intake, come from a 2001 study that evaluated the effect of different levels of dietary sodium in conjunction with the Dietary Approaches to Stop Hypertension (DASH) program in persons with and without hypertension [Sacks FM et al. *N Engl J Med* 2001]. The DASH dietary program encourages the consumption of fruits, vegetables, whole grains, and low-fat dairy foods. It includes meat, fish, poultry, nuts, and beans and is limited in sugar-sweetened foods and beverages, red meat, and added fats. Following the DASH program in conjunction with a reduction in sodium intake substantially lowered blood pressure (BP).

The 2010 *Dietary Guidelines for Americans* recommend limiting sodium to <2300 mg per day; however, individuals who are aged ≥51 years and those of any age, including children, who are black or have high BP, diabetes, or chronic kidney disease should limit intake to 1500 mg of sodium per day [USDA/Department of Health and Human Services. *Dietary Guidelines for Americans*, 7th Edition, Washington, DC: US Government Printing Office, December 2010].

In addition to sodium reductions, the 2010 dietary guidelines recommend a daily potassium, calcium, and magnesium intake of 4700 mg (adults), 1000 to 1300 mg (> age 4), and 240 to 420 mg (> age 9), respectively. Animal studies have shown that high potassium intake reduces BP, cerebral vascular lesions, cerebral hemorrhage and mortality, protects against sodium-induced femoral artery intimal thickening, and leads to thinner aortic and mesenteric walls in hypertensive rats. Potassium may also protect against kidney function, interstitial nephritis, and bone resorption.

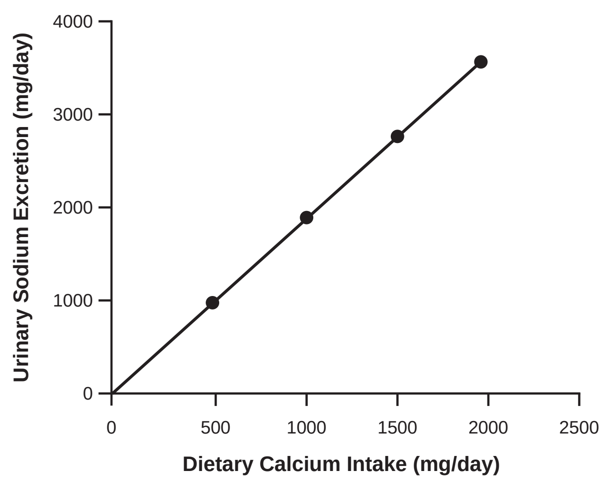
There is an interactive effect of increased potassium and reduced sodium, where one may modulate the level of the other. Urinary sodium/potassium ratios correct for urine collections and appear to be more informative than either sodium or potassium value alone [Cook NR et al. *Arch Intern Med* 2009]. A positive relationship (χ^2 for trend= -2.69; p=0.007) has been noted between urinary sodium/potassium and stroke mortality in men (aged 40 to 75 years) [He FJ, MacGregor GA. *BMJ* 2001].

The long-term benefit of increased potassium intake on CV disease (CVD) mortality was shown in a trial in which subjects were switched from regular salt to potassium-enriched salt [Chang HY et al. *Am J Clin Nutr* 2006]. Fewer CVD-related deaths after 31 months were seen in individuals receiving potassium-enriched salt (HR, 0.59; 95% CI, 0.37 to 0.95; Figure 1).

The average intake of potassium in America is 2640 mg/day [USDA, ARS. *What We Eat in America* 2009-2010], while only 3% of Americans meet recommended adequate in-take for potassium [Fulgoni VL et al. *J Nutr* 2011]. It is becoming increasing difficult to meet both the sodium and potassium requirements without changes in the current food supply, noted Dr. Weaver.

Dr. Weaver's final topic of discussion was sodium, calcium, and magnesium interactions in adolescents. In a metabolic balance study in black and white girls, sodium retention was higher in black girls compared with white girls [Palacios C et al. *J Clin Endocrinol Metab* 2004]. As sodium excretion was not greater in blacks, nor did BP or weight increase, the authors speculated that the retained sodium may reside in a nonextracellular compartment, possibly bone. This difference between the two populations may contribute to underlying racial differences in susceptibility to hypertension. In addition, relative to white girls, urinary calcium excretion in black girls is significantly lower with high sodium intake (p<0.05), while calcium retention is higher regardless of sodium intake [Wigertz K et al. *Am J Clin Nutr* 2005]. These findings may explain racial differences in incidence of hypertension and osteoporosis. Blacks also retain more magnesium regardless of sodium intake [Palacios C et al. Unpublished]. Information regarding the amount of calcium intake and sodium excretion may also be useful for predicting bone loss in postmenopausal women (Figure 1). High-quality diets buffered by increases in potassium and calcium and reductions in sodium may be the best strategy for healthy eating, concluded Dr. Weaver.

