



UNIVERSITY OF  
**South Carolina**

NUTRITION CONSORTIUM  
ARNOLD SCHOOL OF PUBLIC HEALTH  
10TH ANNUAL NUTRITION SYMPOSIUM  
NUTRITION RESEARCH DAY: SHARE, DISCOVER, CONNECT  
VIRTUAL CONFERENCE  
SEPTEMBER 18, 2020 – OCTOBER 23, 2020

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**10:00-11:00AM Friday, September 18, 2020**

*Ensuring Trust in Science: Challenges and Responses in Nutrition*

**Welcome**

Christine Blake, PhD

**Opening Remarks**

Dean Thomas G. Chandler, MSc, PhD

**Keynote**

Edward Frongillo, PhD

**Facilitated Discussion**

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**10:00-11:00AM Friday, September 25, 2020**

*Cutting Edge Science in Dietary Patterns Research*

**Welcoming Remarks**

Moderator: Dr. Anwar Merchant

**Presentations**

Susan Steck, PhD, RD

*Dietary patterns and cancer risk*

Brie Turner-McGrievy, PhD, RD

*Plant-based dietary patterns for the prevention and treatment of obesity and chronic disease*

Angela Liese, PhD

*New directions in dietary pattern research: How can we improve existing dietary quality indices?*

Shawn Arent, PhD, CSCS\*D, FISSN, FACSM

*Sport and Exercise Nutrition: Current trends and controversies*

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**10:00-11:00AM Friday, October 2, 2020**

*Advances in Global Nutrition*

**Welcoming Remarks**

Moderator: Dr. Spencer Moore

**Presentations**

Courtney Monroe, PhD, EP-C

*A review of behavior change techniques, transparency, and quality in Mexico's top-ranked commercial smartphone apps for weight control, physical activity, and healthy diet*

Alex McLain, PhD

*Estimating Global Burden of Nutrition Related Disease: a peek behind the curtain*

Shiva Bhandari, PhD candidate

*Sustaining Agriculture-nutrition Interventions: Analysis of Determinants of Village Model Farmer Active Engagement in Nepal*

Christine Blake, PhD, RD

*Understanding Values that Drive Food Choice in Rapidly Changing Food Environments*

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**Friday, October 9, 2020**

*Nutrition Interventions Across the Lifecourse*

**Welcoming Remarks**

Moderator: Dr. Glenn Weaver

**Presentations**

Jihong Liu, ScD

*The effects of an antenatal lifestyle intervention on gestational weight gain in overweight and obese pregnant women: A Randomized Clinical Trial*

Dawn Wilson, PhD

*The Relationship between Parent Feeding Practices and African American Adolescent Dietary Outcomes and Family Mealtime in the FIT Trial*

Edward Frongillo, PhD

*Seniors' needs for food and food assistance in the United States*

Nazratun Monalisa, PhD

*Food-choice values of elementary school children and strategies used to influence mothers' food purchasing decisions*

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**10:00-11:00AM Friday, October 16, 2020**

*Practitioner Perspectives on Enhancing Trust of Nutrition Recommendations*

**Welcoming Remarks**

Moderator: Dr. Abbi Lane-Cordova

**Panel Discussion**

Brooke Brittain, MS, RD, CHES, CLC

*Program Manager Public Health Nutrition and Outreach at Clemson University*

Kristin Coggin, RD

*Director of Performance Nutrition at UofSC*

Jim Cook, MD

*OB-GYN with Centering Pregnancy*

Nancy Lintner, MS, ACNC-BC, BC-ADM

*Diabetes Care and Education Specialist*

Olivia Sullivan, MS, RDN, LD

*Dietitian for UofSC Student Health Services*

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**Friday, October 23, 2020**

*Poster Presentation Awards- hosted by the Nutrition Student Group*

Marilyn Wende

*President*

Nkechi Okpara

*Vice President*

Kelli DuBois

*Secretary*

Shiva Bhandari

*Treasurer*

## ORAL ABSTRACTS

Shawn Arent, Department of Exercise Science

### **Sport and Exercise Nutrition: Current trends and controversies**

Sport & exercise nutrition is a rapidly growing field and has a firm foundation in exercise physiology and exercise biochemistry. From obesity to elite athletic performance, there are unique insights and application stemming from the research in this area. Topics include such things as macronutrient composition, nutrient timing, periodized nutrition, and ergogenic aids/nutritional supplements. An important distinction to put the field and findings into context is the difference between “sufficient” and “optimal”. This presentation will focus on current trends in the field, including the implications of fad diets. Additionally, the differences between sport and physique nutrition will be considered, with potential points of contradiction identified. The concept of “performance nutrition” will be addressed with a focus on the broader application of the term.



