40th National Nutrient Databank Conference

Advancing Food and Nutrient Databases through Partnerships and Technology

July 23-25, 2018
University of Minnesota
Humphrey School of Public Policy Conference Center
Minneapolis, Minnesota

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PROGRAM AND ABSTRACTS

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July 23-25, 2018, Minneapolis, Minnesota

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In Memoriam

The National Nutrient Databank Conference remembers and recognizes the contributions of the following volunteers, all of whom gave generously of their time, talents, and energy to the conference.

Phyllis Stumbo (1934-2017)
University of Iowa

Marilyn Buzzard (1934-2015)
Nutrition Coordinating Center at the University of Minnesota
and Virginia Commonwealth University

Joanne Holden (1946-2014)
Research Leader, USDA Nutrient Data Lab

Ruth Matthews (1927-2000)
Chief, USDA Nutrient Data Research Branch

Frank Hepburn
Leader, USDA Nutrient Data Research Group

Margaret Carrington Moore (1896-1995)
Louisiana State University Health Sciences Center,
New Orleans, LA

Robert Rizek
Director of Consumer and Food Economics
Research Division, USDA

Please send any additions or corrections to the NNDC Executive Committee Chair, David Haytowitz (David.Haytowitz@ARS.USDA.GOV)

Message from the NNDC Executive Committee Chair:

Welcome to the 40th National Nutrient Databank Conference (NNDC) in Minneapolis, Minnesota. Food and nutrient databases make nutrition research possible, and this year's theme, *Advancing Food and Nutrient Databases through Partnerships and Technology*, reminds us of the effort required to keep these databases relevant. Through the collaborative efforts of academia, government and industry, our national and international databases grow and advance, providing the science behind food labeling, adding new components to enable new research, and supporting technological innovations in nutrition research. On behalf of the Executive and Steering Committees, I thank the tireless efforts of our volunteers on the Program Committee, led by Pamela Pehrsson and Diane Mitchell, and the Local Arrangements Committee, led by Lisa Harnack. I am confident that you will enjoy the results of their labors – an interesting and thought-provoking slate of speakers at a comfortable venue. The schedule includes many opportunities for networking and conversation.

I would also like to draw your attention to the page titled "In Memoriam", a new addition to the program booklet. As many of you know, we lost an important member of the NNDC community this past year with the passing of Phyllis Stumbo. The Executive Committee felt it important to establish a way to recognize and remember those who contributed greatly to NNDC. Each was a force within NNDC, and we remember their enthusiasm and dedication with gratitude. If we have omitted anyone, we apologize and ask that you send the information to be included at the next meeting.

One of Phyllis' endeavors since the last NNDC meeting was to establish standard procedures for conferring the NNDC Recognition Award, which the Executive and Steering Committee will bestow at each biannual meeting. I hope you will join me on Wednesday morning as we honor Catherine Champagne with the NNDC Recognition Award for 2018.

Finally, I acknowledge the dedication of my fellow Executive Committee members: Carol Boushey, David Haytowitz, Rose Tobelmann, Julie Eichenberger-Gilmore, and Phyllis Stumbo, as well as all the efforts of the NNDC Steering Committee – I relied on their guidance, experience, and energy to ensure the work of the NNDC stayed on track. I know you will enjoy the presentations, hope that you will enhance your experience at the conference through networking, and encourage you to join the enthusiastic volunteer community that keeps NNDC advancing!

Thea Palmer Zimmerman

40th National Nutrient Databank Conference Program

"Advancing Food and Nutrient Databases through Partnerships and Technology"

Monday, July 23, 2018

7:30 am – 4:15 pm	Registration
7:30 am – 8:30 am	Breakfast

Opening Session

8:30 am – 9:00 am	Welcome
9:00 am – 10:00 am	Keynote Speaker John Finley, National Program Leader, Agricultural Research Service, USDA Big Data, the Food System and Public Health: Addressing the Questions of Tomorrow in a Changing Environment
10:00 am – 10:15 am	**Break**

Session 1: Advancing our National Nutrient Databases

Session Chairs: Pamela Pehrsson and Laura Sampson

10:15 am – 10:40 am	Advances in the 2015-2016 Food and Nutrient Database for Dietary Studies *Alanna Moshfegh, Research Leader, Food Surveys Research Group, Agricultural Research Service, USDA*
10:40 am – 11:05 am	Items Designated as Fortified: Food and Nutrient Database for Dietary Studies (FNDDS), 2013-2014 *Carrie Martin, Nutritionist, Food Surveys Research Group, Agricultural Research Service, USDA*
11:05 am – 11:30 am	A Partnership for Better Health: USDA Branded Food Products Database *Alison Kretser, International Life Sciences Institute, North America*

11:30 am – 11:55 am	Modernization and Revitalization of the FDA Total Diet Study *Judi Spungen, US Food and Drug Administration*
11:55 am – 12:15 pm	Questions and Discussion
12:15 am – 1:45 pm	**Lunch and Poster Session 1 with Presenters**

Session 2: Dietary Components: New Research and Challenges

Session Chairs: Bernadette Marriott and Trish Zecca

1:45 pm – 2:05 pm	Protein Quality, Efficiency, and Methodology: Assuring Accurate Labels and Databases and Adequate Intake *David Plank, University of Minnesota*
2:05 pm – 2:25 pm	Are Conversion Factors used in Food Composition Databases Still Valid? *David Haytowitz, Nutrient Data Laboratory, Agricultural Research Service, USDA*
2:25 pm – 2:45 pm	Addition of Gluten to a Food and Nutrient Database *Bhaskarani Jasthi, Nutrition Coordinating Center, Epidemiology & Community Health, University of Minnesota*
2:45 pm – 3:05 pm	Comprehensive Chemical Profiles of Foods as a Basis for Comparison and Characterization of Variance *James Harnly, Research Leader, Food Composition and Methods Development Lab, Agriculture Research Service, USDA*
3:05 pm – 3:25 pm	Updating Human Milk Nutrient Composition in USDA FooDS: Where We Are Now and Future Directions *Xianli Wu, Nutrient Data Laboratory, Nutrient Data Laboratory, Agricultural Research Service, USDA*
3:25 pm – 3:45 pm	Iodine in Foods and Dietary Supplements: Development of Special Interest Data *Pamela Pehrsson, Research Leader, Nutrient Data Laboratory, Agricultural Research Service, USDA*
3:45 pm – 4:15 pm	**Break**

Session 3: International Nutrient Databases and Data

Session Chairs: Alanna Moshfegh and Rachel Fisher

4:15 pm – 4:35 pm	What are Canadians Eating in 2015? *Isabelle Massarelli, Bureau of Food Surveillance and Science Integration, Food Directorate, Health Canada*
4:35 pm – 4:55 pm	New Information Portal about Food Composition Databases and Tables: the World Nutrient Databases for Dietary Studies *Morven McLean, ILSI Research Foundation*
4:55 pm – 5:15 pm	Assessment of Sodium and Sugar Content in Infant and Toddler Prepackaged Foods in Canada *Mary L'Abbe, Department of Nutritional Sciences, Faculty of Medicine, University of Toronto*
5:15 pm – 5:30 pm	Nutritional Analysis of Selected Commercial Rice Varieties of Sindh, Pakistan *Najma Memon, National Centre of Excellence in Analytical Chemistry, University of Sindh, Jamshoro, Pakistan*
5:30 pm – 5:35 pm	**Housekeeping and Adjourn**
6:00 pm – 8:00 pm	**Reception - Courtyard by Marriott, Minneapolis Downtown, Salon ABC**

<u>Tuesday, July 24, 2018</u>

8:00 am – 3:00 pm	Registration
8:00 am – 9:00 am	Breakfast
	Posters displayed until 3 pm. Authors present 12:30 - 1:30 pm
9:00 am – 9:15 am	Welcome and Announcement of Student Poster Award Winners

Session 4: Advances in Food Labels to Meet the Needs of Consumers and Researchers

Session Chairs: Judi Spungen and Rose Tobelmann

9:15 am– 9:45 am	Update on Food Labeling *Patricia Hansen, CFSAN Office of Nutrition and Labeling, US Food and Drug Administration*
9:45 am – 10:00 am	Methodology to Modernize the RACCs/Serving Sizes for the Nutrition Facts Label *WenYen Juan, Office of Nutrition and Food Labeling, Center for Food Safety and Applied Nutrition, US Food and Drug Administration*
10:00 am – 10:15 am	Questions and Discussion
10:15 am – 10:45 am	**Break**
10:45 am – 11:05 am	Effects of a voluntary Front-of-Pack Nutrition Labelling System on Packaged Food Reformulation *Cliona Ni Mhurchu, National Institute for Health Innovation, University of Auckland, Auckland, New Zealand*
11:05 am – 11:25 am	Tracking Changes in Sodium Content of Popular Commercially Processed and Restaurant Foods using USDA-CDC Sentinel Foods Sodium Monitoring Program *Jaspreet Ahuja, Nutritionist, Nutrient Data Laboratory, Agricultural Research Service, USDA*
11:25 am – 11:45 am	Dietary Supplement Label Database (DSLD): Mobile-Friendly Version *Leila Saldanha, Office of Dietary Supplements, NIH*
11:45 am – 1:30 pm	**Lunch and Poster Session 2 with Presenters**

Session 5: Innovations for Today and the Future: Apps, Software, and New Technology

Session Chairs: Diane Mitchell and Carol Boushey

1:30 pm – 2:00 pm	Focusing a New Lens on Dietary Assessment Methods *Carol Boushey, University of Hawaii at Manoa*

2:00 pm – 2:15 pm	Changes to Nutrition Data System for Research (NDSR) to Meet Emerging Needs of Researchers *Lisa Harnack, Division of Epidemiology and Community Health, School of Public Health, University of Minnesota*
2:15 pm – 2:30 pm	Assessing the Accuracy of Nutrient Calculations of Popular Nutrition Tracking Applications *Carly Griffiths, University of Minnesota*
2:30 pm – 2:45 pm	Updates to the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA24) *Thea Zimmerman, Westat*
2:45 pm – 3:00 pm	**Break**
3:00 pm – 3:15 pm	The NUTS and DATES of Automating the Harvard Food Frequency Questionnaires and Databases over 38 years. *Laura Sampson, Harvard School of Public Health, Nutrition Department*
3:15 pm – 4:00 pm	VioScreen, A web-based Food Frequency Questionnaire, generating automated Personalized Food Recommendations for Clinicians based on the Healthy Eating Index. *Rick Weiss, Viocare Inc.*
4:00 pm – 4:30 pm	Questions and Discussion
4:30 pm – 4:15 pm	**Adjourn**
6:30 pm – 7:30 pm	**Walking Tours of Minneapolis Riverfront and Mill City District departing from lobby of Courtyard Minneapolis Downtown**

<u>Wednesday, July 25, 2018</u>

8:00 am – 9:00 am	Registration
8:00 am – 9:00 am	Breakfast
9:00 am – 10:00 am	National Nutrient Databank Conference Recognition Award "DASHing Through a Career in Research" *Catherine Champagne, Pennington Biomedical Research Center*

Session 6: Microbiome, Carbohydrates and Fiber: Strategies and Challenges

Session Chairs: Alison Kretser and David Haytowitz

10:00 am – 10:30 am	The Effect of Diet on the Gut Microbiome *Joanne Slavin, Department of Food Science and Nutrition, University of Minnesota*
10:30 am – 10:45 am	Food Manufacturers' Use of Isolated and Synthetic Non-Digestible Carbohydrate Ingredients No Longer Considered Sources of Dietary Fiber for Labeling Purposes in the U.S. *Lisa Harnack, Nutrition Coordinating Center, University of Minnesota*
10:45 am – 11:00 am	Dietary Fiber – The Confluence of Physiology and Methodology *David Plank, University of Minnesota*
11:00 am – 11:15 am	Implications of Two Different Methods for Analyzing Total Dietary Fiber in Foods for Food Composition Databases *David Haytowitz, Nutrient Data Laboratory, Agricultural Research Service, USDA*
11:15 am – 11:30 am	Questions and Discussion
11:30 am – 12:00 pm	**Announcements and Closing Remarks** **Box Lunch**

Poster Listings

Monday, July 23, 2018

A. Modifying the Typical North Dakotan Diet to Fit a Mediterranean Diet Pattern.
B. Reported dietary carotenoid intakes are weakly associated with serum carotenoid concentrations in adults.
C. Weight loss practices and nutrient intakes in a national sample of 8-15 years old children by frequency of trying to lose weight.
D. Status of Purine Data among Selected Foods.

1. Dietary Analysis Exercise Fosters Intercultural Awareness among College Students.
2. Iranian Cooked Food Composition Tables.
3. Assessing Multivitamin-multimineral (MVM) Supplements for Meeting Gaps in Food Intakes.
4. The Grocery Purchase Quality Index-2016 Performs Similarly to the Healthy Eating Index-2015 in a National Survey of Household Food Purchases.
5. Marketplace Changes in the Baby Food Aisle.
6. A New and Flexible Method for the Estimation of Free and Added Sugars in Foods: An Example from the UK National Diet and Nutrition Survey.
7. Nutrient Consumption among the U.S. Population Using Food Label Information, National Health and Nutrition Examination Survey (NHANES), 2005-2010.
8. Exploring Foods of the Pacific (EFP): The Children's Healthy Living Program (CHL) for remote underserved minority populations in the Pacific region.
9. U.S. Food and Drug Administration's Total Diet Study: How Improved Analytical Methods Affect Monitoring Data.
10. Recipe Development Advances in the Food and Nutrient Database for Dietary Studies 2015-2016.

Tuesday July 24, 2018

11. Using the Nutrient Rich Food Index 6.3 as the Basis for Creating a Nutrient Density Score that Includes Food Groups.
12. Median Serving Size of Ready-to-Eat Cereal Over a 12-year Period.
13. Measured Cup Weights of Ten Raw Leafy Vegetables are lower than Weights Reported in Food Composition Databases or Nutrition Labels.
14. What We Eat in America, NHANES: Comparing Day 1 and Day 2 Dietary Intake Data.
15. U.S. Food and Drug Administration's Total Diet Study: Monitoring of the Mineral Nutrients in Infant Formula.
16. Trans fat content trend analysis of prepackaged foods using Mintel's Global New Product Database: potential uses of food label data.
17. Application of the Child Nutrition Database (CNDB) in Support of Federal Meal Requirements.
18. Vitamin D and Iodine Values and Variability for Six Types of Processed Eggs.

19. Release 4 of the Dietary Supplement Ingredient Database (DSID): results for the 2nd national study of adult multivitamins and for single ingredient green tea dietary supplements.
20. Modernization and Revitalization of the FDA Total Diet Study.
21. Restaurant Foods Nutritional Data: Comparison of Calculation Method and Analytical Methods.
22. Monitoring trends of sodium content in selected popular commercially processed and restaurant foods (or Priority-2 Foods) using label information.
23. What are Canadians Eating in 2015?
24. Iodine in Foods and Dietary Supplements: Development of a Special Interest Database.

