ILSI North America

Nutrition Briefs

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Sodium

Validation of Spot Urine in Predicting 24-h Sodium Excretion at the Individual Level

Zhou L, Tian Y, Fu JJ, Jiang YY, Bai YM, Zhang ZH, et al. *Am J Clin Nutr.* 2017 Mar 29 [Epub ahead of print]. doi: 10.3945/ajcn.116.147553. Article Link

Significance: Spot urine collection is a convenient method commonly used for sodium estimation, but its validity for predicting 24-h urinary sodium excretion at the individual level has not been well evaluated among the general population.

Evidence for the effect of dietary sodium intake on the risk of cardiovascular disease has been controversial. One of the main explanations for the conflicting results lies in the great variability associated with measurement methods for sodium intake. The aim of this study was to evaluate the validity of the Kawasaki, the International Cooperative Study on Salt, Other Factors, and Blood Pressure (INTERSALT), and the Tanaka formulas in predicting 24-h urinary sodium excretion by using spot urine samples in Chinese adults. We analyzed the relative and absolute differences and misclassification at the individual level from 3 commonly used methods for estimating sodium intake among 141 Chinese community residents. The mean measured 24-h sodium excretion was 220.8 mmol/d. The median (95% CIs) differences between measured sodium and those estimated from the Kawasaki, INTERSALT, and Tanaka methods were 6.4 mmol/d (-17.5, 36.8 mmol/d), -67.3 mmol/d (-96.5, -46.9 mmol/d), and -42.9 mmol/d (-59.1, -24.8 mmol/d), respectively. The proportions of relative differences >40% with the Kawasaki, INTERSALT, and Tanaka methods were 31.2%, 41.1%, and 22.0%, respectively; and the absolute difference for the 3 methods was >51.3 mmol/d (3 g salt) in approximately half of the participants. The misclassification rate was 63.1% for the Kawasaki method, 78.7% for the INTERSALT method, and 66.0% for the Tanaka method at the individual level. The results from our study do not support the use of spot urine to estimate 24-h urinary sodium excretion at the individual level because of its poor performance with respect to misclassification.

Carbohydrates

Systematic Review and Meta-Analysis of Dietary Carbohydrate Restriction in Patients With Type 2 Diabetes

Snorgaard O, Poulsen GM, Andersen HK, Astrup A. *BMJ Open Diabetes Res Care*. 2017 Feb 23;5(1):e000354. doi: 10.1136/bmjdrc-2016-000354. Article Link

Significance: Low- to moderate-carbohydrate diets have greater effect on glycemic control in type 2 diabetes compared with high-carbohydrate diets in the first year of intervention.

Nutrition therapy is an integral part of self-management education in patients with type 2 diabetes. Carbohydrates with a low glycemic index are recommended, but the ideal amount of carbohydrate in the diet is unclear. We performed a meta-analysis comparing diets containing low to moderate amounts of carbohydrate (LCD) (energy percentage below 45%) to diets containing high amounts of carbohydrate (HCD) in subjects with type 2 diabetes. The research team systematically reviewed Cochrane library databases, EMBASE, and MEDLINE in the period 2004-2014 for guidelines, meta-analyses, and randomized trials assessing the outcomes HbA1c, BMI, weight, LDL cholesterol, quality of life (QoL), and attrition. The study identified 10 randomized trials comprising 1376 participants in total. In the first year of intervention, LCD was followed by a 0.34% lower HbA1c (3.7 mmol/mol) compared with HCD (95% CI 0.06 (0.7 mmol/mol), 0.63 (6.9 mmol/mol)). The greater the carbohydrate restriction, the greater the glucose-lowering effect (R=-0.85, p<0.01). At 1 year or later, however, HbA1c was similar in the 2 diet groups. The effect of the 2 types of diet on BMI/body weight, LDL cholesterol, QoL, and attrition rate was similar throughout interventions. The greater the carbohydrate restriction, the greater glucose lowering, a relationship that has not been demonstrated earlier. Apart from this lowering of HbA1c over the short term, there is no superiority of low-carbohydrate diets in terms of glycemic control, weight, or LDL cholesterol.