Figure 1. Ratio of Urinary Sodium Excretion to Calcium Intake Needed to Maintain Bone Density



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Measuring Food Intake

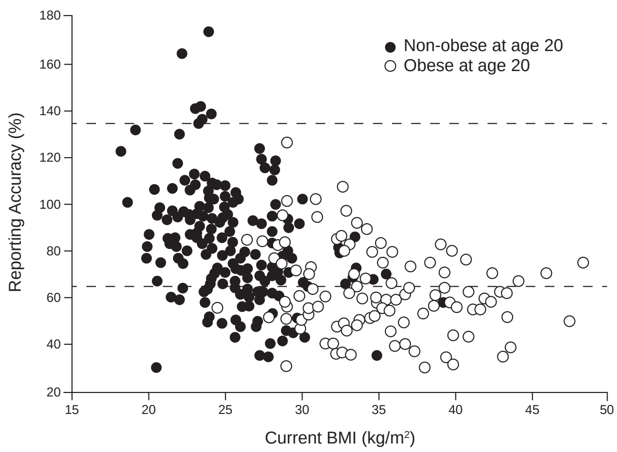
Written by Maria Vinall

Measuring food intake is a crucial part of the study of nutrition. Dale A. Schoeller, PhD, University of Wisconsin, Madison, Wisconsin, USA, discussed the pros and cons of the various food monitoring technologies currently being used in nutritional studies.

For outpatients, the most popular food tracking methods include weighed diet records and surveys based on recall (either based on food frequency or meal-by-meal). The problem with both of these is the accuracy and precision of the reporting. Underreporting is particularly problematic in those with higher body mass index (BMI; Figure 1) [Nielsen BM et al. *J Nutr* 2009] and among adolescents. Specific disadvantages include inaccuracy due to serving size error and/or missing foods, etc, that are influenced by social desirability and memory. The advantage of these record and recall techniques is that they are capable of identifying the location, time, and patterns of food intake.

Current inpatient clinical methods that avoid serving size and memory errors include using weighed trays or a form of inventory control such as a vending machine or controlled pantry. These inpatient methods are accurate, offer good dietary control, and allow for analysis of data; however, they can also be influenced by social desirability and are conducted in a nonrepresentative, artificial environment.

Figure 1. Underreporting Increases With BMI



BMI=body mass index.

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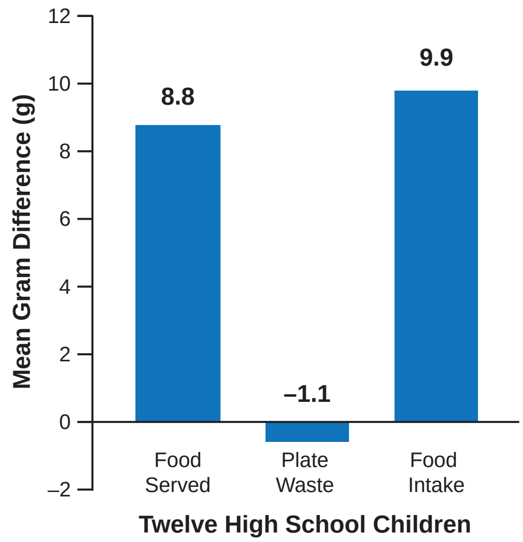
Better interview methods and the use of computers have improved survey approaches to dietary research. Web-based dietary recalls such as DietDay are inexpensive, offer wide accessibility, and are superior to paper food-frequency questionnaires [Arab L et al. *Am J Epidemiol* 2011]. The Digital Photography of Foods Method, which uses a combination of human and computer software to identify foods consumed accurately, calculating energy and nutrient intake of adults and children in cafeterias [Martin CK et al. *J Hum Nutr Dietetics* 2013]. A similar approach (Remote Food Photography Method [RFPM]) uses smart phones to capture images of the food selected and leftovers. These images are then transmitted in near real-time to a server for diet analysis. RFPM can be very accurate, and it offers the advantage of reduced participant burden, eliminates of the need for participants to estimate portion size, and uses automation to improve the accuracy, efficiency and cost-effectiveness of measuring food intake (Figure 2). These newer tools also reduce analysis time, improve accuracy, can identify food patterns, and allow for nutrient analysis. Among the disadvantages are the lack of precision (a 6-day average of only 30%) and the requirement for participant cooperation in and awareness of the process that may alter eating behavior.

Figure 2. Digital Photo Analysis of Food Intake



Reproduced from Martin CK et al. Measuring food intake with digital photography. *J Hum Nutr Diet* 2013; Suppl 1:72-81. With permission from John Wiley.

Less traditional methods of food monitoring include detecting swallowing by using a sound sensor located over laryngopharynx or by a bone-conduction microphone and detecting chewing through a below-the-ear strain sensor [Sazonov E et al. *Physiol Meas* 2008]. Methods relying on chewing sounds can successfully distinguish dry, wet, and soft foods [Amft O, Tröster G. *Artif Intell Med* 2008]. Wrist actigraphy can detect meal events, snacking, and within-meal patterns [Dong Y et al. *Appl Psychophysiol Biofeedback* 2012]. These less traditional devices are useful for identifying eating events, mealtime length, and food texture, but they cannot identify the actual food eaten or measure total energy.