ABSTRACTS

Student Posters Submitted for Award Competition
Monday, July 23, 2018

A. Modifying the Typical North Dakotan Diet to Fit a Mediterranean Diet Pattern.
Katelyn Langaas[1,2], Angela Scheett[2], Susan Raatz[1,2,3], [1]Nutrition and Dietetics, University of North Dakota, Grand Forks, ND, [2]USDA, ARS, Grand Forks Human Nutrition Research Center, Grand Forks, ND, [3]Food Science and Nutrition, University of Minnesota, St Paul, MN

Background: The Mediterranean diet exerts beneficial effects for the prevention of heart disease, diabetes, cancer, and other diseases compared to a typical Western style diet. The North Dakota diet pattern has properties similar to a Western style diet including low intake of fiber, fruits and vegetables, and high intake of red meats and simple sugars. Use of a Mediterranean diet pattern is not restricted to geographical area and can be adhered to in any part of the world. However, modifying one's current diet to correlate with a Mediterranean diet pattern can be challenging.

Objective: To modify a North Dakota diet pattern to meet the guidelines for a Mediterranean diet pattern.

Description: For this study we modified the typical "North Dakotan" diet to be compliant with the Mediterranean diet pattern using the USDA SuperTracker Food Tracker. We revised menus of typical North Dakotan foods and recipes with foods commonly consumed in the Mediterranean diet. Nutrient calculations of the macro and micro nutrients in each diet pattern were performed to evaluate compliance with a Mediterranean diet pattern.

Conclusion: These dietary changes will result in menus that will be acceptable to North Dakotan individuals.

B. Reported dietary carotenoid intakes are weakly associated with serum carotenoid concentrations in adults. Ambria Crusan MS RD, Marla Reicks PhD RD, Susan Raatz PhD MPH RD; Department of Food Science and Nutrition, University of Minnesota, Minneapolis, MN

Objective: Multiple post-digestion factors can attenuate serum carotenoid concentrations. Longitudinal studies have shown an inverse relationship between serum carotenoids and body mass index (BMI); however, the relationship between β-carotene and BMI in population samples is not well understood. Our primary objective was to determine the association between reported dietary β-carotene intakes and serum β- carotene concentrations, controlling for BMI, age, sex, and ethnicity.

Methods: Data were obtained from NHANES 2003-2006 using multistage probability sampling, including dietary intake and serum β-carotene concentrations for 9,182 male and non-pregnant female participants aged 20-85 years in the United States. The distributions of reported dietary and serum β-carotene concentrations were skewed, therefore log transformed values were used for analysis. Multiple linear regression estimated serum carotenoid concentrations based on reported dietary intake of carotenoids adjusted for BMI, age, sex, and ethnicity.

Results: The prevalence of low serum β-carotene concentrations (<50 µg/dL) was 86.7%, and prevalence of obesity was 32.6%. Mean and standard deviation (SD) was 2.51 ± 0.85 µg/dL for log (serum β-carotene) and 6.52 ± 1.48 µg for log(reported dietary β- carotene). Mean and SD for BMI was 28.27±6.55 kg/m^2. Serum β-carotene concentrations were inversely associated with BMI (r= -0.19, p<0.0001) and weakly associated with reported dietary β-carotene intake (r=-0.04, p<0.0002). Mean untransformed serum β-carotene was significantly lower in obese subjects compared to normal weight subjects (14.39 ± 14.87 µg/dL versus 21.80 ± 24.46 µg/dL, p<0.001).

Serum β-carotene concentrations decreased by 0.22 µg/dL for each standard deviation increase in BMI and increased by 0.22 µg/dL for each standard deviation increase in reported dietary β-carotene.

Conclusions: There was a weak association present between reported dietary β- carotene intakes and serum β-carotene concentrations. A moderate association was present between serum β-carotene and BMI, suggesting individuals with an increased BMI may have a greater risk of low serum β-carotene concentrations despite adequate dietary intake of β-carotene.

C. Weight loss practices and nutrient intakes in a national sample of 8-15 years old children by frequency of trying to lose weight.

Taiya Brown, Marla Reicks PhD, RD, Francine Overcash, PhD University of Minnesota.

Objective: Efforts to lose weight among children/adolescents could have undesirable effects on dietary intake because of unhealthy weight loss practices. The purpose was to examine relationships between frequency of trying to lose weight in a national sample of 8-15 year olds and demographic and physical characteristics, nutrient intakes and weight loss practices.

Methods: National Health and Nutrition Examination Survey data (2011-2012) from youth 8-15 years (n = 1331) were used to examine associations between frequency of trying to lose weight (never vs. sometimes/a lot) and demographic characteristics, BMI category, and weight-loss efforts. Chi-square and t-tests were used to determine differences between groups.

Results: Approximately 48% reported never trying to lose weight; 52% reported trying to lose weight sometimes or a lot. Frequency of trying to lose weight did not differ by sex or education level of the household reference person. Frequency of trying to lose weight was greater among non-Hispanic black and Hispanic children (55%) than non-Hispanic white children (50%) (p = 0.01), overweight/obese children (82%) than normal weight children (39%) (p < 0.0001), and children with lower family income than higher income (58% vs. 50%, p = 0.03). Frequency of practices to lose weight (sometimes/a lot) for those who indicated they tried to lose weight (n = 730) included dieting (42%) starving (19%), cutting back (71%), skipping meals (37%), exercising (92%), and eating less sweets or fatty foods (84%). Mean one day intakes of total calories, sugars, fat and carbohydrate were lower for those who had tried to lose weight compared to those who reported never trying to lose weight (all p = < 0.05). No differences were observed for fiber or total protein intakes.

Significance: The frequency of trying to lose weight may lead to dietary changes among youth that need to be examined for effects on health.

D. Status of Purine Data among Selected Foods.

Beiwen Wu; Janet M. Roseland, MS RD; David B. Haytowitz, MS; Pamela R. Pehrsson, PhD; USDA/ARS, BHNRC, Nutrient Data Laboratory

Background: Gout, the most common type of hyperuricemia, is becoming a global burden at an increasing rate. Hyperuricemia treatment in Japan restricts purine intake to 400mg/day, although

US sources have not specified a definitive amount. Two uricogenic purine bases, adenine and hypoxanthine found in meats and seafood, have shown a greater influence on raising serum uric concentration than purine-rich vegetables.

Objective: To ascertain status of data regarding purine bases in foods and to identify data gaps.

Materials and Methods: An extensive literature search was conducted to obtain data for four main purine bases (adenine, guanine, hypoxanthine, xanthine) in foods. Published data were compiled using Microsoft Access—means, standard errors, minimum and maximum values were calculated. Methodologies reported in each study were evaluated and scored based on the USDA Data Quality Evaluation System.

Results: Thirteen published studies were included, predominantly from countries other than the United States, dating from 1976 to 2017, with about half of the studies conducted before 1990. Studies were limited in scope, types and descriptions of foods, and data quality, especially for US foods. Purine values in beef and its variety products, typically restricted during hyperuricemia treatment, rangedfrom 7.2 to 95.8 mg/100g for adenine, 7.6 to 97.3 mg/100g for guanine, 0 to 96.6 mg/100g for hypoxanthine, and 0 to 112 mg/100g for xanthine. It was observed that purine content varied for the same food in different studies, possibly due to natural variability in foods, different sampling plans, sample handling, and analytical methodologies.

Significance: Existing purine data are limited, old and poorly described. Lifestyle and an overall healthy eating plan play an important role in supporting hyperuricemia management.

ABSTRACTS

Poster Presentations

Monday July 23, 2018

1. Dietary Analysis Exercise Fosters Intercultural Awareness Among College Students.

Priscilla Connors, PhD RDN Priscilla.Connors@unt.edu Department of Hospitality & Tourism Management, 1155 Union Circle, #311100, University of North Texas, Denton, TX 76203-5017 USA

Background: *Meals for a Day* is a dietary analysis exercise in an undergraduate nutrition class that incorporates social responsibility including insights into diverse cultures, civic life, and empathy for others. Students analyzed provided meal patterns for nutritional adequacy using a publisher database and the USDA Food Composition Databases and discussed the experience in an online forum.

Description: Culturally diverse participants were recruited to record food and drink for one day on a standardized form which included a space for describing the context and an option for photographs of food and drink consumed. The intent was to present students with novel foods and culturally unfamiliar eating patterns that disrupted personal rules and biases. Countries represented included Brazil, Zimbabwe, Kenya, and United States. Students were instructed in (a) using food composition databases, (b) making decisions about equivalent foods and (c) analyzing results. Students also shared impressions in a discussion forum that encouraged exploration of cultural values and reflection on how different food choices combine to meet nutrient needs.

Conclusions: A dietary analysis assignment is common in an undergraduate nutrition class. Typically, student record their own intake and compare results to Dietary Reference Intakes (DRI). This assignment introduced a new dimension by presenting culturally unfamiliar foods. Students found this process both frustrating and rewarding. Comments ranged from "I had trouble finding foods I never heard of," to "I loved it!" Students observed that the publisher database relied on brands while the USDA Food Composition Databases were more comprehensive. A dietary analysis project that incorporates unfamiliar eating patterns from ethnically diverse participants promotes social responsibility when coupled with discussion designed to shift personal rules and biases and sponsor empathy for novel dietary practices.

2. Iranian Cooked Food Composition Tables.

Mitra Ghazizadeh, MSc. RHN; Mahmoud Behnammoradi, MSc. and Pegah Behnammoradi, BA. Mitra Ghazizadeh, 1909-1082, Seymour St. Vancouver, BC, Canada; 604 565 0522(phone); mitra1956@yahoo.com

Objective: Determination of nutrient content of Iranian cooked dishes by recipe calculation method.

Material and Methods: In this study, nutrient content of 100 g edible portion of 47 Iranian cooked dishes have been calculated by Mixed method (yield factors have been applied at recipe level and nutrient retention factors have been applied at ingredient level). Raw ingredients were mostly purchased from local stores, except for vegetables, especially green herbs, which were bought fresh from Persian stores. The recipes, especially the proportion of the main ingredients, have been adopted from the *Honare Ashpazi* cookbook (1). Excess oil of frying step of preparation of dishes was removed. Data for nutrient content of ingredients has been extracted from the online Canadian Nutrient File (CNF), USDA National Nutrient Database for Standard, Food Composition Tables for the Near East, FAO, and Food Composition Tables of Iran (2, 3, 4, and 5 respectively). Cooking yield factors (YFs) have been measured by dividing the total weight of edible part of cooked food to the total weight of edible part of raw ingredients. Retention factors (RFs) have been extracted from the USDA Table of Nutrient Retention Factors, and BFE Tables of Nutrient Retention Factors (6, 7 respectively).

Results: The Proximate/Energy component of 100 g edible part of dishes is: 16.26-83.46 g moisture, 0.10-3.01 g mineral, 0.98-30.08 g protein, 1.10-37.77 g total fat, 0.12-66.53 g carbohydrate, 0.05-5.32 g dietary fiber, and 45.82-392.48 Kcal energy. The dishes also contain 0.41-590.21 mg sodium, 0.15-4.71 g saturated fat, 0-0.81 g trans-fat, and 0-173.77 mg cholesterol. Cooking yield factors of dishes are between 0.48 and 3.54.

Significance: These tables can be useful tool for professionals in human nutrition studies. In addition, they can be utilized by external users, including food manufacturers, restaurants, and the general public.

3. Assessing Multivitamin-multimineral (MVM) Supplements for Meeting Gaps in Food Intakes.

Johanna T Dwyer DSc, RD[1], Leila Saldanha PhD RD[1], Regan L Bailey PhD MPH RD[2], Jaime Gahche MS[1], Laverne Brown PhD[1], Nancy Potischman PhD[1], Richard Bailen MBA[1] ODS/NIH Bethesda, MD[1], Purdue University, W.LaFayette, IN[2]

Background Nutritionists recommend "foods first"; basing intakes on a wide variety of foods to fulfill nutrient needs and using supplements only when gaps are not filled by foods alone. MVM are popular in the US and their nutrient composition is critical to capture.

Objective: Describe methods for examining the extent to which current MVM formulations fill gaps in nutrient intakes unmet by foods alone relative to requirements. **Description**: On-market MVM labels targeted to persons ≥ 4yr. were identified using the Dietary Supplement Label Database (DSLD). Labels were categorized as MVM using two definitions; 1) NHANES criterion (> 3 V and 1 M ± botanicals and 2) another proposed criterion (≥ 14 nutrients with an established Daily Value [DV] + ≥ 50% DV for 14 + ≤ the Tolerable Upper Level [UL]); the number meeting the two definitions differed**.** For each product categorized as an MVM by each definition, %DV, absolute amount and the UL were determined for each nutrient. MVM labels exceeding the UL, or providing 100%, 75%, 50% 25% or <25% DV were ascertained. Mean %DV of each nutrient in the MVM was compared to nutrient intake gaps from food alone reported on 24-hr.recalls by NHANES participants. The **%** DV was usually higher for V than for M. Few MVM contained nutrients greatly exceeding the UL. In NHANES, some M and V present in MVM did not meaningfully contribute to dietary status because few persons were at risk of inadequacy while others, such as vitamins D and E did fill a gap.

Conclusion Some MVM formulations can help to fill shortfalls in certain nutrient intakes from foods alone, but for other nutrients, intakes are already satisfactory. Additional amounts from MVM are not necessarily beneficial. Thus, some reformulation may be advisable, especially for products that contribute to intakes >UL.

4. The Grocery Purchase Quality Index-2016 Performs Similarly to the Healthy Eating Index-2015 in a National Survey of Household Food Purchases.

Philip J. Brewster, MS[1]; Carrie M. Durward, PhD, RD[2]; John F. Hurdle, MD, PhD[1]; Patricia M. Guenther, PhD, RD[3]; [1]Dept. of Biomedical Informatics, University of Utah; [2]Dept. of Nutrition, Dietetics and Food Sciences, Utah State University; [3]Dept. of Nutrition and Integrative Physiology, University of Utah

Objective: The objective of this study was to validate the Grocery Purchase Quality Index-2016 (GPQI-2016) by comparing it to the Healthy Eating Index- 2015 (HEI-2015). The GPQI-2016, a tool for assessing grocery food purchase quality, is based on expenditure shares for food categories found in the USDA Food Plans.

Methods: In 2012 the USDA Economic Research Service conducted the National Household Food Acquisition and Purchase Survey. Household members recorded all foods acquired for a week. Using these data, the authors mapped foods to the 29 food categories used in USDA Food Plans and collapsed them into the 11 components of the GPQI-2016. Expenditure shares were estimated for each component. USDA food codes, provided in the survey database, were used to calculate the HEI-2015. After scoring purchases from food stores by participating households (n=4,187), the Spearman's correlation coefficient was used to compare GPQI-2016 scores with HEI-2015 scores. Linear regression models with fixed effects were used to determine differences among various subgroups of households.

Results: The correlation coefficient for the total GPQI-2016 and the total HEI-2015 scores was 0.70. Among the component scores, the lowest correlation was for Sweets & Sodas in the GPQI-2016 and Added Sugars in the HEI-2015 (0.65); the highest was for Whole Fruit (0.91), which is in both indexes ($p<0.01$ for all components) Both GPQI-2016 scores and HEI-2015 scores varied by household characteristics, such as region, income, race/ethnicity, education, use of Nutrition Facts panels, and shopping with a list, in expected directions.

