

measurement ERROR webinar series

Estimating usual intake distributions for dietary components consumed daily by nearly all persons (Webinar 2)

Objectives:

- Identify considerations in estimating usual intakes of nutrients and foods consumed nearly daily by nearly all persons.
- Describe statistical modeling techniques and associated data requirements for estimating usual intake distributions for nutrients and foods consumed nearly daily by nearly all persons.
- Describe assumptions made in current approaches to estimating usual intake distributions and challenges in self-report dietary data not addressed by current statistical modeling techniques.

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.
- Tooze JA, Kipnis V, Buckman DW, Carroll RJ, Freedman LS, Guenther PM, Krebs-Smith SM, Subar AF, Dodd KW. A mixed-effects model approach for estimating the distribution of usual intake of nutrients: the NCI method. *Stat Med.* 2010;29(27):2857-68.

Key terms:

Back-transformation	A mathematical technique used to restore a variable to its original scale after a transformation has been applied.
Between-person variance	A measure of the spread of values among persons.
Box-Cox transformation	A type of power transformation; often applied to skewed data to lessen skewness or to approximate normality.
Day-of-week effect	A phenomenon indicating how overall mean intake varies according to the day of the week.
Distribution	The pattern of values taken on by a random variable.
Iowa State University (ISU) method	A statistical modeling approach used to estimate distributions of usual intake.
Mean	An indicator of central tendency, derived as the average of a set of values (the sum of the values divided by the number of values in the set).

Measurement error	The difference between the observed or measured value and the true value.
Median	An indicator of central tendency, derived as the middle value in a set of ordered numbers.
Mode effect	Refers to differences in observed intakes due to the method of administration of an instrument (for example, mail, telephone, Web-based, in-person, interviewer-administered, self-administered).
Monte Carlo simulation	A method for obtaining estimates through simulation rather than direct calculation; often used to estimate percentiles and other characteristics of the usual intake distribution.
National Cancer Institute (NCI) method	A unified approach for estimating usual intake distributions and predicting individual intakes for use in diet and health models; can be used for dietary components consumed nearly daily by nearly all persons and those consumed episodically.
National Research Council (NRC) method	An early statistical modeling approach to estimate usual intake distributions; extended by researchers at Iowa State University.
Nonepisodically consumed dietary components	A term describing nutrients and foods that are consumed nearly every day by nearly everyone in the population and whose intake may therefore rarely, if ever, be reported as zero on a particular day.
Normal (Gaussian) distribution	A probability distribution that is symmetrical (i.e., density function resembles a bell-shaped curve); occurs commonly in nature, such as heights of adults in a homogeneous population.
Nuisance effect	A variable that has an effect on observations but is of no intrinsic interest itself. Examples include interview sequence and mode of administration of the instrument.
One-part model	For the purposes of this webinar series, this term refers to a model developed by the National Cancer Institute for estimating usual intake distributions of nonepisodically consumed dietary components and predicting individual intakes of nonepisodically consumed dietary components for use in diet-health models.
Percentile	The value below which the specified percent of observations fall.
Probability	The chance of a particular event or value; how likely an event is to occur.
Probability distribution	The pattern of values showing the relative frequencies associated with all possible values of a random variable in a population. Examples include Normal, t, F, Binomial, and Chi-square.

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.
Replicates/repeats	A repeated measure; for example, a second 24-hour recall or a second doubly labeled water measurement.
Sequence effect	The effect of repeated administration of an instrument on reported intakes.
Skewed distribution	A distribution that is not symmetrical.
Surveillance	A general term for monitoring; in the context of nutrition, refers to tracking the population's diet- and nutrition-related health events.
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.
Time-dependent covariate	A covariate that changes in value over time.
Transformation	The application of a mathematical function (for example, the logarithm or the square root) to a set of values to create a new set of values.
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.
Unbiased instrument	An instrument with only random error.
Usual intake	Long-term average daily intake, taking into account both consumption and nonconsumption days.
Usual intake distribution	A distribution that describes usual intakes, including the mean and percentiles, among a population.
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.