Shiva Bhandari, Department of Health Promotion, Education, and Behavior

### **Sustaining Agriculture-nutrition Interventions: Analysis of Determinants of Village Model Farmer Active Engagement in Nepal**

Edward A. Frongillo, Rojee Suwal, Aman Sen Gupta, Narayan Prasad Tiwari, Kenda Cunningham

Objective: Homestead food production (HFP) programs rely on village model farmers (VMFs) for implementation of agriculture-nutrition activities. No studies have assessed sustainability of VMFs. Our objective was to test determinants of VMFs remaining and actively working several years after being selected as VMFs.

Methods: We used cross-sectional monitoring data, collected in 2018 and 2019 among VMFs in Suaahara (2011-2021), a multi-sectoral integrated nutrition program that includes HFP in Nepal. Remaining as a VMF was assessed from self-report. Actively working as a VMF was based on whether s/he was leading an HFP beneficiary group, registered the HFP group, conducting regular group meetings, and engaging in saving and credit activities. Potential socio-economic and demographic determinants were identified a priori: gender, age, education, caste, being a female community health volunteer, socio-economic status, agricultural land size, household size, duration of being a VMF, residing in disaster-affected districts, agro-ecological zone, and number of training and inputs received. Multivariable logistic regression was used to estimate adjusted odds ratios among 4,732 VMFs.

Results: The odds of remaining and actively working were greater among those with some education compared to those without education. VMFs having more agricultural land were 2.25 and 1.14 times more likely to be remaining and actively working as a VMF, respectively. VMFs working for longer were less likely to remain and be active. More types of trainings and inputs received were associated with greater odds of remaining and actively working as a VMF. VMFs older than 35 y, other caste than Dalit, and living in Mountains and Hills were more likely to remain and actively work. We did not find significant association for household size and richer households. Conclusion: Age, education, caste, agricultural land size, household wealth, time since becoming a VMF, and number of trainings and inputs received were important determinants of VMFs remaining and actively working in the program. Examining these factors can help selection of front-line workers to ensure their engagement and sustainability.



Christine Blake, Department of Health Promotion, Education and Behavior

### **Understanding Values that Drive Food Choice in Rapidly Changing Food Environments**

Ligia Reyes, Krystal Rampalli, Abdullah Khan

Achieving optimal and sustainable healthy diets requires understanding how people make food choices in changing food environments, specifically what, how, and why people eat the way they do. Values play a central role in food choice and responsiveness to nutrition messaging, but little is known about values in rapidly changing food environments. The aim of this study was to identify and describe the values undergirding food choice in different settings experiencing rapid changes in livelihoods and food environments. Qualitative data from gender and age stratified focus groups investigating drivers of food choice conducted in peri-urban Kenya (n=14) and rural Tanzania (n=28) were analyzed. Thematic a priori coding based on Schwartz's Theory of Human Values was conducted to identify and describe values in relation to food choice. All Person Focus values including self-enhancement values of achievement and power and openness to change values of self-direction, stimulation, and indulgence were expressed in relation to food choice. Most Social Focus values of conservation including face, security, tradition, and conformity and self-transcendence values of benevolence were expressed in relation to food choice. Participants described processes of modernization involving greater exposure to foods, physical mobility, and changing livelihoods and food environments as contributing to shifts in value priorities (e.g. conformity versus stimulation among youth). The consistent expression of values in relation to food choice across settings supports the assertion of universalism of Schwartz's basic values. Understanding how basic values drive food choice in specific populations is important for promotion of sustainable healthy diets



Edward Frongillo, Department of Health Promotion, Education and Behavior

### **Older adults' needs for food and food assistance in the United States**

Andrea Warren

**Objective:** Food and nutrition assistance targeted to seniors experiencing or at risk of food insecurity prevents poor health outcomes and enables seniors to age in place. Currently, the primary modes of service delivery are targeted to seniors who are older and frailer than average, rendering these modes less responsive to the needs of the broader population of food-insecure seniors. This study aimed to understand needs among seniors for food and food assistance and develop a comprehensive taxonomy for these needs.