Significance: Overall, the GPQI-2016, estimated from a national survey of households, performed similarly to the HEI-2015. The tool has potential for use in nutritional epidemiology and for evaluating policies and interventions aimed at improving food environments and household purchases, including retail- oriented interventions when the nutrient content and gram weights of foods purchased are not available.

5. Marketplace Changes in the Baby Food Aisle.

Jennifer Stevenson, Bhaskarani Jasthi, PhD RD, Kristine Schmitz, Janet Pettit, and Lisa Harnack, DrPH RD. Nutrition Coordinating Center, Epidemiology & Community Health, University of Minnesota

Objective: To describe changes between 2009 and 2018 in the following characteristics of baby food products offered in the US by leading manufacturers: products labeled as 'organic'; products sold in pouches; dry cereals containing whole grain ingredients; and complexity (inclusion of multiple ingredients).

Materials and Methods: The University of Minnesota Nutrition Coordinating Center (NCC) Food and Nutrient Database includes baby foods sold by leading manufacturers in the US, and this food category was updated in 2018 to reflect the current marketplace. To examine changes in baby food products over time the products offered in 2018 were compared with products in the database when this product category was updated in 2009. Manufacturers included in the database in both 2009 and 2018 include Gerber, Beech-Nut, and Earth's Best. In 2018 baby food products sold by several additional manufacturers were added (Plum Organics, Ella's Kitchen, and Happy Family).

Results: When comparing data from 2009 to 2018, Beech-Nut, Earth's Best, and Gerber increased the number of baby food products they offer. Beech-Nut and Gerber increased the number of products labeled as 'organic' while other manufacturers sell only organic foods (e.g. Earth's Best and Plum Organics). Most of the dry cereals in the market today contain one or more whole grain ingredients, with a notable increase for Gerber (from 25% to 72% of their dry cereals). While pouches did not exist in the marketplace in 2009 for the major manufacturers, currently all of the companies in the NCC database sell some or all of their products in pouches. Baby foods that combine multiple ingredients (e.g. fruit and vegetable ingredients) are more common now than in 2009.

Significance: The NCC Food and Nutrient Database has been updated to reflect changes to assist researchers studying the diets of infants and young children.

6. A New and Flexible Method for the Estimation of Free and Added Sugars in Foods: An Example from the UK National Diet and Nutrition Survey.

Birdem Amoutzopoulos, PhD; Toni Steer, PhD; Caireen Roberts; Darren Cole; David Collins; Suzanna Abraham; Sonja Nicholson, PhD; Polly Page; Medical Research Council (MRC), Elsie Widdowson Laboratory

Objective: Reliable assessment of nutrient intakes depends upon provision of up-to-date, robust, standardized yet versatile food composition data, reflective of foods consumed and aligned to the specifics of nutrient and public health recommendations which change over time and vary within national and international contexts. Sugar is a prime candidate with various definitions often subject to debate and change, and is exemplified by the recent move to 'free sugars' with subtle differences in application by governments and advisory bodies (e.g. WHO, UK Scientific Advisory Committee on Nutrition (SACN) and Public Health England). We aimed to establish a feasible and accurate method to interchangeably estimate the consumption of sugars based on specifics of different definitions including added sugars, free sugars and non-milk extrinsic sugars.

Materials and Methods: Our method involved six steps to disaggregate sugars in ingredients of foods in the UK National Diet and Nutrition Survey (NDNS) Nutrient Databank into seven individual sugar components (e.g. sugar from table sugar, sugar from honey). The components were then combined according to different sugar definitions. Automation techniques facilitated the process. Inter-rater repeatability and validity tests were conducted. Sugar intake for different age groups in NDNS 2012–14 were estimated according to different definitions.

Results: Validation tests demonstrated good repeatability and accuracy for the method. Free sugar intake across all age groups was higher for the SACN definition compared to the WHO definition. Added sugar intake across all age groups was lower than free sugar intake. For all sugar definitions, 11-18 year-olds had the highest intake.

Significance: This approach enables feasible, specific and standard estimation of added and free sugars, and can be readily adapted to subtle differences in definition (e.g. inclusion/exclusion of vegetable purees) and adopted to test population- and product- specific measurements as well as providing flexibility and longevity to food composition databases.

7. Nutrient Consumption among the U.S. Population Using Food Label Information, National Health and Nutrition Examination Survey (NHANES), 2005-2010.

WenYen Juan, PhD; Office of Nutrition and Food Labeling, Center for Food Safety and Applied Nutrition, Food and Drug Administration

Objective: Compare nutrient consumption amounts between the US population, who reported using food label information versus those who did not use the food label information.

Methods: Cross-sectional analysis of data from NHANES 2005-2010 was used to estimate selected nutrient intakes among adults (≥18 years, n=16,802). The intakes of calories and 42 nutrients were compared among adult males and females who used food label information (users) and those who

did not use the food label information (non-users). Food label information includes the Nutrition Facts label (the NFL), which includes information on calories and eight specific nutrients, the serving size on the NFL, the ingredients list, and claims (such as nutrient content claims, health claims, and structure and function claims).

Results: Males and females reported using the NFL information more often than other components (e.g., ingredients, claims, and serving size) on the food label. Calorie intake was significantly lower among female NFL label users compared to non-users, but no significant difference in calorie intake was observed among male label users and non-users. Depending on which component of the food label information was used, the intakes of fiber, B vitamins, vitamins D and C, folate, calcium, and potassium were significantly higher and total fat was significantly lower, among label users compared to non-users of either gender. Among NFL users who reported seeking specific nutrient information (calories, fat, trans fat, saturated fat, cholesterol, sodium, carbohydrate, fiber, and sugar) on the NFL, the intake of calories was significantly lower and fiber intake was significantly higher for males. For females, the intakes of carbohydrate and sodium were significantly lower.

Significance: These findings suggest that consumers who used nutrition information on packaged food labels may have improved their nutrient consumption, and that utilizing food label information may lead to beneficial dietary practices.

8. Exploring Foods of the Pacific (EFP): The Children's Healthy Living Program (CHL) for remote underserved minority populations in the Pacific region.

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Objective: The purpose of EFP was to capture culturally relevant definitions of traditional and acculturated foods from the U.S. Affiliated Pacific (USAP); and to assess frequency of consumption of fruits and vegetables (F&V) meeting these classifications among the CHL sample of children 2-8 y. Defining a "traditional" food is challenging as many cultural groups in the Pacific underwent disruption with World War II and many foods considered as "traditional" (such as Spam®) represent modern interpretation. Helping to define and identify the use and extent of traditional and acculturated foods in the Pacific is one of the secondary goals of CHL.

Methods: Stakeholders from the 11 jurisdictions, i.e., Alaska, Guam, Hawai'i, American Samoa, Commonwealth of the Northern Mariana Islands, the Federated States of Micronesia (Yap, Chuuk, Kosrae and Pohnpei), the Republic of Palau, and the Republic of the Marshall Islands (RMI), completed a questionnaire to identity foods as traditional, acculturated, or locally grown. Parent/caregivers completed 2-day dietary records (DR). The DR (n=3,553) contained 105,290 entries which were labeled as fruit or vegetable; and traditional, acculturated, or locally grown.
Results: Using the F&V status identified by stakeholders, 20% of the recorded F&V intake was classified as traditional; the highest was Yap (67%) and the lowest were Alaska and Hawai'i (9 and 10%, respectively). For acculturated F&V, the proportion was 28%; RMI at 8% was lowest and

Hawai'i was highest (38%). Of the 58 foods added to the food composition database, 7 were traditional, i.e., Ambarella fruit, pandanus paste, sapodilla, edible hibiscus leaves, caribou, moose, and palolo worm. The remainders were non-traditional, e.g., unsweetened cranberry juice, sweetened almond milk, frozen chicken patty, canned pasta, and cocoa with milk.

Significance: Many of the F&V reported were not traditional and would suggest a nutrition transition from traditional F&V in the USAP.

9. U.S. Food and Drug Administration's Total Diet Study: How Improved Analytical Methods Affect Monitoring Data.

Dana Hoffman-Pennesi, MS; Judith Spungen, MS RD; Terry Councell; Edward Nyambok; Stephanie Briguglio, MPH CPH; Alexandra Gavelek, MS; and Mark Wirtz, BS. FDA-CFSAN 5001 Campus Dr. Rm 2A-034 College Park, MD 20740.

Background: In 2014, the U.S. Food and Drug Administration's (FDA) Total Diet Study (TDS) began updating the digestion/extraction and the determinative methods for nutrient and toxic elements. The analytical methods for iodine, manganese, and selenium were all updated to inductively-coupled plasma mass spectrometry (ICP-MS) from colorimetric determination, inductively-coupled plasma atomic emission mass spectrometry (ICP- AES), and hydride generation atomic absorption spectroscopy (HGAAS), respectively. With updates in digestion/extraction and determinative methods, new limits of detection (LODs) and limits of quantitation (LOQs) were determined.

Objective: The changes in methods for iodine, manganese, and selenium analysis were evaluated based on the proportion of results above the LOQ, below the LOD (non-detects or NDs), and between the LOD and LOQ (trace values), in data generated in the year before and the year after the changes.

Description: The proportion of NDs for iodine was 87% lower using ICP-MS than the colorimetric method; the proportions of trace values and values above the LOQ were 4% lower and 149% higher, respectively. The proportion of NDs for manganese was 52% lower using ICP-MS than using ICP-AES, and the proportions of trace values and values above the LOQ were 100% lower and 19% higher, respectively. For selenium, there was little change in the proportion of NDs or the proportion of values above the LOQ, but the proportion of trace values was 40% higher using ICP-MS than using HGAAS.

Conclusion: Updating methods can have various effects on data and potentially how data are utilized. While selenium showed little change, iodine and manganese had lower proportions of NDs and higher proportions of values above the LOQ. For TDS, this indicates that these new methods are in general an improvement on the old methods.

10. Recipe Development Advances in the Food and Nutrient Database for Dietary Studies 2015-2016.

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Background: The Food and Nutrient Database for Dietary Studies (FNDDS) 2015- 2016 contains over 7,600 food and beverage items. Since it is not possible to generate a nutrient profile for every item in FNDDS using only analytical data, recipe calculations generate nutrient profiles for 2/3 of FNDDS items.

Objective: The objective of this presentation is to describe the recipe development process utilized to standardize and streamline the 1000+ new food/beverage items added to FNDDS 2015-2016.

Description: With every two-year release of FNDDS, the data undergo comprehensive review and update. For FNDDS 2015-2016, over 20 established categories of similar food/beverages were updated using a streamlined process to determine recipes for new items and to revise existing recipes for similar foods. Recipe calculations generated nutrient profiles for home-prepared dishes, as well as cooked meats, eggs, grains, and vegetables, that take into account salt and/or fat used in preparation. When no appropriate analytical data for processed or restaurant foods were available, recipes were used to generate nutrient profiles for those foods. New approaches to recipe development for FNDDS 2015-2016 included: (1) Evaluating the integrity and currency of underlying values for the ingredient codes that form the basis of nutrient profiles for each FNDDS food/beverage. (2) Reviewing current consumption and preparation patterns to develop directives to operationalize recipes within categories. (3) Selecting ingredients, amounts, retention factors, and moisture changes that cover a large number of variants of basic dishes. (4) Incorporating any changes as distinct ingredients in the recipe, thus increasing transparency. (5) Creating new FNDDS codes/recipes used only as *ingredient foods* (cheese as ingredient in sandwiches) in subsequent recipe calculations.

Conclusion: FNDDS 2015-2016 will be available at www.ars.usda.gov/nea/bhnrc/fsrg. The files provide additional detail on recipes and the advances to standardize and streamline food/beverage items.

11. Using the Nutrient Rich Food Index 6.3 as the Basis for Creating a Nutrient Density Score that Includes Food Groups.

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Background: Nutrient density (ND) scores can serve as a tool for regulators to build nutrition policy and individuals to guide food choices. However, few ND scores currently incorporate food groups. **Objective:** To create an ND score that considers the balance of nutrients to encourage, nutrients to limit and food groups.

Description: The nutrient rich food Index (NRF) is an established measure of ND. NRF 6.3 (NRF 6.3) includes six nutrients to encourage and three nutrients to limit. The contribution of a food towards the daily recommended intake for each nutrient is calculated: the positive nutrients are capped at 100% and summed while the negative nutrients are not capped and subtracted from the total. Thus, a higher score indicates a higher ND. Using these principles, we updated the NRF 6.3 to include food groups. This new Hybrid NRF score includes six positive nutrients (protein, fiber, calcium, iron, vitamin D, potassium), seven food groups (seafood, nuts, dairy, fruit, vegetables, whole grains, oils) and three nutrients to limit (sugar, saturated fat, sodium). We tested how over 30 foods within the Food and Nutrient Database for Dietary Studies 2013-2014 scored using the NRF 6.3 and the Hybrid NRF. Of the 33 foods evaluated, 16 (48%) had an increase in the rank of their score and 17 (52%) had the same or decreased rank. The foods that had the biggest increase in the rank of their score were roasted mixed nuts, crunchy granola bars, brown rice, whole wheat bread, and apples.

Conclusion: While these results are dependent on the limited list of foods evaluated, and further work is needed to validate this score, these initial results indicate that a ND score that includes nutrients to encourage, nutrients to limit and food groups may be useful in nutrition policy and dietary guidance.

12. Median Serving Size of Ready-to-Eat Cereal Over a 12-year Period.

Jessica Smith, Neha Jain, Vipra Vanage, Farhat Pathan, Nort Holschuh, Kathy Wiemer. General Mills Bell Institute of Health, Nutrition and Food Safety.

The U.S. Food and Drug Administration updated the reference amounts customarily consumed (RACC) for more than 20 food categories, including ready-to-eat cereal (RTEC). The RACC of medium-weight RTEC increased from 30g to 40g and for heavy- weight RTEC from 55g to 60g. RACCs are required to be based on recent U.S. consumption data yet the most recent data available at the time of NLR was NHANES 2003-2008.

Objective: To compare the newly finalized RACCs for RTEC to current intakes.

Materials and Methods: Here we report the median intake of two categories of RTEC, medium-weight RTEC (20g to <43g per cup) and heavy-weight RTEC (43g or more per cup), using 6 NHANES cycles (2003-2004 through to 2013-2014) for the total population 4 years and older and for children 4-12 years.

Results: We found that the median intake of medium-weight RTEC for the population 4 years and older over the 12-year period of 2003-2014 was 36.7 g. This was a modest increase compared to the 1993 RACC of 30 g (22% higher). The median intake in the most recent cycle, NHANES 2013-2014, was 32.2 g (7% higher than 1993 RACC). Among children 4-12 years, the median intake of medium-weight RTEC from 2003-2014 was 30.8 g (3% difference from 30 g). The most recent (NHANES 2013-2014) median intake for children was 29.2 g and the highest median intake was 38.5 g in 2003-2004. For heavy-weight RTEC, the median intake over the 11-year period of 2003-2014 for the total population was 55.5 g (1% difference from 1993 RACC of 55 g) and for children it was 43.5 g (-21% difference from 55 g).

Significance: The public health impact of increasing the RACC for these two categories of RTEC, in light of little data to support an increased intake, remains to be seen.