Other experimental approaches include glucose monitoring to detect time of eating events, monitors for heart rate, respiration rate, skin temperature, oxygen saturation, and blood pressure are also available and may prove useful in the study of ambient and physiologic factors associated with eating behavior. Stable isotopes can be used to identify individuals having omnivore, lacto-ova and vegan diets, as well as sugar intake [Choy K et al. *J Nutr* 2013]. Dietary biomarkers for protein, fish oil, citrus fruit, and garlic can objectively assess dietary consumption without the bias of self-reported dietary intake errors, but assessments of their precision for most biomarkers are still in their infancy [Hedrick VE et al. *Nutr J* 2012].

Dr. Schoeller concluded that traditional dietary methods are inaccurate, imprecise, and differentially biased, while the technology enhanced traditional methods are more accurate and precise, but probably also differentially biased. Biosensors are less differentially biased but very imprecise. The rapidly expanding field of less traditional methods for monitoring food intake is more objective, but their accuracy, precision, and utility requires further research and development.

The Perception of Organic Foods: Is It Correct?

Written by Phil Vinall

The consumer often perceives organic foods as being safer, more nutritious, and in general, better for the environment. After analyzing the published data, however, Roger Clemens, DrPH, CFS, CNS, University of Southern California, Los Angeles, California, USA, has concluded that the evidence is inconsistent.

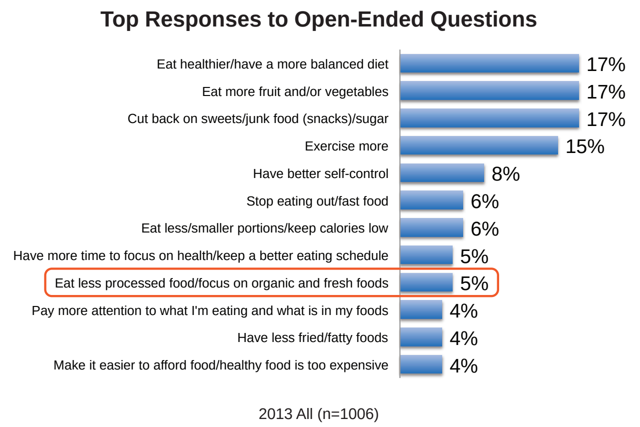
A 2012 systematic review of the literature comparing the health effects of organic and conventional foods concluded that, published literature lacks strong evidence that organic foods are significantly more nutritious than conventional foods [Smith-Spangler C et al. *Ann Intern Med* 2012]. One erroneous perception is that the government evaluates the quality of organic foods through programs like the National Organic Program (NOP). However, the NOP only oversees the growing process not the quality of the food produced. With respect to crops, a United States Department of Agriculture (USDA) organic seal indicates that irradiation, sewage sludge, synthetic fertilizers, *prohibited* pesticides, and genetically modified organisms were not used [USDA. NOP Organic Standards. http://www.ams.usda.gov/AMSv1.0/nop]. The USDA organic seal on meats verifies that meat producers have met animal health and welfare standards, did not use antibiotics or growth hormones, used 100% organic feed, and provided animals with access to the outdoors.

When the 2013 Food and Health Survey [International Food Information Council Foundation. 2013; http://www.foodinsight.org/foodandhealth2013.aspx] on attitudes toward food safety, nutrition, and health asked 1006 consumers how they could improve their diets, they identified four ways: eat healthier/have a more balanced diet; eat more fruit and/or vegetables; cut back on sweets/junk food/sugar; and exercise more. Eating less processed foods and more organic foods (5%) was fourth from the bottom (Figure 1).

Only 27% of consumers reported regularly buying products because they were advertised as “organic” on the label. Women and younger consumers (aged 18 to 34 years) and highly educated consumers (college graduates) are more apt to have purchased organic.

The International Food Information Council performed a Consumer Perceptions of Food Technology Survey in 2012 [http://www.foodinsight.org/Resources/Detail.aspx?topic=2012ConsumerPerceptionsofTechnologySurvey]. The results showed that only 13% of Americans make food choices out of concern about the use of biotechnology in food production. Among these, 15% said they eat less of, do not eat, or do not buy such foods; while 6% said they eat organic.

Figure1. Response to Survey on How Americans Would Improve Their Diet



Source: 2013 Food and Health Survey; http://www.foodinsight.org/foodandhealth2013.aspx

Studies have shown that just putting the label “organic” on foods evokes lower calorie estimates and a willingness to pay more for the product. Organic labels also stimulate the consumer to view the product as having more positive nutritional value [Lee WJ et al. *Food Quality Preference* 2013]. In one study, Czech consumers (n=1054) of organic foods reported they felt these foods had positive health benefits, were environmentally friendly, and tasted better [Zagata L. *Appetite* 2012].

However, according to Dr. Clemens, there is no research available that organic foods are safer than conventional foods, and flavor and nutritional profiles are indistinguishable. According to the USDA, the organic seal is simply a confirmation of a method of production, not a safety endorsement. In addition organic foods are not