**Methods:** A total of 147 seniors were purposively sampled from 12 food assistance programs across 9 states in the US. A team of 3 researchers from the University of South Carolina conducted in-depth interviews, which were recorded and transcribed. Interviews were coded thematically using NVIVO 10 and analyzed following an inductive qualitative method.

**Results:** The taxonomy represents the needs of seniors that are relevant for the design, targeting, and uptake of food assistance both at points of distribution and within the home. The taxonomy depicts self-identified needs that relate to their ability to access and use food and nutrition assistance across 3 domains: physical abilities, consuming food, and access and use of transportation. Each domain is further subdivided into variants and respective degrees of ability.

**Conclusions:** This study provided in-depth information to support effective alignment of programs with the needs of seniors. Targeted food assistance should be a key component of chronic disease prevention and management for low-income seniors and those experiencing or at risk of food insecurity.



Angela Liese, Department of Health Promotion, Education and Behavior

**New directions in dietary pattern research: How can we improve existing dietary quality indices?**

Diet quality indices such as the Healthy Eating Index (HEI), the Dietary Approaches to Stop Hypertension (DASH) Index and many others allow description and quantification of dietary intake patterns and quality. In 2015 the Dietary Patterns Methods Project (DPMP) demonstrated that a high-quality diet, characterized by dietary intake in the top (5th) quintile of HEI, DASH and other diet quality indices was consistently associated with a 11–28% reduced risk of death due to all causes, CVD, and cancer compared with the lowest quintile, independent of known confounders with lower mortality in three large cohort studies in the United States (US) (Liese et al. 2015). While the consistency of the findings was reassuring, the magnitude of the associations raised questions as to the nature of the dietary patterns in the top quintile and whether there may be ways to improve the existing dietary quality indices. This presentation will describe two such efforts. The first involves novel statistical methods that use empirical data to inform the weighting of a diet quality index's components, based on the idea that an index should be informed by health outcome information (Ma et al. 2017; Kravitz & Carroll 2019). The second is a continuation of DPMP and explores the diversity within high-quality dietary patterns by utilizing cluster analysis and pattern recognition approaches. These efforts have the potential to inform future revisions of the HEI and other diet quality indices.



Jihong Liu, Department of Epidemiology and Biostatistics  
**The effects of an antenatal lifestyle intervention on gestational weight gain in overweight and obese pregnant women: A Randomized Clinical Trial**

Objectives: To evaluate the effect of a lifestyle intervention program on gestational weight gain in overweight and obese pregnant women.

Methods: An 18-month, randomized, assessor-blind, clinical trial enrolled 219 overweight and obese pregnant women from Columbia, SC. Eligible women were randomized to a behavioral intervention (n=112) or a standard care group (n=107). The antenatal intervention was designed to promote weight self-monitoring and increase physical activity and healthy dietary behavioral practices. The intervention was delivered through one in-depth counseling session, followed by phone counseling, behavioral podcasts, and social media support. Standard care women received monthly mailings and a matched number of podcasts on non-weight related topics.

Results: Our sample was diverse (56% white, 44% African American) with a mean prepregnancy BMI of  $32.3 \pm 6.0$  kg/m<sup>2</sup>. There was no difference in mean total weight gain (kg) between the intervention ( $12.9 \pm 6.9$ ) and standard care group ( $12.4 \pm 8.6$ ), although the variance was smaller in the intervention group ( $p=0.02$ ). Among overweight women, total weight gain was lower in the intervention group ( $13.9 \pm 5.3$ ) vs. control ( $16.5 \pm 6.9$ ,  $p=0.03$ ), while among obese women, the total weight gain was higher in the intervention group ( $11.9 \pm 8.0$ ) than control ( $8.8 \pm 8.3$ ,  $p=0.05$ ). Among white women, the intervention group had smaller variance than the control group for mean total weight gain ( $13.0 \pm 5.9$  vs.  $12.2 \pm 8.4$ ,  $p<0.001$ ).