13. Measured Cup Weights of Ten Raw Leafy Vegetables Are Lower Than Weights Reported in Food Composition Databases or Nutrition Labels. Catherine A. Chenard, MS, RD, LD; Megan M. Anderson, BA; Lisa L. Brooks, MA, RD, LD; M. Bridget Zimmerman, PhD; University of Iowa, Iowa City, IA

Objective: The measured cup weight of raw leafy vegetables was compared to weights reported in the National Nutrient Database for Standard Reference Release 28 (SR), Food and Nutrient Database for Dietary Studies 2013-2014 (FNDDS), and/or nutrition facts panel (Label).

Materials and Methods: Cup weights for a convenience sample of ten vegetables were measured by six individuals during 2016 and 2018. Sequential cups of loosely/moderately packed pieces from one package/head/bunch of each vegetable were weighed on a calibrated scale to the nearest 0.1 gram until none remained. Any moisture was blotted with paper towels, refuse (core, root, inedible leaves) was removed, and leaves were cut/torn into approximately 1 inch pieces; ready-to-eat produce was measured as purchased; parsley was cut into sprigs and then chopped. A random effects model was fitted to obtain the total variability between and within measurers and the mean a) gram weight for one cup and b) gram weight expressed as a percent of the cup weight reported in SR, FNDDS, and/or Label.

Results: Replicate measurements per vegetable ranged from 22 to 83. Mean(SD) cup weight [mean(SD) % reported cup weight]: Earthbound Farm® Organic Baby Spinach 15.6(2.4)g [37.5(5.7)% Label; 52.2(8.1)% SR; 62.6(9.7)% FNDDS]; Earthbound Farm® Organic Spring Mix 15.0(2.4)g [35.9(5.6)% Label]; Earthbound Farm® Organic Baby Arugula 13.8(2.4)g [33.2(5.6)% Label; 69.0(12.0)% SR, FNDDS]; Dole® Garden Salad 46.0(6.1)g [81.2(10.7)% Label]; Rolling Hills® Boston Butter Bibb Lettuce 19.3(2.2)g [35.1(3.9)% SR; 77.2(8.7)% FNDDS]; Green Leaf Lettuce 18.7(3.4)g [51.9(9.5)% SR]; Romaine Lettuce 28.6(6.0)g [81.7(17.1)% FNDDS]; Collard Greens, stems removed 18.1(2.5)g [50.3(7.1)% SR, FNDDS]; Bok Choy with stems 59.0(7.0)g [84.3(9.9)% SR, FNDDS]; Bok Choy without stems 45.6(8.3)g; Parsley sprigs 7.8(0.8)g; Parsley, chopped 17.3(5.6)g [28.9(9.4)% SR].

Significance: Measured cup weights were consistently lower than reported weights. Reported weights varied among sources. Inconsistent or inaccurate cup weights may impact the calculated nutrient intake of individuals.

14. What We Eat in America, NHANES: Comparing Day 1 and Day 2 Dietary Intake Data.
Alanna J Moshfegh, MS, RD; Lara H Sattgast, MS; Donna G Rhodes, MS, RD: John C Clemens U.S. Department of Agriculture, Agricultural Research Service, Beltsville Human Nutrition Research Center, Food Surveys Research Group, Beltsville, MD.

Objective: The objective of this research is to compare day 1 and day 2 dietary intakes of adults in What We Eat in America (WWEIA), NHANES 2013-2014.

Materials and Methods: Dietary recalls of males (n=1,284) and females (1,325) 20+ years who had both a day 1 and day 2 recall and reported their intake as usual on both days in WWEIA, NHANES 2013-2014 were examined. The day 1 recall was conducted in-person in the NHANES Mobile Exam Center; day 2 was collected by telephone 3 to 10 days later. USDA's Automated Multiple-Pass Method was used by trained interviewers to collect each recall. Two-day dietary weights adjusted for day of the week. Mean energy intake/number of items reported by males (160 kcal) and females (120 kcal) was used to compare recalls.

Results: Mean (±SE) energy intake for males was 2,460 ±36 kcal for day 1 and 2,364 ±47 kcal for day 2 (p=.048). For females, 1,868 ±24 kcal and 1,780 ±38 kcal were reported for day 1 and 2, respectively (p=.028). When comparing intakes regardless of gender, 13 ± 1% of individuals had day 1 and day 2 intakes within 160/120 kcal. Of the remainder, 49 ±2% had day 1 intakes greater and 38 ±2% had intakes lower in energy than day 2 intakes. Further results for the two recalls will be presented.

Significance: Mean energy intake of adults was not statistically different between the two days of recall. The difference was less than 5% for either gender. For more than a third of the adults, day 1 intakes were lower in energy than day 2 by more than 160 kcal for males and 120 kcal for females.

15. U.S. Food and Drug Administration's Total Diet Study: Monitoring of the Mineral Nutrients in Infant Formula.

Alexandra Gavelek, MS; Dana Hoffman-Pennesi, MS; Judith Spungen, MS RD; Terry Councell; Edward Nyambok; Stephanie Briguglio, MPH CPH; and Mark Wirtz, BS; Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration

Background: The U.S. Food and Drug Administration's (FDA) Total Diet Study (TDS) monitors levels of certain nutrients and toxic elements in multiple foods consumed in the U.S., including minerals in infant formulas. Infant formulas must be specially formulated to meet the nutrient requirements of infants. Manufacturers are required by the 1980 Infant Formula Act to meet specified vitamin and mineral levels per 100 kcal in all infant formulas sold in the United States; these levels are specified in Code of Federal Regulations (CFR) Title 21 Part 107.

Objective: The objective is to determine the variability of certain mineral levels in infant formulas sold in the United States, as sampled and analyzed by TDS.

Description: Data collected from FDA's Total Diet Study from 2014-2016 for calcium, copper, iodine, iron, magnesium, manganese, phosphorus, potassium, selenium, sodium and zinc in soy-based and iron-fortified milk- based ready-to-feed infant formula were reviewed. The data included 16-22 composite samples of infant formula; the composites were each formed from samples collected in three different cities and could include multiple brands. These TDS data were evaluated to determine the variability in the mineral components of formulas. Labels for the most popular brands of formula were reviewed to determine the variability of the mineral levels claimed to be in infant formulas. The range of mineral levels found in infant formulas sampled by the TDS were compared to the ranges of labeled values of highly purchased formula brands similar to those sampled by TDS and to the ranges of legal requirements for minerals in infant formula, converted from µg or mg per 100 kcal to the µg or mg per kg basis.

Conclusion: This analysis indicates that the variability of minerals in composite samples of infant formulas tested by TDS typically falls within the legally required range of values for minerals.

16. Trans fat content trend analysis of prepackaged foods using Mintel's Global New Product Database: potential uses of food label data.

Winnie Cheung, Lidia Loukine, Michel Vigneault. Health Canada

Background: Canadian regulations require mandatory labelling of trans fat (TFA) in the nutrition facts table of most prepackaged foods sold in Canada. High consumption of TFA has been found to adversely affect blood lipid levels and is associated with increased risk of cardiovascular disease[1].

Objective: Using food label data from Mintel's Global New Product Database (GNPD), to explore and assess the trend in TFA content reported on prepackaged foods newly introduced to the Canadian market between 2007 and 2015.

Materials & Methods: Only foods with sources of industrial TFA sold in Canada were included for analysis.Food products were compared by standardizing TFA label value unit to per 100g or mL. The average yearly TFA concentration (per 100g or mL) was estimated to assess the overall trend among all foods by food type categories and by categories with the following groups of TFA values: (0g, 0 to 0.1g, 0.1 to 0.5g and > 0.5g) per 100g of food.

Results: The search identified 21,323 products. The average TFA concentration among those products decreased by 2.4% annually. An associated reduction, from 8.2 g (2007) to 5.1g (2015) per 100g was observed among foods with higher TFA values (>0.5g per 100g). A reduction was observed among all food categories except for sauces & seasonings.

Significance: Despite GNPD reporting only new products, it can be useful to provide information on the nutrient trends of packaged foods within a given period of time.

17. Application of the Child Nutrition Database (CNDB) in Support of Federal Meal Requirements.

Natalie Partridge, MS, RD and Bethany Showell; Nutrition, Education, Training and Technical Assistance Division, USDA-Food and Nutrition Service

Background: The USDA, Food and Nutrition Service (FNS), Child Nutrition Programs (CNP) has managed and administered the Child Nutrition Database (CNDB) since 1994. The CNDB is the primary database required in nutrient analysis software approved by USDA for use by State and Local agencies participating in the National School Lunch Program and School Breakfast Program (NSLP/SBP).

Objective: To highlight the importance of acquiring quality nutrient data in the maintenance and dissemination of the Child Nutrition Database.

Description: The CNDB is comprised of several different sources of data. Sources include the USDA National Nutrient Database for Standard Reference (SR) data set, food manufacturers' data, nutrient profiles for USDA Standardized Recipes and data for USDA Foods. The data submitted must be accurate for that current food item. To ensure data quality, reliability, and cohesion; a rigorous control process is conducted by FNS staff and a third party. Once the data have been reviewed and approved for inclusion in the CNDB, software developers are required to incorporate the most recent CNDB version into their software. FNS also notifies other CNP stakeholders of upcoming database release. The CNDB (Release 21) is available as a Microsoft Access file for inclusion in the analysis software. Currently, the CNDB contains approximately 10,000 active foods.

Conclusion: FNS provides a targeted set of nutrient data to school program operators through nutrient analysis software developers. Data is used to analyze school meals to ensure they meet the nutrient requirements of the current regulations. The software in which the CNDB is included is also used for other CNP requirements.

18. Vitamin D and Iodine Values and Variability for Six Types of Processed Eggs.

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Background: Iodine deficiency is reemerging in the US, and surveys indicate that many adults may be deficient in vitamin D3 and serum 25(OH)D. Eggs are an important dietary source of iodine, vitamin D3, and 25(OH)D. The popularity of eggs in the diet necessitates knowledge of content of these nutrients, especially in processed eggs found in commercially-produced foods and foodservice applications.

Objective: To measure differences among analytical nutrient values and variability measures for processed liquid and dried whole eggs, yolks, and whites.

Materials and Methods: Samples of 6 types of egg products (3 lots per product) were obtained from 6 top US processors. Samples and standard reference materials were sent to validated laboratories for analyses of iodine, vitamins D2, D3, 25(OH)D3, and proximates (n=up to18/nutrient/product type). Standard AOAC or other accepted methods were used for analysis. Wilcoxon Rank Sum test was used for statistical analysis between producers.

Results: Values (mean ± SD/100g) for iodine (mcg) ranged from <10 (liquid white) to 362±75 (dried yolk). Vitamin 25(OH)D (mcg) values were <0.03 (liquid white) to 1.69±0.49 (dried whole egg). Vitamin D3 (mcg) values ranged from <0.10 (liquid and dried white) to 15.39±11.14 (dried yolk). Highest protein (g) content was in dried white (79.87±1.34); the lowest was in liquid white (10.09±0.27). Dried yolk had highest fat (g) (55.51±0.90), while liquid white had the lowest fat content (0.15±0.04). Dried whole egg had highest ash (g) content (6.21±0.51), and liquid white had lowest ash(0.70±0.05). Liquid white had highest moisture (g) content (88.31±0.29), while dried yolk had the lowest moisture (3.59±0.59). Vitamin D2 was not detected. No statistical differences were observed between producers, for any of the nutrients tested.

Significance: Updated values for eggs may enable intake estimates for iodine and maybe useful to help explain the discrepancy between dietary and serum measures of vitamin D status.

19. Release 4 of the Dietary Supplement Ingredient Database (DSID): results for the 2nd national study of adult multivitamins and for single ingredient green tea dietary supplements.

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Objective: The DSID provides analytically-derived estimates of ingredient content in dietary supplements (DS) sold in the US. The latest release, DSID-4, reports on our second national study of adult multivitamins (adult MVM-2017). Predicted mean estimates for vitamins and mineral content are applied to the National Health and Nutrition Examination Survey (NHANES) 2009-2014 DS files. We also expanded the DSID to include botanical DS for the first time, with results for the content of total catechins, epigallocatechin gallate (EGCG) and caffeine in single ingredient green tea (GT) DS.

Materials & Methods: Nationally representative adult MVM products were identified, sampled and analyzed by qualified laboratories experienced in DS chemical analysis. The relationships between the analytically measured and labeled ingredient content were evaluated by regression analysis. The regression models are incorporated into the DSID calculators converting labeled into analytically predicted ingredient content. For the GT DS study, 2 lots of 32 DS were tested for phytochemical content and these results were compared to label claims for amounts of GT and GT constituents.

Results: For the 18 ingredients analyzed in both adult MVM studies, mean overages in ingredient content were found for all vitamins (except thiamin) and minerals. Calculators for vitamin A, vitamin D and chromium are available for the first time. The analytical content of EGCG in green tea DS ranged from 0.5 - 562 mg/serving. Products with label claims for EGCG or caffeine content were more likely to have higher analytical content than those with information only about the amount of GT or GT extract.

Significance: The DSID provides estimates that are, in most cases, more accurate than label information and can improve the calculation of nutrient intakes from DS. It is also important to track the intake of phytochemicals, especially those that are found in both foods and supplements, to evaluate their health effects.

20. Modernization and Revitalization of the FDA Total Diet Study.

Judith Spungen, Terry Councell, Dana Hoffman-Pennesi, Alexandra Gavelek, Stephanie Briguglio, Edward Nyambok, Mark Wirtz. FDA Center for Food Safety and Applied Nutrition, Division of Risk and Decision Analysis

Background: FDA's Total Diet Study (TDS), initiated in 1961, continuously monitors concentrations of mineral nutrients and contaminants in about 265 foods, based on regular sampling and analysis of these foods in various locations in the U.S. FDA uses TDS concentration data to provide perspective for safety assessments, to inform risk assessments, to identify potential safety concerns, and to estimate dietary nutrient intakes and contaminant exposures. The TDS concentration data are publicly available and may be downloaded from FDA's website. Over the past three years, FDA has focused attention on modernizing and revitalizing the TDS program.

Objective: Describe FDA efforts to modernize and revitalize the TDS program, including development of a data management system for trend analysis, changes in analytical methods, revision of the food list, revision of the sample collection protocol, and development of new tools for intake/exposure assessment.

Description: New TDS analytical methods include better digestion methods (acid microwave extraction) and use of more sensitive instruments (inductively coupled plasma mass spectrometry), resulting in lower limits of detection (LOD) and quantification (LOQ). However, concentration data for some elements still include high proportions of values below the LODs, presenting challenges for statistical calculations. The new sampling protocol will, for the first time, allow characterization of seasonal and regional variability for some TDS foods. More specific sampling criteria will allow more accurate estimates of mineral concentrations in foods, and a new strategy for mapping National Health and Nutrition Examination Survey/What We Eat In America foods to TDS foods will allow more accurate estimation of mineral nutrient intakes and contaminant exposures.

Conclusion: Recent changes to the FDA TDS program are resulting in improved quality of data on food composition. These data are useful for a variety of types of analysis.