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Biomarkers

Challenges and Lessons Learned in Generating and Interpreting NHANES Nutritional Biomarker Data

Pfeiffer CM, Lacher DA, Schleicher RL, Johnson CL, Yetley EA. *Adv Nutr.* 2017 Mar 15;8(2):290–307. doi: 10.3945/an.116.014076. Article Link

Significance: This review uses a "lessons learned" approach to present a series of challenges that are relevant to researchers measuring biomarkers in NHANES and beyond.

For the past 45 y, the National Center for Health Statistics at the CDC has carried out nutrition surveillance of the US population by collecting anthropometric, dietary intake, and nutritional biomarker data, the latter being the focus of this publication. The earliest biomarker testing assessed iron and vitamin A status. With time, a broad spectrum of water- and fat-soluble vitamins was added and biomarkers for other types of nutrients (e.g., fatty acids) and bioactive dietary compounds (e.g., phytoestrogens) were included in NHANES. The cross-sectional survey is flexible in design, and biomarkers may be measured for a short period of time or rotated in and out of surveys depending on scientific needs. Maintaining high-quality laboratory measurements over extended periods of time such that trends in status can be reliably assessed is a major goal of the testing laboratories. Focusing on the continuous NHANES, which started in 1999, this review uses a "lessons learned" approach to present a series of challenges that are relevant to researchers measuring biomarkers in NHANES and beyond. Some of those challenges are the use of multiple related biomarkers instead of a single biomarker for a specific nutrient (e.g., folate, vitamin B-12, iron), adhering to special needs for specimen collection and handling to ensure optimum specimen quality (e.g., vitamin C, folate, homocysteine, iodine, polyunsaturated fatty acids), the retrospective use of long-term quality-control data to correct for assay shifts (e.g., vitamin D, vitamin B-12), and the proper planning for and interpretation of crossover studies to adjust for systematic method changes (e.g., folate, vitamin D, ferritin).

The Nutritional Metabolomics Crossroads: How to Ensure Success for Dietary Biomarkers

Brennan L. *Am J Clin Nutr*. 2017 Feb;105(2):293–294. doi: 10.3945/ajcn.116.150847. Article Link

Significance: With respect to dietary biomarkers derived from metabolomics, the time has come when it is imperative that we develop standardization and a clear demonstration of the utility of dietary biomarkers in terms of dietary assessment.

Metabolomic Profiles as Reliable Biomarkers of Dietary Composition

Esko T, Hirschhorn JN, Feldman HA, Hsu YH, Deik AA, Clish CB, et al. *Am J Clin Nutr.* 2017 Mar;105(3):547-554. doi: 10.3945/ajcn.116.144428. Article Link

Significance: This methodology may help elucidate mechanistic pathways linking diet to chronic disease risk.

Clinical nutrition research often lacks robust markers of compliance, complicating the interpretation of clinical trials and observational studies of free-living subjects. This study aimed to examine metabolomics profiles in response to 3 diets that differed widely in macronutrient composition during a controlled feeding protocol. Twenty-one adults with a high body mass index (in kg/m2; mean ± SD: 34.4 ± 4.9) were given hypocaloric diets to promote weight loss corresponding to 10-15% of initial body weight. They were then studied during weight stability while consuming 3 test diets, each for a 4-wk period according to a crossover design: low fat (60% carbohydrate, 20% fat, 20% protein), low glycemic index (40% carbohydrate, 40% fat, 20% protein), or very-low carbohydrate (10% carbohydrate, 60% fat, 30% protein). Of 333 metabolites, researchers identified 152 whose concentrations differed for ≥1 diet compared with the others, including diacylglycerols and triacylglycerols, branched-chain amino acids, and markers reflecting metabolic status. Analysis of groups of related metabolites, with the use of either principal components or pathways, revealed coordinated metabolic changes affected by dietary composition, including pathways related to amino acid metabolism.

Dietary Patterns

Association Between Dietary Factors and Mortality From Heart Disease, Stroke, and Type 2 Diabetes in the United States

Micha R, Peñalvo JL, Cudhea F, Imamura F, Rehm CD, Mozaffarian D. *JAMA*. 2017 Mar 7;317(9):912–924. doi: 10.1001/jama.2017.0947. Article Link

Significance: In the United States, national associations of individual dietary factors with specific cardiometabolic diseases are not well established.