Conclusions: The antenatal behavioral lifestyle intervention was beneficial in changing the distribution of total gestational weight although it was not significant in changing the mean. This intervention was effective in reducing total weight gain in overweight but not obese women.



Alex McLain, Department of Epidemiology and Biostatistics  
**Estimating Global Burden of Nutrition Related Disease: a peek behind the curtain**

Edward Frongillo, Sonja Y. Hess, Ellen Piwoz

**Objectives:** The Global Burden of Disease (GBD) study is an ambitious effort to estimate the burden attributable to various risk factors. The results from the GBD are used around the world to monitor the UN established Sustainable Development Goals (SDGs), set health policies and research strategies, among others. Other studies, such those from the Maternal Child Epidemiology Estimation Group (MCEE) and the Lancet Breastfeeding Series Group (LBS), produce estimates of global burden that exhibit considerable differences from those published by the GBD. We give a detailed review of the methods used by GBD and other entities to estimate the global burden attributable to undernutrition, suboptimal breastfeeding and dietary iron deficiency.

**Methods:** We reviewed and compare the methods used by different study groups to estimate the global burden of nutrition related factors. The differences were compared to try to determine which assumptions lead to differences in global health estimates.

**Results:** There are significant differences in methods used to estimate global burden, but the impact of these differences is difficult to reconcile due to the estimation methods, which have substantially increased in complexity since the initial 1990 GBD report. We find that the main determinant of differences in estimates is what causes of death are linked to each risk factor.

**Conclusions:** Methods used to estimate nutrition- related disease burden need to be more clearly documented to foster discussion and collaboration on the important assumptions required to produce estimates.



Nazratun Monalisa, Department of Health Promotion, Education and Behavior

**Food-choice values of elementary school children and strategies used to influence mothers' food purchasing decisions**

Edward Frongillo, PhD; Christine Blake, PhD; Susan Steck, PhD; Robin DiPietro, PhD

**Objectives:** This study aimed to understand the values held by elementary school children in constructing food choices and the strategies they used to influence their mothers' food purchasing decisions.

**Methods:** Semi-structured qualitative interviews were conducted with 40 children, aged 6-11 years, and their mothers. Food choice information was collected from children and strategies to influence mothers' food purchases were collected from both children and mothers. Interviews were audio-recorded, transcribed verbatim, and open-coded. Coding matrices were used to compare children's and mothers' responses on children's strategies to influence mothers.

**Results:** Children most valued taste, texture, and flavor of foods, followed by perceived benefits, happiness, craving, following family and friends, items' healthfulness, preparation, and presentation when they made food choice decisions. Children reported 157 strategies that they used to influence mothers' purchasing decisions. Mothers had concordance with 80 strategies that children mentioned. In mother-child dyads, more concordance was observed between mothers and sons than between mothers and daughters. The most common and successful strategies from both the children's and mothers' perspectives were reasoned requests, repeated polite requests, and referencing friends. Mothers perceived that children had a lot of influence on their food purchasing decisions.

**Conclusions:** Children were aware of the strategies that would get mothers' positive reactions. Mothers' acknowledgement of children's influence on their food purchase decisions suggests that children can serve as change agents for improving mothers' food purchases if children prefer healthy foods. Interventions are needed for mothers to help address children's strategies to influence mothers to purchase unhealthy foods.



Courtney Monroe, Department of Health Promotion, Education, and Behavior

**A review of behavior change techniques, transparency, and quality in Mexico's top-ranked commercial smartphone apps for weight control, physical activity, and healthy diet**

Edney S, Reyes LI, Cruz A, Turner-McGrievy G, Jang SM, Bonvecchio A, Leon Ortiz MC, Jauregui A, Thrasher JF

Objective: This study evaluated Mexico's top-ranked weight control, physical activity (PA), and dietary apps for behavior change techniques (BCTs), transparency, and quality.