21. Restaurant Foods Nutritional Data: Comparison of Calculation Method and Analytical Methods.

Xu Weisheng, PhD; Zhao Jia; Liu Yang, Wang Zhu, PhD; National Institute For Nutrition And Health, Chinese Center For Disease Control And Prevention.

Objective: To establish a food database containing the nutrient content of restaurant dishes, from standardized food recipes and nutrient composition data and to develop a supplement to the Chinese Food Composition Database.

Methods: Recipes of dishes were sampled and weighed, including 1) raw food ingredients without data in the food composition tables; 2) recipes for dishes (such as fried and salted dishes) including the oil and salt used in processing (cooking). Common dishes were selected from a number of restaurants comparing the results of our calculation method to that of chemical analysis. Methodology differences were statistically tested by paired t-test. By categorizing and encoding all the dishes involved in a unified approach, and standardizing the data of the same cuisine from different restaurants, a food ingredients library and nutrients component database was developed.

Results: Compared the results from a weighted record method with that from analytical methods, we found that weighted record method gives a lower values for energy, protein and fat, which were 10.1kcal/100g, 0.4g/100g, 0.9g/100g, respectively, and higher values for sodium and carbohydrate, which were 0.4g/100g and 7.3mg/100g. The difference between the two results was less than 10%. A t-test showed the difference in energy and protein to be in the acceptable range ($P < 0.05$).

Conclusion: Our research is the first in this field that has investigated the recipes of dishes from Chinese restaurants in Beijing. The energy and major nutrients contained in 998 recipes have been collected by weighed record method which included the edible portion, oil absorption rate and the waste rate and determined that there is little difference between the weighed and analytical methods.

22. Monitoring trends of sodium content in selected popular commercially processed and restaurant foods (or Priority-2 Foods) using label information.

Ying Li[1], PhD; Jaspreet Ahuja[1], MSc, MS; Mary Cogswell[2], PhD; Pamela Pehrsson[1], PhD. [1]Nutrient Data Laboratory, Beltsville Human Nutrition Research Center, Agricultural Research Service, USDA; [2]Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention, DHHS

Objective: To assess temporal trends in the sodium contents of commercially processed and restaurant foods (or Priority-2 Foods, P2Fs)

Materials and Methods: Nutrient Data Laboratory (NDL) has reviewed and updated sodium values for commercially processed and restaurant foods that are major contributors to US sodium intake in the USDA National Nutrient Database for Standard Reference (SR) used for What We Eat in America, as part of the USDA-CDC sodium-monitoring program. In 2012-2013, NDL reviewed sodium content of ~1,100 P2F's using nutrient information from manufacturers or restaurant chains (e.g. Nutrition Facts Labels and websites), and subsequently tracked them biennially. P2F's were tracked in addition to the sentinel foods monitored mainly through chemical analysis (results presented elsewhere). The list was shortened in 2016, and this study presents changes in sodium values from 2012-2013 for these 329 foods, currently being tracked. The review procedures for each P2F included identifying top brands with the highest market share, and calculating the weighted sodium value per 100 grams. This value was used to update SR if the change was >10% and the previous value was based on labels, or was based on analytical data that was more than 10 years old.

Results: From 2012 to 2016, 84 P2Fs had changes of ≥ 10% in sodium values. The sodium value declined for 46 and increased for 38 foods. For 245 foods (74.5%) the sodium value changed by <10%. There was no consistent temporal trend in sodium values for P2Fs across food types.

Significance: The monitoring of sodium in P2Fs may provide a potential indicator of sodium reduction in commercially processed and restaurant foods, including reformulation and changes in the market share of brands, or could reflect temporal changes in the accuracy of sodium values.

23. What are Canadians Eating in 2015?

Isabelle Rondeau, RD, Isabelle Massarelli, RD and Nadine Kebbe, RD Bureau of Food Surveillance and Science Integration, Food Directorate, Health Canada

Background/Objective: The 2015 Canadian Community Health Survey – Nutrition (2015 CCHS-Nutrition) is the latest nationally-representative survey that collected information, from Canadians ages 1 and older in the 10 provinces, about their eating habits and use of nutritional supplements, as well as other health factors (e.g. height and weight, physical activity and chronic conditions). The nutrient database used for this survey was based on the 2015 Canadian Nutrient File (CNF), a compilation of Canadian food composition data. In total, 20,487 individuals took part in the survey, with a response rate of 61.6%. The data collected in the 2015 CCHS-Nutrition was released in June 2017. Selected tables were also produced at the time of the data release: BMI of adults and children, physical activity and screen time for those aged 6 to 17 years, past-month vitamin and mineral supplement consumption, and percentage of total energy intake from carbohydrate, protein and fat.

Description: Canadians reported consuming more of their calories from protein and fat and fewer from carbohydrates than they did a decade ago. Among children and teenagers, the percentage of daily energy intake from carbohydrates edged down from 54.6% in 2004 to 53.4% in 2015 while among adults, it decreased from 49.1% to 47.7%. Almost half of Canadians (45.6%) aged 1 year and older reported taking a nutritional supplement in 2015, with multivitamins as the most common nutritional supplement reported. The percentage of overweight and obese Canadians aged 18 or older has increased from 2004, 59.2% to 61.3%, while in children and teenagers, a decrease from 34.3% to 30.9% was observed.

Conclusion: The 2015 CCHS-Nutrition provides an opportunity to examine the food and nutrient intakes of Canadians, the extent to which intakes have changed since the 2004 CCHS-Nutrition, and the relationship between diet and a wide range of health and socio-demographic characteristics.

24. Iodine in Foods and Dietary Supplements: Development of a Special Interest Database.

Pamela Pehrsson, PhD, Nutrient Data Lab, USDA; Abby Ershow, Sc.D., R.D., FAHA, Office of Dietary Supplements, NIH; Kristine Patterson, PhD, Univ of MD; Judith Spungen, MS, RD, CFSAN, FDA.

Objective: Data on the iodine content of foods and dietary supplements would be useful in providing guidance for professionals and the public, especially those at risk for deficiency (i.e., women of reproductive age and young children). However, the USDA food composition databases do not currently include iodine values.

Methods: The USDA Nutrient Data Laboratory, in collaboration with the Food and Drug Administration Total Diet Study and the NIH Office of Dietary Supplements, have recently used inductively coupled plasma mass spectrometry to generate iodine data on major sources such as seafood, dairy products, eggs, baked products and commercial foods from both groceries and restaurants.

Results: Among finfish, saltwater species such as haddock and cod had considerably higher iodine values (151 +/- 90, n= 7) (mean ± SD) than fresh water fishes (<10 mcg/100g). Dairy and egg products are another group of major contributors to iodine intake in the U.S.; 2% milk contained 39 ± 6 mcg I/100g (n=32) and various cheeses contained 62 ± 20 mcg I/100g (n=30) The few egg samples analyzed to date show a wide range of iodine values (55-300 mcg I/100g); analyses of additional egg samples are underway. Cheeseburgers from three fast food restaurant chains also had highly variable iodine contents, ranging from <10 to nearly 400 mcg I /100g, suggesting that buns containing iodate dough conditioners may be the source of the wide variability both between and within a restaurant chain. Restaurant entrées such as lasagna and cheese ravioli were found to contain approximately about 25 mcg I /100g of iodine, likely due to their cheese content.

Significance: Upon completion, the information will be a valuable resource in understanding the relative contribution of different foods to total iodine intake in the diets of individuals and populations.

ABSTRACTS FOR ORAL PRESENTATIONS

Monday July 23, 2018

Opening Session: Keynote Speaker

Big Data, the Food System and Public Health: Addressing the Questions of Tomorrow in a Changing Environment

John Finley, Nutrient Data Laboratory, USDA ARS Beltsville Human Nutrition Research Center, 10300 Baltimore Ave., Beltsville, MD 20705, USA

Session 1: Advancing our National Nutrient Databases

Advances in the 2015-2016 Food and Nutrient Database for Dietary Studies.

Alanna Moshfegh, MS, RD; Donna Rhodes, MS, RD; Carrie Martin, MS, RD; Suzanne Morton, MPH, MBA; Lois Steinfeldt, MS; U.S. Department of Agriculture, Agricultural Research Service, Beltsville Human Nutrition Research Center, Food Surveys Research Group, Beltsville, MD

Background: The USDA Food and Nutrient Database for Dietary Studies (FNDDS) is used to convert food and beverages consumed in What We Eat in America (WWEIA), National Health and Nutrition Examination Survey into gram amounts and to determine their nutrient values. It is developed for each two-year release of WWEIA, NHANES.

Objective: The objective of this presentation is to describe landmark enhancements and updates for FNDDS 2015-2016.

Description: With every two-year release of FNDDS, the data undergo a process of review and update. Development of FNDDS 2015-2016 included a three-pronged approach to enhance currency and support food and beverages collected in 2015-2016 WWEIA, NHANES: (1) Utilization of the USDA Branded Food Products Database and other sources to inform nutrient profiles of foods and beverages. (2) Descriptions and nutrient content have always been provided for each item in FNDDS, however, additional details are useful for research purposes and enhanced transparency of the database. Expanded characterization of the sources used for the nutrient values and the year of their determination (if available) were added. (3) Development of more than 20 evidence-based expert directives used to operationalize the construct/revision of more than 1000 recipes of FNDDS items. These directives included a standardized protocol and provided the framework for selection of ingredients and amounts for groups of similar items.

Conclusion: FNDDS 2015-2016 will be available at www.ars.usda.gov/nea/bhnrc/fsrg . The enhanced database allows for new research analyses and provides additional detail on database development and nutrient profiles for food and beverages.

Items Designated as Fortified: Food and Nutrient Database for Dietary Studies (FNDDS), 2013-2014.

Martin, Carrie, MS RD[1]; Lara Sattgast, MS[2]; Moshfegh, Alanna MS, RD[1]; U.S. Department of Agriculture, Agricultural Research Service, Beltsville Human Nutrition Research Center, Food Surveys

Research Group, Beltsville, MD[1]; American Society for Nutrition, Rockville, MD[2]

Background: The Food and Nutrient Database for Dietary Studies (FNDDS) is used to convert food and beverages consumed in What We Eat in America, National Health and Nutrition Examination Survey (WWEIA, NHANES) into gram amounts and determine their nutrient values. The file of *Items Designated as Fortified in FNDDS 2013-2014* identifies foods and beverages with one or more fortified nutrients.

Objective: Describe the methodology and updates to *Items Designated as Fortified in FNDDS 2013-2014*.

Description: Designation of foods and beverages as a fortified product or product containing fortified ingredients was first included in FNDDS 2011-2012. This designation has also been developed for FNDDS 2013-2014. Foods and beverages were designated as one of three fortification identifiers: unfortified, fortified, or containing fortified ingredients. A change made in the fortified designation for FNDDS 2013-2014 was including products with enriched flours and grains in which nutrients were added in amounts higher than naturally occurring (e.g., folic acid) as a fortified designation.

FNDDS 2013-2014 includes 8,536 items, 7,675 foods and 861 beverages. A greater proportion of the beverages (68%) compared to the foods (51%) have a fortified designation. Approximately half of all items are designated as fortified or containing fortified ingredients (17 and 36%, respectively). Of those items containing fortified ingredients, most include margarine, milk, or flour, and often in minor amounts.

Conclusion: *Items Designated as Fortified in FNDDS 2013-2014* is available at http://www.ars.usda.gov/nea/bhnrc/fsrg. This designation provides further characterization of foods and beverages in FNDDS.

A Partnership for Public Health: USDA Branded Food Products Database.

Alison Kretser, Angela Fernandez, Kyle McKillop, Keitt Moore, Delia Murphy, Pamela Starke-Reed, John Veltri. International Life Science Institute, North America

Background: A Partnership for Public Health: The USDA Branded Food Products Database is a public-private partnership between the U.S. Department of Agriculture (USDA), the International Life Sciences Institute North America (ILSI North America), GS1 US, 1WorldSync, Label Insight, and the University of Maryland, College Park's Center for Food Safety and Security Systems (CFS3) and the Joint Institute for Food Safety and Applied Nutrition (JIFSAN), whose goal is to enhance public health and to share open data by augmenting the USDA National Nutrient Database with nutrient composition and ingredient information on branded foods. Since the last update on the Partnership at NNDC 2016, the USDA Branded Food Products Database launched in September 2016 and now contains over 220,000 food products.

Objective: The presentation will provide an update on the USDA Branded Food Products Database and its integration within the USDA database infrastructure upgrades.

Description: The Partners will share metrics and case studies of how the Database is being used by the research community, app developers, and the public; future plans for including private label and other additions to the Database; and plans for global expansion to a USDA Global Branded Food Products Database.

Modernization and Revitalization of the FDA Total Diet Study.

Judith Spungen, Terry Councell, Dana Hoffman-Pennesi, Alexandra Gavelek, Stephanie Briguglio, Edward Nyambok, Mark Wirtz. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Office of Analytics and Outreach, Division of Risk and Decision Analysis, Exposure Assessment Branch

Background: FDA's Total Diet Study (TDS), initiated in 1961, continuously monitors concentrations of mineral nutrients and contaminants in about 265 foods, based on regular sampling and analysis of these foods in various locations in the U.S. FDA uses TDS concentration data to provide perspective for safety assessments, to inform risk assessments, to identify potential safety concerns, and to estimate dietary nutrient intakes and contaminant exposures. The TDS concentration data are publicly available and may be downloaded from FDA's website. Over the past three years, FDA has focused attention on modernizing and revitalizing the TDS program.

Objective: Describe FDA efforts to modernize and revitalize the TDS program, including development of a data management system for trend analysis, changes in analytical methods, revision of the food list, revision of the sample collection protocol, and development of new tools for intake/exposure assessment.

Description: New TDS analytical methods include better digestion methods (acid microwave extraction) and use of more sensitive instruments (inductively coupled plasma mass spectrometry), resulting in lower limits of detection (LOD) and quantification (LOQ). However, concentration data for some elements still include high proportions of values below the LODs, presenting challenges for statistical calculations. The new sampling protocol will, for the first time, allow characterization of seasonal and regional variability for some TDS foods. More specific sampling criteria will allow more accurate estimates of mineral concentrations in foods, and a new strategy for mapping National Health and Nutrition Examination Survey/What We Eat in America foods to TDS foods will allow more accurate estimation of mineral nutrient intakes and contaminant exposures.

Conclusion: Recent changes to the FDA TDS program are resulting in improved quality of data on food composition. These data are useful for a variety of types of analysis.

Session 2: Dietary Components: New Research Challenges

Protein Quality, Efficiency, and Methodology: Assuring Accurate Labels and Databases and Adequate Intake.

David Plank[1], Lisa Povolny[2], and Jonathan DeVries[3]. [1]Sr. Technical Manager, Medallion Labs, General Mills. Sr. Research Fellow, University of Minnesota. Specializing in up to date analytical methods including protein quality and efficiency, Dual industry-academic role provide unique insights. [2]Manager, Medallion Labs, General Mills. Specializing in understanding industry needs for regulatory compliance. [3] DeVries & Associates, Adjunct Expert, University of Minnesota, retired Medallion Labs, General Mills.

Background: Protein is an essential diet macronutrient. The quality and efficiency of a particular protein have proven difficult to characterize regarding its quality and efficiency despite activity in this arena for decades.