The objective was to estimate associations of intake of 10 specific dietary factors with mortality due to heart disease, stroke, and type 2 diabetes (cardiometabolic mortality) among US adults. A comparative risk assessment model incorporated data and corresponding uncertainty on population demographics and dietary habits from National Health and Nutrition Examination Surveys (1999-2002: n = 8104; 2009-2012: n = 8516); estimated associations of diet and disease from meta-analyses of prospective studies and clinical trials with validity analyses to assess potential bias; and estimated disease-specific national mortality from the National Center for Health Statistics. Consumption of 10 foods/nutrients associated with cardiometabolic diseases: fruits, vegetables, nuts/seeds, whole grains, unprocessed red meats, processed meats, sugar-sweetened beverages (SSBs), polyunsaturated fats, seafood omega-3 fats, and sodium. Dietary factors were estimated to be associated with a substantial proportion of deaths from heart disease, stroke, and type 2 diabetes. These results should help identify priorities, guide public health planning, and inform strategies to alter dietary habits and improve health.

Dietary Fiber

Understanding the Physics of Functional Fibers in the Gastrointestinal Tract: An Evidence-Based Approach to Resolving Enduring Misconceptions about Insoluble and Soluble Fiber

McRorie JW Jr, McKeown NM. *J Acad Nutr Diet*. 2017 Feb;117(2):251–264. doi: 10.1016/j.jand.2016.09.021. Article Link

Significance: This review focused on isolated functional fibers (eg, fiber supplements) whose effects on clinical outcomes have been readily assessed in well-controlled clinical studies

Enduring misconceptions about the physical effects of fiber in the gut have led to misunderstandings about the health benefits attributable to insoluble and soluble fiber. This review will also focus on three health benefits (cholesterol lowering, improved glycemic control, and normalizing stool form [constipation and diarrhea]) for which reproducible evidence of clinical efficacy has been published. In the small bowel, clinically meaningful health benefits are highly correlated with the viscosity of soluble fibers: high viscosity fibers exhibit a significant effect on cholesterol lowering and improved glycemic control, whereas nonviscous soluble fibers and insoluble fibers do not provide these viscosity-dependent health benefits. When making recommendations for a fiber supplement, it is essential to recognize which fibers possess the physical characteristics required to provide a beneficial health effect, and which fiber supplements are supported by reproducible, rigorous evidence of one or more clinically meaningful health benefits.

Fatty Acid Intake and Its Dietary Sources in Relation With Markers of Type 2 Diabetes Risk: The NEO Study

Wanders AJ, Alssema M, de Koning EJ, le Cessie S, de Vries JH, Zock PL, et al. *Eur J Clin Nutr*. 2017 Feb;71(2):245–251. doi: 10.1038/ejcn.2016.204. Article Link

Significance: This study suggests that the relations between fatty acid intakes and markers of type 2 diabetes risk may depend on the dietary sources of the fatty acids.

The aim of this study was to examine the relations between intakes of total, saturated, mono-unsaturated, poly-unsaturated and trans fatty acids (SFA, MUFA, PUFA and TFA), and their dietary sources (dairy, meat and plant) with markers of type 2 diabetes risk. This was a cross-sectional analysis of baseline data of 5675 non-diabetic, middle-aged participants of the Netherlands Epidemiology of Obesity (NEO) study. Associations between habitual dietary intake and fasting and postprandial blood glucose and insulin, Homeostatic Model Assessment of Insulin Resistance (HOMA-IR), HOMA of β-cell function (HOMA-B) and Disposition Index were assessed through multivariable linear regression models with adjustments for demographic, lifestyle and dietary factors.

Scientific Integrity

Ensuring Scientific Integrity in the Age of Trump

Goldman GT, Berman E, Halpern M, Johnson C, Kothari Y, Reed G, et al. *Science*. 2017 Feb 17;355(6326):696–698. doi: 10.1126/science.aam5733. Article Link

With the new Donald J. Trump Administration comes uncertainty in the role that science will play in the U.S. federal government. Early indications that the Administration plans to distort or disregard science and evidence, coupled with the chaos and confusion occurring within federal agencies, now imperil the effectiveness of our government. Evidence from the past 20 years demonstrates that, when faced with such threats, supporters of science can take steps to protect the integrity of science in the federal policy-making process. The scientific community will need to connect science-informed policy to positive outcomes and staunchly defend scientific freedom. It must also spotlight political interference in science-based policy development and be prepared to protect scientists—both within and outside the government—against executive or legislative overreach. A range of scientific integrity and transparency policies across federal agencies provides critical tools but must be enforced and protected.