Methods: Mexico's top-ranked 25 free and paid apps in the "Health and Fitness" category of the iTunes and Google Play stores (100 total apps) were identified from an app analytics website (App Annie) in January 2018. Two reviewers screened, downloaded, and evaluated the apps. The presence of BCTs was assessed using Michie et al's BCT taxonomy v1. App transparency and quality were assessed using the Health on the Net Foundation criteria and Mobile Application Rating Scale (MARS; 1[low]-5[high]), respectively. Descriptive statistics were calculated for all variables.

Results: Fifty-six apps were eligible for analysis, with most (n=43; 77%) focusing on PA. The mean number of BCTs per app (out of a possible 30) was 9.4±3.7. Self-monitoring was the most frequently included technique (n=53; 95%). The mean MARS score was 3.8±0.5, with the functionality domain yielding the highest mean rating (4.4±0.6) and information quality yielding the lowest mean rating (3.3±0.4). The mean number of transparency criteria per app (out of a possible 8) was 3.3±1.8.

Providing contact information (n=50; 89%) was the most frequently addressed criterion. Only 12 (21%) apps cited sources of information.

Conclusions: Despite high functionality, few of Mexico's popular health apps proved transparent and leveraged a high number of BCTs. As the digital health landscape expands against the backdrop of an obesity epidemic, it

will be crucial to continue to explore options for effective mobile health solutions.



Brie Turner-McGrievy, Department of Health Promotion, Education and Behavior

**Plant-based dietary patterns for the prevention and treatment of obesity and chronic disease**

Brie Turner-McGrievy, PhD, MS, RD

Plant-based dietary patterns, such as vegan or vegetarian diets, have been shown to be associated with lower rates of obesity, heart disease, diabetes, and cancer. Randomized intervention trials have shown potential advantages of using plant-based diets for weight loss compared to omnivorous, low-fat diets. This presentation will highlight the recent observational and intervention research in the area of plant-based diets for preventing and treating chronic disease and obesity. Specifically, this study will present the results from the New Dietary Interventions to Enhance the Treatment for weight loss (New DIETs) study and provide a background on the currently ongoing Nutritious Eating With Soul (NEW Soul) study. Both projects examine the use of a plant-based diet for treating obesity and preventing cardiovascular disease.



Susan Steck, Department of Epidemiology and Biostatistics  
**Dietary patterns and cancer risk**

Angela Murphy

Objectives: Over the past decade, the search for dietary factors on which to base cancer prevention guidelines has led to the rapid expansion of the field of dietary patterns and cancer risk. Dietary patterns can be grouped as either data-driven dietary patterns determined by empirical analyses or investigator-defined dietary indexes based on a pre-determined set of dietary components.

Methods: We review the current state of the field of dietary patterns and cancer risk with a focus on

summarizing systematic reviews and meta-analyses published in the past decade. We provide a critical appraisal of new developments and identify priority areas for future research.

Results: Consistent reduced risk of multiple cancers has been reported for the Healthy Eating Index, Mediterranean Diet Score and Dietary Approaches to Stop Hypertension score. Increased risk has been reported for diets conforming to a “Western” type diet and those with higher inflammatory potential.

Effectiveness of different dietary pattern recommendations in reducing risk could depend on the type of cancer or on other risk factors, such as family history, sex, age, other lifestyle factors or comorbidities, as well as on metabolomic signatures or gut microbiota profiles.

Conclusion: New developments, such as the use of metabolomics to identify objective biomarkers of dietary patterns and novel statistical techniques, could provide further insights into the links between diet and cancer risk. Although animal models of dietary patterns are limited, progress in this area could identify the potential mechanisms underlying the disease-specific associations observed in epidemiological studies.



Dawn Wilson, Department of Psychology

**The Relationship between Parent Feeding Practices and African American Adolescent Dietary Outcomes and Family Mealtime in the FIT Trial**

Allison Sweeney, Ph.D., Haylee Loncar, MA, Colby Kipp, BS, & Mary Quattlebaum, BS.