Objective: Provide knowledge to participants on the latest efforts regarding methods to determine

protein quality and efficiency and potential impacts on nutrition labels and databases.

Description: Protein, a diet macronutrient is essential for human growth/health, especially for building/maintaining muscle vs fat mass when considering weight gain/loss/stabilization. Consumer demand has resulted in increased variety and availability of high protein products. Consideration of the environmental impact, the sustainability of source, and the quality of protein (regarding digestion/impact on the human system) is essential for determining the world's future protein needs.

Conclusion/Significance: Inaccurate/overstated protein claims in food/supplements create avoidable regulatory and class action risks. Optimized methodology for protein quality and efficiency will provide accurate protein information for labels and for databases, which can subsequently be used for projecting future protein supply needs.

Are conversion factors used in food composition databases still valid?

Haytowitz, David B; Baer, David J; Pehrsson, Pamela R. USDA-ARS-Beltsville Human Nutrition Research Center, Beltsville, MD. USA

Background: Conversion factors are commonly used in the production of food composition databases (FCDB). Conversion factors are commonly used to convert nitrogen- (measured analytically) to-protein (reported in FCDB). Additionally, conversion factors (Atwater factors) are used to convert macronutrient composition to energy.

Objective: There are significant limitations of the nitrogen-to-protein (N2P) and macronutrient composition to energy conversion factors, including that they are based on outdated methodology, generally developed from limited data, and not necessarily applied appropriately.

Description: N2P conversion factors were first developed in the 1880s along with the Kjeldahl method which actually measures total nitrogen, including non-protein sources. At that time proteins were assumed to be 16% nitrogen yielding a N2P of 6.25. Jones (1931) expanded upon this work and developed additional specific factors for various foods. In 2003 an FAO/WHO expert consultation recommended summing amino acids to determine protein content rather than N2P. Summing amino acids in dry roasted almonds produces a protein value of 18.89 g/100g while the Jones factor of 5.18 gives a value of 20.2 g/100g and the general factor of 6.25 gives a value of 24.37 g/100g. Calorie conversion factors share similar issues. Atwater first developed the general factors (the product of gross energy and digestibility) for mixed diets in the early 1900s. In subsequent years, specific factors for broad food groups were developed from the original data. For example, nuts and dry beans, cowpeas and other legumes were all given the same factors. Today, these factors have been extended to individual foods, including fulfilling food labeling requirements. More recently, ARS researchers examined several nuts and found lower energy values than those obtained by using the Atwater factors.

Conclusion: Based on emerging information, it is time to evaluate the accuracy of these factors, and to consider alternative approaches that may improve accuracy of FCDB.

Addition of Gluten to a Food and Nutrient Database.

Bhaskarani Jasthi, Janet Pettit, and Lisa Harnack. Nutrition Coordinating Center, Epidemiology & Community Health, University of Minnesota

Background: Gluten is a protein found in wheat, rye, barley and their crossbred varieties and derivatives. It is responsible for triggering hypersensitivity reactions in people with celiac disease, and research is underway to determine whether it may contribute to other health outcomes.

Objective: Add gluten to the Nutrition Coordinating Center (NCC) Food and Nutrient Database so that researchers conducting studies related to gluten may assess intake of this food component.

Description: Few foods have been chemically analyzed for their gluten content. Consequently, gluten values were assigned to foods in the NCC Food and Nutrient Database using imputation procedures based on two assumptions. The first is that foods that do not include any wheat, rye or barley grain ingredients or their derivatives are presumed to contain 0 grams of gluten. Thus, foods such as fruits, vegetables, and vegetable oils were assigned gluten values of 0 grams.

The second is that a specified fraction of protein found in wheat, rye, barley and their crossbred varieties and derivatives (0.75) is presumed to be gluten. The factor of 0.75 was selected based on findings from studies in which chemical analysis of some gluten containing grains and their derivatives were carried out to estimate the percentage of gluten. It is important to note that gluten values in the NCC Database may not be appropriate for use in determining whether a food or diet is gluten-free because foods with "zero" values may not meet the FDA definition of gluten-free (<20 parts per million of gluten). However, the values may be useful in determining whether a food or diet is low, moderate or high in gluten.

Conclusion: The approach used to add gluten to the NCC Database may be a useful model for other database developers, though the approach has some limitations.

Comprehensive chemical profiles of foods as a basis for comparison and characterization of variance.

James Harnly, Ping Geng, Jianghao Sun, and Pei Chen, Food Composition and Methods Development Lab, Beltsville Human Nutrition Research Center, Agriculture Research Service, US Department of Agriculture, Beltsville, MD.

Background: Foods consist of thousands of compounds, each with the potential to impact human health. Classical nutrient analyses are based on targeted methods that focus on a relatively few compounds and limit our view of other health-promoting possibilities and their synergism. In addition, methods for classical nutrients are time consuming and expensive and negate broad application to many foods and many components. Conversely, comprehensive chemical profiles based on non-targeted methods such as spectral fingerprinting offer hundreds to thousands of components for comparison of foods or judging their natural biological variation. Equally important, fingerprinting methods, even using high resolution mass spectrometry, require less than 5 minutes per sample and are highly cost effective.

Objective: Develop a systematic approach to characterizing the chemical composition of foods is fast, comprehensive, provides expanded data on thousands of compounds.

Description: Fingerprinting, based on flow injection high resolution mass spectrometry (FIHRMS), combined with pattern recognition methods, such as principal component analysis (PCA), emphasizes the relationship between components and their variation. While differences between similar foods can be identified by specific ions, the identities of the compounds are not known. However, representative foods can be selected based on their fingerprints and subjected to metabolomic analysis to identify specific compounds. Initial investment in the development of a metabolite library can then be coupled with high throughput FIHRMS to rapidly identify compounds in foods and their variation as a function of cultivar, environment, and processing conditions.

Conclusion: This systematic approach to characterizing the chemical composition of foods is fast, comprehensive, and permits accurate comparison of foods and their natural variability.

Updating Human Milk Nutrient Composition in USDA FooDS: Where We Are Now and Future Directions.

Xianli Wu, Jaspreet Ahuja, Pamela R. Pehrsson, Nutrient Data Laboratory, USDA ARS Beltsville Human Nutrition Research Center, 10300 Baltimore Ave., Beltsville, MD 20705, USA.

Background: Human milk (HM) is considered to be the ideal food for infants. Accurate, representative and up-to-date nutrient composition data of HM are crucial for the management of infant feeding and assessment of infant nutritional need. Current HM composition data in the USDA national nutrient database USDA FooDS are outdated.

Objective: To understand the complexity and challenges in generating nationally representative HM nutrient composition data for the USDA FooDS.

Description: Literature review conducted in NDL suggested that HM nutrient data for the US and Canada populations are very limited – only 28 studies were found over last 36 years (1980-2016). And most studies were published before 1990s with relatively small sample sizes. HM is a complex and dynamic biological fluid that contains thousands of constituents. Sampling plan, sample handling and analytical methodology are important factors for data representation and quality. Method could be the major contributor to the data variation. For future studies, sampling, sample handling and analytical methodology must be carefully validated and standardized to ensure data quality. In addition, many so- called "non-traditional" components in HM, such as oligosaccharides and functional proteins, have recently been shown to process important biological functions. These components should be considered to be added in USDA FooDS.

Conclusion: Human milk is an extremely complex and highly variable biological fluid. To obtain accurate, representative and up-to-date composition data of HM, more well designed comprehensive studies are needed through collaborations with federal and academic partners.

Iodine in Foods and Dietary Supplements: Development of a Special Interest Database.

Pamela Pehrsson, PhD, Nutrient Data Lab, USDA; Abby Ershow, Sc.D., R.D., FAHA, Office of Dietary Supplements, NIH; Kristine Patterson, PhD, Univ of MD; Judith Spungen, MS, RD, CFSAN, FDA.

Objective: Data on the iodine content of foods and dietary supplements would be useful in providing guidance for professionals and the public, especially those at risk for deficiency (i.e., women of reproductive age and young children). However, the USDA food composition databases do not currently include iodine values.

Methods: The USDA Nutrient Data Laboratory, in collaboration with the Food and Drug Administration Total Diet Study and the NIH Office of Dietary Supplements, have recently used inductively coupled plasma mass spectrometry to generate iodine data on major sources such as seafood, dairy products, eggs, baked products and commercial foods from both groceries and restaurants.

Results: Among finfish, saltwater species such as haddock and cod had considerably higher iodine values (151 +/- 90, n= 7) (mean ± SD) than fresh water fishes (<10 mcg/100g). Dairy and egg products are another group of major contributors to iodine intake in the U.S.; 2% milk contained 39 ± 6 mcg I/100g (n=32) and various cheeses contained 62 ± 20 mcg I/100g (n=30) The few egg samples analyzed to date show a wide range of iodine values (55-300 mcg I/100g); analyses of additional egg samples are underway. Cheeseburgers from three fast food restaurant chains also had highly variable iodine contents, ranging from <10 to nearly 400 mcg I/100g, suggesting that buns containing iodate dough conditioners may be the source of the wide variability both between and within a restaurant chain. Restaurant entrées such as lasagna and cheese ravioli were found to contain approximately about 25 mcg I/100g of iodine, likely due to their cheese content.

Significance: Upon completion, the information will be a valuable resource in understanding the relative contribution of different foods to total iodine intake in the diets of individuals and populations.

Session 3: International Nutrient Databases and Data

What are Canadians Eating in 2015?

Isabelle Rondeau, RD, Isabelle Massarelli, RD and Nadine Kebbe, RD Bureau of Food Surveillance and Science Integration, Food Directorate, Health Canada.

Background/Objective: The 2015 Canadian Community Health Survey – Nutrition (2015 CCHS-Nutrition) is the latest nationally-representative survey that collected information, from Canadians ages 1 and older in the 10 provinces, about their eating habits and use of nutritional supplements, as well as other health factors (e.g. height and weight, physical activity and chronic conditions). The nutrient database used for this survey was based on the 2015 Canadian Nutrient File (CNF), a compilation of Canadian food composition data. In total, 20,487 individuals took part in the survey, with a response rate of 61.6%. The data collected in the 2015 CCHS-Nutrition was released in June 2017. Selected tables were also produced at the time of the data release: BMI of adults and children, physical activity and screen time for those aged 6 to 17 years, past- month vitamin and mineral supplement consumption, and percentage of total energy intake from carbohydrate, protein and fat.

Description: Canadians reported consuming more of their calories from protein and fat and fewer from carbohydrates than they did a decade ago. Among children and teenagers, the percentage of daily energy intake from carbohydrates edged down from 54.6% in 2004 to 53.4% in 2015 while among adults, it decreased from 49.1% to 47.7%. Almost half of Canadians (45.6%) aged 1 year and older reported taking a nutritional supplement in 2015, with multivitamins as the most common nutritional supplement reported. The percentage of overweight and obese Canadians aged 18 or older has increased from 2004, 59.2% to 61.3%, while in children and teenagers, a decrease from 34.3% to 30.9% was observed.

Conclusion: The 2015 CCHS-Nutrition provides an opportunity to examine the food and nutrient intakes of Canadians, the extent to which intakes have changed since the 2004 CCHS-Nutrition, and the relationship between diet and a wide range of health and socio-demographic characteristics.

A new information portal about food composition databases and tables: the World Nutrient Databases for Dietary Studies.

Morven A. McLean, Ph.D., ILSI Research Foundation

The ILSI Research Foundation has compiled a catalogue of food composition databases and tables called the World Nutrient Databases for Dietary Studies (WNDDS). This interactive web-based tool provides information about, and links to, international, regional and national food composition databases and tables. WNDDS serves as a curated clearinghouse for information about food composition databases and tables, and should be a valuable resource for researchers and other stakeholders interested in food composition data. Information contained in WNDDS was gathered through a systematic review of publicly accessible food composition data resources, and with additional inputs solicited from managers of food composition databases from around the world. The interactive tool was developed using StatPlanet Desktop software to allow users to assess currently available databases and tables across geographic levels (national, regional, and international), indicators (food classifications, nutrients, etc.) and provides multiple graphical representations of the queried information. WNDDS does not contain food composition data *per se* but links users to original data sources. WNDDS was launched in October 2017, and preliminary feedback has been very positive. The ILSI Research Foundation is committed to maintaining its currency of WNDDS with semi-annual updates.

Assessment of Sodium and Sugar Content in Infant and Toddler Prepackaged Foods in Canada.

Susan Trang, Alyssa Schermel, Jodi Bernstein, Mary R. L'Abbe.

Objective: To determine sodium and sugar levels in prepackaged infant and toddler foods and evaluate the proportion meeting Health Canada's sodium reduction benchmarks.

Methods: This was a cross-sectional analysis of Canadian prepackaged foods, using the University of Toronto's Food Label Information Program (FLIP) 2017 (N=19,802). Sodium and sugar content were obtained from the Nutrition Facts table. Presence of added sugars was defined by the US Food & Drug Administration, and determined from the ingredients list. Foods were categorized according to Health Canada's *Guidance for the Food Industry on Reducing Sodium in Processed Foods* for sodium (n=64), and *Table of Reference Amounts for Food* for sugar (n=232).

Results: Overall, 89.1% (n=57) of infant and toddler foods met one of the sodium benchmarks: 4.7% (n=3) met Phase 1, 12.5% (n=8) met Phase 2, and 71.9% (n=46) met Phase 3 (2016) benchmarks. Categories with the highest proportion meeting 2016 benchmarks were non-savoury snacks including cookies, biscuits and bars (76.6%) and toddler mixed dishes (77.8%). Only 4.7% (n=3) of foods exceeded maximum levels. Added sugars were present in 26.7% (n=62) of foods. Categories with the greatest proportion of products with added sugars included cereal bars (n=7, 77.8%); cookies, teething biscuits, puffs, and other finger foods (n=35, 76.1%); and toddler mixed dishes (n=5, 55.6%). Sodium and sugar levels ranged from 0 to 310 mg and 0 to 30 g per serving, respectively. Mean sodium and sugar levels (mean ± SD) per serving were highest in toddler mixed dishes (174 ± 94 mg) and strained or junior mixed dishes (10 ± 6 g), respectively.

Significance: These data provide an assessment of sodium and sugar levels in infant and toddler foods for 2017. The food industry needs to continue efforts in monitoring sodium and added sugars in the foods they produce to identify and reduce excess levels.

Nutritional analysis of selected commercial rice varieties of Sindh, Pakistan.

Najma Memon, Sanam Erum Soomro, Shahabuddin Memon; National Centre of Excellence in Analytical Chemistry, University of Sindh, Jamshoro, Pakistan

Objective: To update nutrient data for rice varieties mostly consumed in Sindh, Pakistan.

Methods: Nine commercial rice varieties; DR 83, DR 82, IR 6, IR 8, DR 59, latify, kanwal, DR 92 and red ganga were collected governmental seed bank and analysed for proximate composition, minerals, fatty acids profile and fat soluble vitamins. Standard official methods of analysis were validated and applied to collect the analytical data.

