

measurement ERROR webinar series

Estimating usual intake distributions for multivariate dietary variables

(Webinar 9)

Objectives:

- Identify challenges in addressing measurement error when modeling multivariate dietary variables such as diet quality indices.
- Describe statistical modeling techniques to correct for measurement error in estimating multivariate dietary variables.

Recommended resources:

- Guenther PM, Reedy J, Krebs-Smith SM, Reeve BB. Evaluation of the Healthy Eating Index-2005. J Am Diet Assoc. 2008;108(11):1854-64.
- Guenther PM, Reedy J, Krebs-Smith SM. Development of the Healthy Eating Index-2005. J Am Diet Assoc. 2008;108(11):1896-901.
- Reedy J, Mitrou PN, Krebs-Smith SM, Wirfält E, Flood A, Kipnis V, Leitzmann M, Mouw T, Hollenbeck A, Schatzkin A, Subar AF. Index-based dietary patterns and risk of colorectal cancer: the NIH-AARP Diet and Health Study. Am J Epidemiol. 2008;168(1):38-48.
- Zhang S, Krebs-Smith SM, Midthune D, Perez A, Buckman D, Kipnis V, Freedman LS, Dodd KW, Carroll RJ. Fitting a bivariate measurement error model for episodically consumed dietary components. Intl J Biostat. 2011;7(1):Article 1.
- Zhang S, Midthune D, Guenther PM, Krebs-Smith SM, Kipnis V, Dodd KW, Buckman DW, Tooze JA, Freedman L, Carroll RJ. A new multivariate measurement error model with zero-inflated dietary data, and its application to dietary assessment. Ann Appl Stat. 2011;5(2B):1456-87.

Key terms:

Back-transformation	A mathematical technique used to restore a variable to its original scale after a transformation has been applied.
Box-Cox transformation	A type of power transformation; often applied to skewed data to lessen skewness or to approximate normality.
Cox regression	A statistical method for relating the time until a specified event (for example, a health outcome or mortality) to covariates of interest; also known as the proportional hazards model.
Density model	Regression model used for examining diet-health relationships in which nutrients or foods are expressed as densities (that is, ratios of nutrients or foods to energy).
Dietary intake	Intake from foods and beverages (excludes supplements).

Dietary patterns	For the purpose of this webinar series, this term refers to the combination of foods and beverages that constitute an individual's dietary intake over time.
Distribution	The pattern of values taken on by a random variable.
Energy adjustment	Adjustment of nutrient intake for total energy intake.
Epidemiology	The study of the distribution and determinants of health outcomes or diseases among populations and the application of that study to enhancing public health.
Episodically consumed dietary components	Nutrients and foods that are not consumed on a daily basis by nearly everyone in the population and whose intake may therefore commonly be reported as zero on a particular day.
Hazard ratio	A ratio similar to relative risk; it expresses the relative effect of a variable on the risk of an event (such as the development of a disease) in the context of a Cox regression model.
Healthy Eating Index	A measure of dietary quality that assesses compliance with the Dietary Guidelines for Americans.
Markov chain Monte Carlo method	A technique used to estimate the parameters of statistical models through simulation.
Measurement error	The difference between the observed or measured value and the true value.
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.
Multivariate	Having to do with two or more variables.
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 Health and Nutrition Examination Survey (NHANES)	A representative survey of the civilian, noninstitutionalized U.S. population conducted by the National Center for Health Statistics; used to monitor diet and study associations between diet, nutrition, and health.
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.

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.
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.
Usual amount consumed	For episodically consumed dietary components, the usual amount consumed is the long-term average amount consumed on consumption days; when multiplied by the probability of consuming the dietary component, the product equals usual intake.
Usual intake	Long-term average daily intake, taking into account both consumption and nonconsumption days.
What We Eat in America (WWEIA)	The dietary intake interview component of the National Health and Nutrition Examination Survey (NHANES).