlation between error and true intake; for example, persons with low energy intake may overreport intake and persons with high energy intake may underreport intake.
Long-term instrument	A dietary instrument that captures intake over a long period of time, such as a food frequency questionnaire.

Measurement error	The difference between the observed or measured value and the true value.
Observing Protein and Energy Nutrition (OPEN)	A study conducted by the National Cancer Institute in 1999-2000 to assess dietary measurement error using two self-report instruments (24HR and FFQ) and unbiased biomarkers of energy and protein intakes; included 484 men and women aged 40-69 years living in Montgomery County, Maryland.
Person-specific bias	The difference between an individual's reported intake averaged over many repeated measures and true usual intake, after taking constant additive error and intake-related bias into account. It is constant within an individual but randomly changes between individuals, with a mean of zero and constant variance.
Random error	A source of error that contributes variability (reduces precision) but does not influence the sample mean or median.
Random within-person error	Variation in the observed value of a variable when it is repeatedly measured in the same individual; for example, day-to-day variation in dietary intake reported using multiple 24-hour recalls.
Reference period	The time period to which a dietary assessment instrument pertains, such as 24 hours for a 24-hour recall, some number of days for a food record, or the period the participant is asked to recall (usually 30 days to 1 year) for a food frequency questionnaire.
Short-term instrument	A dietary instrument that captures intake over a short period of time, such as a food record or 24-hour recall.
Systematic error (bias)	A source of error in which measurements consistently depart from the true value in the same direction; affects the sample mean or median and can result in incorrect estimates and conclusions.
True intake	Actual intake, which cannot be observed in practice among free-living individuals.
Twenty-four-hour dietary recall (24HR)	A dietary instrument that requires the respondent to remember and report all foods and beverages consumed in the preceding 24 hours or during the preceding day.
Usual intake	Long-term average daily intake, taking into account both consumption and nonconsumption days.
Within-person variance	A measure of the variation in repeated observations of a variable in the same person. In dietary measurement using 24-hour recalls, it is the day-to-day variation in reported dietary intake of an individual.