Results: Results show moisture (8.68-9.58 g/100g), protein (6.012-8.12 g/100g), fat (1.07-2.55 g/100g), available carbohydrates (79.06-80.78 g/100g), dietary fiber (4.19-5.25 g/100g) and ash (1.28 - 1.03 g/100g). The fatty acids profiles showed palmitic acid (239-705 mg/100g) as major component while stearic acid (720-80 mg/100g) was next higher and other saturated fatty acids like arachidic acid, behenic acid, lignoceric acid, cerotic acid were also found. Among unsaturated fatty acids oleic, euracic and linoleic acid were also observed in small quantity. For fat soluble vitamins (A, E, D and β-carotene); vitamin E was found in a range of 0.10–0.37 mg/100g. Minerals like sodium, potassium, magnesium, iron and zinc were screened and found 17.94-30.33 mg/100 g, 158.5–218.5 mg/100 g, 186.7– 528.3 mg/100 g, 9.02– 14.14 mg/100 g, 1.41– 2.24 mg/100 g, respectively.

Significance: Average content of fat, iron, sodium and dietary fiber is found higher in rice from Sindh, Pakistan as compared to neighbouring Indian rice. Fatty acid composition was also found different. This is first detailed study on the composition of rice from Pakistan.

Tuesday July 24, 2018

Session 4: Advances in Food Labels to Meet the Needs of Consumers and Researchers

Update on Food Labeling.
Patricia Hansen, CFSAN Office of Nutrition and Labeling, US Food and Drug Administration

Methodology to Modernize the RACCs/Serving Sizes for Nutrition Facts Label. WenYen Juan, PhD; Martine Ferguson; Marc Boyer; Cherisa Henderson, MS; Jillonne Kevala, PhD; Office of Nutrition and Food Labeling, Center for Food Safety and Applied Nutrition, US Food and Drug Administration.

Background: The serving size declaration on the Nutrition Facts label has been an important vehicle to help consumers compare nutrient values among similar products and maintain healthy dietary practices since its establishment in 1993. Serving sizes must be presented in household measurements based on the Reference Amounts Customarily Consumed (RACCs) for about 140 product categories. RACCs are defined as the amount of food customary consumed per eating occasion. Since 1993, these amounts have shown some changes.

Objective: We examined the changes of consumption patterns, to determine if the consumption amount increased or decreased significantly from the 1993 RACCs.

Description: FDA updated the 1993 RACCs to reflect the current consumption amount of the US population infants 0 to 12 months and young children 1 through 3 years old or 4 years and older. Specifically, 3 steps were in this evaluation process: (1) there is an adequate sample size to estimate a reliable median consumption amount for the product; (2) when the median consumption amount calculated from an adequate sample size has significantly changed from the 1993 RACCs with at least a 25% difference based on 95% confidence intervals; and then (3) we used a systematic approach to consider whether the RACCs needed to be updated accounting for the RACCs of the comparable products. Generally, the comparable products would have similar RACCs for consumers to compare nutrient values among those products. When consumption data were not available, serving sizes used on the product labels that are currently on the market and other data sources (e.g., sales data) were also been considered. Additionally, single-serving container rule and dual column labeling rule are also been updated.

Conclusion: The agency is continuing to monitor the consumption patterns of the US population for the future modernization of the Nutrition Facts label and Serving Sizes as needed.

Effects of a voluntary front-of-pack nutrition labelling system on packaged food reformulation.

Cliona Ni Mhurchu, Helen Eyles, Yeun-Hyang Choi, National Institute for Health Innovation, University of Auckland, Auckland, New Zealand

Objective: We aimed to evaluate the effects on food reformulation of the Health Star Rating (HSR), a new voluntary interpretive, front-of-pack (FOP) labelling system in New Zealand.

Methods: Data were extracted from an annually updated database of packaged food and beverage labelling and composition for the period before and after adoption of HSR (2014 to 2016). Outcomes assessed were HSR uptake by food group; star ratings of products displaying a HSR label; composition of products displaying HSR compared with non-HSR products; and composition of products displaying HSR labels in 2016 compared with their composition prior to introduction of HSR.

Results: In 2016, two years after adoption of the voluntary system, 5.3% of packaged food and beverage products (n = 807/15,357) displayed HSR labels. The highest rates of uptake were for cereals, convenience foods, packaged fruit and vegetables, sauces and spreads, and 'Other' products (predominantly breakfast beverages). Small but statistically significant changes were observed in mean energy density (-29 KJ/100 g, p = 0.002), sodium (-49 mg/100 g, p = 0.03) and fibre (+0.5 g/100 g, p = 0.001) contents of HSR-labelled products compared with their composition prior to adoption of HSR. Reformulation of HSR-labelled products was greater than that of non-labelled products over the same period, e.g., energy reduction in HSR products was greater than in non- HSR products (-1.5% versus -0.4%), and sodium content of HSR products decreased by 4.6% while that of non-HSR products increased by 3.1%.

Significance: Roll-out of the voluntary HSR labelling system appears to be driving healthier food reformulation. Databases that capture food labelling information as well as composition data can be used to assess the effects of natural experiments such as implementation of new nutrition labelling systems.

Tracking changes in sodium content of popular commercially processed and restaurant foods using USDA-CDC Sentinel Foods Sodium Monitoring Program.

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Objective: To assess changes in the sodium content of 125 popular, sodium- contributing, commercially processed and restaurant foods.

Materials and Methods: Nutrient Data Laboratory conducted a longitudinal study from 2010-2017 tracking sodium content of 125 popular, sodium-contributing, commercially packaged and restaurant 'Sentinel Foods', using multiple means. For baseline values, in 2010-2014 we obtained 3,026 samples of the Sentinel Foods nationwide from 12 locations using a 3-stage probability-proportional-to-size sampling plan, and chemically analyzed sodium content using inductively coupled plasma atomic emission spectroscopy (Association of Analytical Chemists method 985.01(3.2.06) + 984.27

50.1.15 (50.1.15)). Thereafter, we annually tracked sodium contents of over 100 brands of these foods using nutrient information on product labels and websites, and identified changes ≥ 10%. Furthermore, we re-sampled 40 of the 125 foods (1081 samples) and chemically analyzed them using the same procedures as for baseline, and statistically tested changes ≥ 10% for significance.

Results: The monitoring program shows mixed results, with more reductions over the years than increases in sodium contents of Sentinel Foods. About 1 in 4 brands had changes ≥ 10%, of which ~70% were reductions in sodium values ≥ 10%, based on tracking of labels and websites. The preliminary results from chemical analysis show that sodium content of Sentinel Foods continues to be high and variable across and within brands.

Significance: The results provide updated nutrient data for national nutrient databases and for monitoring changes in the sodium content of foods.

Dietary Supplement Label Database (DSLD): Mobile-Friendly Version.
L.G. Saldanha[1], J.T. Dwyer[1], R.A. Bailen[1], H.F. Chang[2], J.C. Goshorn[2], Potischman[1], K.W. Andrews[3], P.R. Pehrsson[3], C.J. Hardy[4]. [1]ODS/NIH, [2]NLM/NIH Bethesda, MD, [3]ARS/USDA, Beltsville, MD, [4]CFSAN, FDA, College Park, MD

Background: The DSLD is a public use database that captures all information printed on dietary supplement (DS) product labels marketed in the United States. The mobile- version of the DSLD was launched in December 2017.

Objective: Demonstrate the DSLD search, view, and data export options for graphing and statistical analysis.

Description: The DSLD was redesigned using the results from usability testing studies with researchers and consumers. Innovative technology is now being used for searches in labels, ingredients, and manufacturers to recognize and adjust for differences in user spelling and punctuation. In addition, downloadable content is now consistently presented in sortable, filterable tables with easy to recognize export buttons found above each table. As of December 2017, the DSLD contained 67,456 labels of which 46,811 were categorized as On Market and 20,645 as Off Market (discontinued products). Included are 2,924 labels imported from NHANES of which 2,329 are On Market and 595 are Off Market. In 2015, LanguaL™ codes (modified for use in the U.S.) for supplement type and form, claims, and intended user group were incorporated into the DSLD, allowing analysis of database constituent characteristics and aiding in linking it with other databases. Information about the database, instructions on how to use, download the search results and the database, and how to use the DSLD files with various statistical software packages is provided under the Help Menu tab.

Conclusion: The DSLD serves as a resource for consumers, health professionals, regulators, and researchers who are interested in finding DS products specific to their needs. It is updated frequently to reflect changes in product formulations, and the addition of new products and features.

Session 5: Innovations for Today and the Future: Apps, Software and New Technology

Focusing a New Lens on Dietary Assessment Methods.
Carol J Boushey, PhD, MPH, RDN; Associate Research Professor, University of Hawaii Cancer Center and Director, Nutrition Support Shared Resource.

This presentation will cover the application of technology as a source of dietary data to complement and inform the field of nutritional assessment. A description of some of the newer technologies available (e.g. wearable technology, machine learning) and considerations for working with these technologies and the data generated will be presented. Additionally, the presentation will provide a context and vision for how these tools may shape the field of nutritional assessment. The challenges and opportunities for using these tools and how these novel approaches will complement existing research paradigms will be included.

Assessing the Accuracy of Nutrient Calculations of Popular Nutrition Tracking Applications.
Carly Griffiths, MPH, Lisa Harnack, DrPH RD, MPH, Mark Pereira, PhD, MPH.

Objective: To assess the accuracy of nutrient intake calculations from leading nutrition tracking applications (apps).

Design: Nutrient intake estimates from 30 24-hour dietary recalls collected using Nutrition Data System for Research (NDSR) were compared with intake calculations from these recalls entered by the researcher into five free nutrition tracking apps. Apps were selected from the Apple App store based on consumer popularity from the list of free "Health and Fitness" apps classified as a nutrition tracking app.

Results: Correlations between nutrient intake calculations from NDSR and the nutrition tracking apps ranged from 0.71 to 0.96 for energy and macronutrients. Correlations for the other nutrients examined (sodium, total sugars, fiber, cholesterol, and saturated fat) ranged from 0.47 to 0.92. For each app, one or more mean nutrient intake calculations were significantly lower than those from NDSR. These differences included total protein (p=0.03), total fat (p=0.005), sodium (p=0.02), and cholesterol (p=0.005) for MyFitnessPal; dietary fiber (p=0.04) for FitBit; total protein (p=0.0004), total fat (p=0.008), sodium (p=0.002), sugars (p=0.007), cholesterol (p=0.0006), and saturated fat (p=0.005) for Lose It; sodium (p=0.03) and dietary fiber (p=0.005) for MyPlate; and total fat (p=0.03) for LifeSum. With respect to the extent to which foods and food amounts entered into each app matched those in the NDSR foods reports, a close matching food or food amount could not be entered for 17-22% of foods entered into each app.

Significance: Findings suggest that nutrient calculations from leading nutrition tracking apps have a tendency to be lower than those from NDSR, a dietary analysis software developed for research purposes. Further research is needed, including replicating the present study with a larger number of dietary recalls or records and a wider variety of apps.

Updates to the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA24).

Thea Palmer Zimmerman for the Westat ASA24 Development Team* (Westat), Eric Miller for the Squishymedia Design Team** (Squishymedia), Sharon Kirkpatrick (University of Waterloo), Christie Kaefer (NCI, NIH), Jennifer Lerman (NCI, NIH), Amy F. Subar (NCI, NIH)

Background: ASA24, developed by the National Cancer Institute and Westat, is a freely available web-based tool that enables automated, self-administered dietary recalls and records. Based on feedback from researchers and user testing, enhancements are implemented with each new version to increase ASA24's usability and novel capacities for dietary assessment in research and clinical studies.

Objective: Share recent enhancements to ASA24 to (1) allow completion on smart phones and tablets; (2) collect food records (FRs) in addition to 24-hour recalls; (3) provide Respondent Nutrition Reports (RNRs), comparing daily intakes to dietary guidance; and (4) improve usability by individuals who may require assistive technologies to interact with web content.

Description: Working in collaboration with NCI, Westat teamed with Squishymedia to redesign the user interface, applying a responsive web design that allows respondents to complete ASA24 using standard web browsers on all mobile devices. New capacity allows the collection of single- or multi-day FRs (consecutive or not), enabling respondents to login multiple times/day to report intakes in real time. The optional RNR output provided to respondents at the completion of a recall or record compares reported intakes to recommendations based on the Institute of Medicine's Dietary Reference Intakes and the Dietary Guidelines for Americans, published jointly by the U.S Department of Agriculture and Department of Health and Human Services. The updated interface has undergone several rounds of testing with members of the general public to identify opportunities to improve overall usability, and the tool has also been tested and modified to improve usability by respondents of differing abilities who may require the use of assistive technologies.

Conclusion: ASA24-2016 is a popular dietary assessment tool among researchers, clinicians, educators, and students (>70 new studies added per month and, as of March 2018, over 370,000 intake days collected). To keep pace with demand and the changing research and technology landscape, NCI continues to invest in improvements. Plans for the next version include the ability to enter recipes, an updated food list, and real-time data analyses.

The NUTS and DATES of Automating the Harvard Food Frequency Questionnaires and Databases over 38 years.

Laura Kent[1], MS RD LDN, Lauren Dougherty[1] MA RD, Mary Franz[1] MS RD LDN, Paula Tocco[1] MS RD, Jennifer Hankin[2], Gary Chase[2], Jorge Chavarro[1,2,3] MD, Sc.D., Walter Willett[1,2,3], MD, Dr.P.H.; 1, Department of Nutrition, Harvard T.H. Chan School of Public Health; 2, Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School; 3, Department of Epidemiology, Harvard T.H. Chan School of Public Health.

Objective: Present the history and automation of the Harvard semi-quantitative food frequency questionnaire (FFQ) and nutrient database over a 38-year span, due to advancements in technology.

The original 3 page paper 1980 Nurses' Health Study (NHS) FFQ consisted of 60 foods. Participants' data were double-key punched. An optical scanner was purchased for the follow-up cycle 4 years later which substantially reduced data entry errors and cost was reduced by about 10-fold.

Online FFQS were first used in 2000 for the Growing Up Today Study (GUTS), in 2007 for the NHS2 and in 2014 for the Health Professionals Follow-Up Study (HPFS). The first all web-based cohort, the NHS3, started in 2007. Online FFQS require IRB approved servers, language compatible with varying web browsers and operating systems. The validity of both the paper and the online FFQS was essentially identical when both were compared to 7 day weighed diet records in our most recent Women's LifeStyle Validation Study.

The 1980 food composition database contained 18 variables and was manually transcribed from USDA Handbook 8 to graph paper and key-punched onto cards and fed into a mainframe computer. In 1994 USDA Standard Release 11 was downloaded directly into our nutrient tables. Improvements in recipe development, addition of label ingredients, DV and label values have all undergone automation over time. Today our nutrient database is composed of 270 USDA variables from SR downloads or stand-alone tables. The database also contains 277 additional derived or non-USDA variables.

Automation of the cohort analysis programs is one of the latest improvements along with a system that is used to append new variables to existing cohort year specific databases. We maintain 10 NHS, 8 NHS2, 9 HPFS, 8 GUTS and 7 NHS3 FFQs. This is a unique strength of the Harvard database system.

VioScreen, a web-based Food Frequency Questionnaire, generating automated personalized food recommendations for clinicians based on the Healthy Eating Index.

Rick Weiss, MS, President and Founder, Viocare, Inc.

Dietary assessment is achieved by collecting food intake records, conducting interviews, and administering questionnaires, all with mixed success. Problems include limited time for conducting assessments, time and resources required to evaluate collected information, and for clinicians, lack of resources for supporting the change process.

New computer, mobile, and web-based technologies are improving efficiency and standardization in dietary assessment tools and streamlining data collection efforts enabling tools to objectively measure dietary behavioral exposures in research and clinical settings. Some technological advances may not only help improve accuracy of data but also provide a platform for improved interventions. Researchers and clinicians are increasingly interested in utilizing enhanced measures to monitor patient/participant dietary behavior for health research and chronic disease prevention or management.

FFQs can provide better estimates of habitual dietary patterns than some of the other dietary assessment techniques. VioScreen, using a graphical FFQ methodology, is a web-based self-administered dietary assessment tool that includes 1,200 food images and portion size options and takes advantage of its ability to capture dietary patterns to support both researchers and enable clinicians to better engage their patients in dietary modifications.

VioScreen generates a dietary analysis of over 160 nutrients and food components including the Healthy Eating Index (HEI) dietary quality score. HEI is a measure of an individual's diet quality based on the Dietary Guidelines of Americans. Nearly 70 studies have examined the association between overall diet quality and health outcomes. VioScreen has uniquely applied the HEI score not only to assess the diet quality of individuals and populations but also as the foundation for personalized nutrition recommendations to help an individual to improve their diet.

VioScreen analysis results are immediately available once a session completes. Reports include a complete nutritional analysis compared to dietary guidelines, a breakdown of foods and nutrients consumed, a list of top foods consumed that provide most of several specific nutrients, and food improvement recommendations. This latter food feedback report is generated by using a combination of the collected food intake history, detailed food pattern analysis, and the HEI generated score, to recommend a set of personalized food behavior changes to help the individual increase their HEI score by 5 or more points. VioScreen, in addition to generating a complete dietary assessment, can also support dietary interventions be more efficient and effective by increasing a patient's overall HEI score, and thus reduce the risk of disease.

Wednesday July 25, 2018

Session 6: Microbiome, Carbohydrates and Fiber: Strategies and Challenges

The Effect of Diet on the Gut Microbiome.

Joanne Slavin, Department of Food Science and Nutrition, University of Minnesota

The gut microbiota are essential to health. It is well accepted that diet alters the microbiota, especially dietary fiber, prebiotics, and probiotics. Dietary fiber intakes continue to be about half recommended levels, despite efforts to add fiber to foods and drinks. New FDA regulations for fiber will challenge nutrient databases since fiber must now show a physiological benefit, not just analyze as dietary fiber.

Food manufacturers' use of isolated and synthetic non-digestible carbohydrate ingredients no longer considered sources of dietary fiber for labeling purposes in the U.S.

Lisa Harnack, DrPH RD; Janet Pettit; Bhaskarani Jasthi, PhD RD; Jennifer Stevenson; Kerrin Brejle. Nutrition Coordinating Center, University of Minnesota.

Objective: There are 26 isolated and synthetic non-digestible carbohydrate ingredients that will no longer be considered sources of dietary fiber for labeling purposes in the U.S. when the new Nutrition Facts label is implemented. We aimed to describe foods in the marketplace that include eight of these ingredients (inulin, gum arabic, oligofructose or fructo-oligosaccharide, polydextrose, resistant or soluble corn fiber, soy fiber, resistant starch, and galactooligosaccharide).

Methods: Brand name food products in the University of Minnesota Food and Nutrient Database that contain one or more of the aforementioned ingredients were identified and described.

Results:.Inulin, gum arabic, oligofructose or fructo-oligosaccharides, and polydextrose were found in the largest number of food products (247, 122, 83, and 71 products respectively). In contrast, resistant starch, soy fiber, resistant or soluble corn fiber, and galactooligosaccharides were each found in a limited number of products in the database (0-34 products). The ingredients examined in this study were found in a variety of food categories (n=22), with the greatest numbers in the following categories: specialty snack bars (n=289 products), granola bars (n=142 products), ready-to-eat cereals (n=75 products), crackers (n=48 products), and specialty drinks & powders (n=46).

Significance: Implementation of the new Nutrition Facts label definition of fiber may result in changes in the fiber values on the labels of a variety of brand name food products. It is possible that food products containing isolated and synthetic non- digestible carbohydrates no longer considered sources of dietary fiber are reformulated to include ingredients that will be considered a source of dietary fiber for labeling purposes. Those developing and maintaining food and nutrient databases will need to devise strategies for addressing the new Nutrition Facts label fiber definition and concomitant marketplace changes.

Dietary Fiber-The Confluence of Physiology and Methodology.

David Plank[1], Lisa Povolny[2], and Jonathan DeVries[3] [1]Sr. Technical Manager, Medallion Labs, General Mills. Sr. Research Fellow, University of Minnesota. [2]Manager, Medallion Labs, General Mills. [3]DeVries & Associates, Adjunct Expert, University of Minnesota, retired Medallion Labs, General Mills.

Background: The United States Food and Drug Administration (USFDA) has promulgated regulations requiring changes in Dietary Fiber (DF) labeling on packaged foods.

Objective: Bring participants up to speed on recent regulatory and analytical developments regarding DF in preparation for impending regulatory enforcement.

Description: Activity has accelerated in the arena of Dietary Fiber (DF) measurement, a consequent industry response due to recent changes in United States (US) regulations. The definition promulgated by the US Food and Drug Administration divides DF into non-digestible polysaccharides (DP > 2) that are: intact and intrinsic in plants; are "isolated"; or are synthetic. This presentation will discuss the latest development(s) in US DF regulations, including the requirements for demonstrating fiber specific physiological benefits. The dialogue will also include the evolving methodology (ies) including methods currently in the development and validation pipelines to meet regulatory requirements and provide accurate data for databases. Recommended industry practices to comply with the regulations will be presented.

Conclusion/Significance: Action will be required with regard to DF labeling. Understanding the regulations and their impact will be important to producing accurate labels.

Implications of two different methods for analyzing total dietary fiber in foods for food composition databases.

Haytowitz, David B. USDA-ARS-Nutrient Data Lab, Beltsville, MD, USA. Katherine M. Phillips, Virginia Tech, Blacksburg, VA, USA

Background: In the first edition of USDA Agriculture Handbook No. 8 (AH8) in 1950, "crude fiber" was defined as "that portion of the food not soluble when boiled in dilute acid and dilute alkali". From 1982 to 1989, AH8 also reported "neutral detergent fiber". Starting in 1989, total dietary fiber values in USDA databases have been based on the enzymatic-gravimetric (EGF) method (AOAC 991.43), in which "fiber" is the residue remaining after a sample is subjected to a series of enzymatic treatments to mimic digestion. In 2009 a modification of the EGF method was introduced, to recover additional non-digestible components (e.g. galacto/fructooligosacharides, polydextrose, resistant starch) (AOAC 2009.01 and 2011.25), or the "McCleary method" (MCF).

Objective: The historic definition of dietary fiber in nutrition research and the expense and lack of comprehensive MCF data create a need for data comparing "fiber" in different foods by these two methods.

Materials and Methods: As part of the USDA's National Food and Nutrient Analysis Program, nationwide samples of various foods were analyzed for MCF and EGF.

Results: MCF did not differ measurably from EGF in wheat bread, tortilla chips, kale, or fast food French fries, but was higher in taco shells, oatmeal cookies, and frozen French fries, by 1.0 -1.5 g/100g (15 -52%). Statistical power was hindered by high analytical uncertainty, especially for MCF (e.g. 32.7% relative standard deviation for repeat analysis of a bread/snack food control sample with ~4g total fiber/100g), likely due to cumulative errors in the multiple analyses comprising MCF.

Significance: These results suggest that analysis of MCF should focus on foods expected to contain significant levels of components that are not measured by EGF, and reporting values for individual fractions would be useful from a research perspective. These data will be released along with total MCF, for select foods, in the forthcoming USDA Food Data System (USDA FooDS).

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40th National Nutrient Databank Conference
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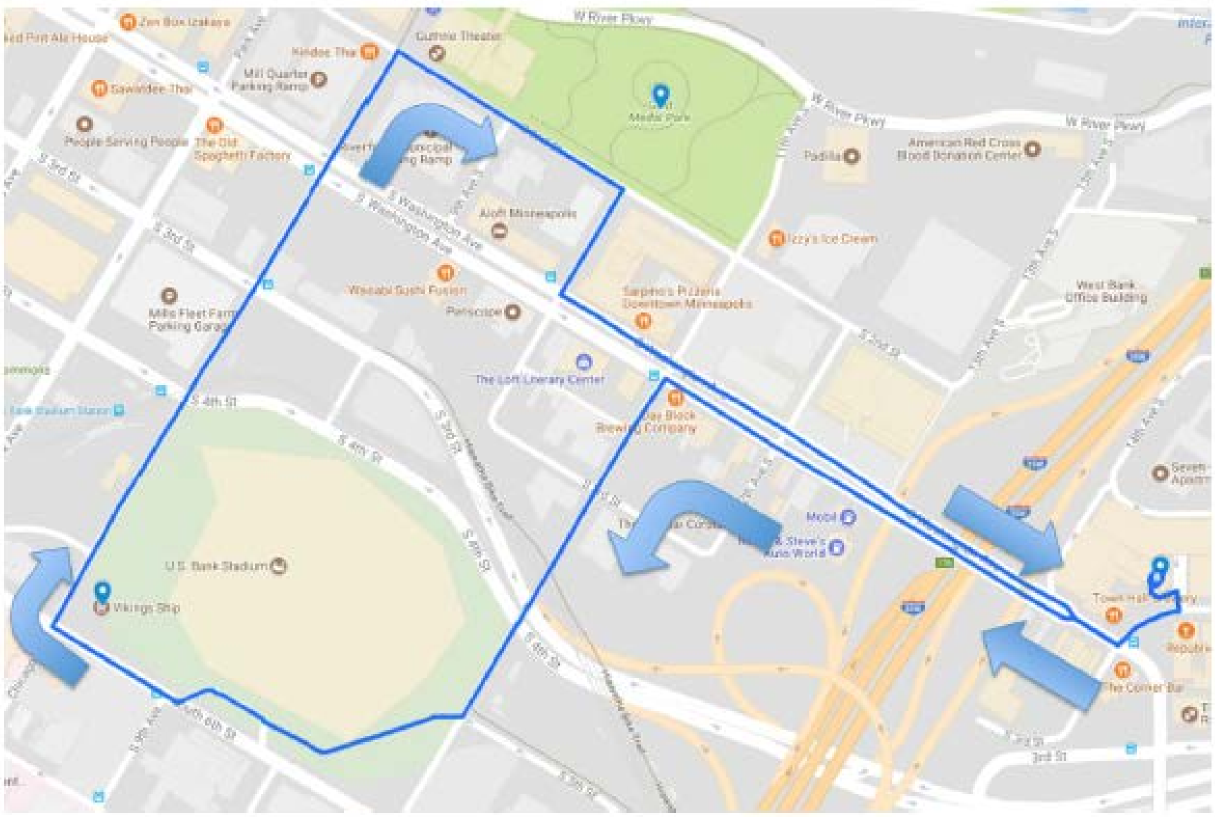
Walking Tour Maps

US Bank Stadium

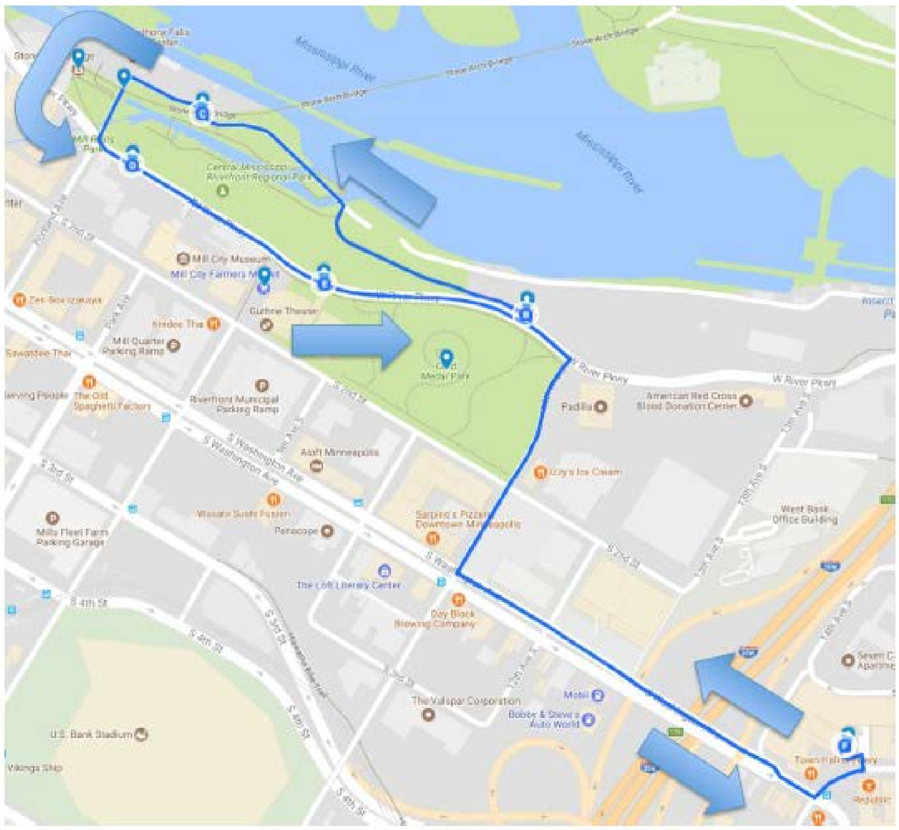
A walk for admirers of modern sporting stadiums



This walk takes you to the site of this year's Super Bowl. US Bank Stadium sports a stunning, ship-inspired architecture, complete with a life-sized replica Viking ship. Take a break at the beautiful parks to the west of the stadium that are the hub of the modern 'East Downtown' neighborhood. On the way back, check out Gold Medal Park, a beautiful green berm with a stunning view of the river. Lisa Harnack will be your guide.

Gold Mill City

View old and new Minneapolis



This walk brings you to the oldest known structures in Minneapolis (the ruins of the great flour mills from which Minneapolis was born). You'll also walk through one of our newest additions, Gold Medal Park, a beautiful green berm with a stunning view of the river. This walk also passes by the memorial for the victims of the 2007 collapse of the 35W bridge, then crosses underneath the fabled Stone Arch Bridge not once but twice! For a special treat, walk partly across the Stone Arch Bridge to view the St. Anthony Waterfalls and a spectacular view of downtown Minneapolis. Your guide will be Rose Tobelmann.

University Bridges

Cross the breathtaking Mississippi River

This walk crosses two bridges, which both span the Twin Cities Mississippi River Gorge -- the only gorge in the 2,320 mile length of our nation's defining river. The Northern Pacific #9 bridge has a breathtaking view both of the University of Minnesota and downtown Minneapolis. The two bridge crossings are punctuated with strolls through both the West-Bank and East-Bank campuses of the University. Your guide is Brian Westrich.