Objectives: African American adolescents are at increased risk for developing obesity and related chronic diseases such as diabetes and metabolic syndrome. The present study examined the associations between parenting feeding practices (responsibility, pressure to eat, monitoring, and restrictive feeding) on adolescent dietary outcomes in the Families Improving Together (FIT) for weight loss NIH funded Trial.

Methods: Baseline data were collected from 241 African American adolescents (M<sub>age</sub>=12.93, SD = 1.75; M<sub>(BMI%)</sub>=96.7, SD = 3.90) and their caregivers (M<sub>age</sub>=44.45, SD = 8.65; M<sub>BMI</sub>=37.63, SD = 8.21) enrolled in the FIT trial. Adolescents self-reported their perceptions of their caregiver’s parental feeding practices and both caregivers and adolescents self-reported their dietary intake using three random 24hr dietary recalls assessed on two weekdays and one weekend day (kcal, fruit & vegetable intake, and fat intake); as well as their frequency of weekly family mealtimes.

Results: Regression analyses controlling for covariates (age, sex, income) demonstrated significant effects of parental feeding practices on adolescent fat intake ( $p<0.05$ ) and on frequency of family mealtimes ( $p<0.05$ ) at baseline. Follow up analyses indicated that higher parental pressure to eat was associated with great dietary fat intake ( $p<0.05$ ) and that parental responsibility for meals was positively associated with great frequency of family mealtimes.

Conclusions: The findings from the present study provide important preliminary data on the importance of parents and positive parenting practices on dietary outcomes and family mealtime in overweight African American adolescents.

## POSTER ABSTRACTS

Andrea Danielle Brown, Epidemiology

### **Examining Mental Health among Food Insecure Adolescents and Young Adults with Diabetes**

Jason A. Mendoza, MD, MPH; Kate Flory, PhD; Beth Reboussin, PhD, ScM; Carla Mercado, PhD, ; Elizabeth T. Jensen, PhD, MPH ; Lawrence Dolan, MD; Dana Dabelea, MD, PhD ; Jean Lawrence, ScD, MPH, MSSA,; Angela D. Liese, PhD, MPH

**Objectives:** This study used cross-sectional data from the SEARCH for Diabetes in Youth study collected in 2015-2019 to evaluate associations between Household food insecurity (HFI) and depression among youth and young adults (YYA) with type 1 diabetes (T1D) or type 2 diabetes (T2D).

**Methods:** HFI was categorized as a binary variable (food secure vs food insecure) using the 18-item USDA food security survey, where  $\geq 3$  affirmations indicated being food insecure. The 20-item Center for Epidemiologic Studies Depression (CES-D) scale was used to quantify depression symptoms as a continuous outcome (scores 0-60). Linear regression models were adjusted for age, sex, race/ethnicity, site, and diabetes duration. Models were analyzed separately for youth with T1D, young adults with T1D, and young adults with T2D.

**Results:** HFI and CES-D data were available for 335 T1D youth (10-17 years), 731 T1D young adults (18-35 years), and 272 T2D young adults (18-34 years). Of these, 18.8%, 17.5%, and 30.1%, respectively, reported being food insecure. Adjusted models showed that food insecure young adults with T1D had 7.4 higher scores on symptoms of depression ( $p < .0001$ ) and those with T2D had 4.8 higher scores on symptoms of depression ( $p = 0.0002$ ), when compared to those that were food secure. Food insecure youth with T1D had 3.2 higher scores on symptoms of depression compared to food secure youth with T1D after adjustment for covariates ( $p = 0.0031$ ).

**Conclusions:** Findings from this study suggest that living in a food insecure household is associated with increased depression symptomology among YYA with T1D or T2D.



### **Yoo Jin Cho, Health Promotion, Education and Behavior Evaluation of a brief health literacy assessment for self-administered, population-based surveys in the US and Mexico**

James F. Thrasher, PhD; Rachel E. Davis, PhD; Gabriela Armendariz, MD, MPH

**Objectives:** The Newest Vital Sign (NVS) is a widely used, interviewer-administered health literacy measure with 6 questions involving interpretation of an ice cream nutrition label. We examined the internal reliability and construct validity of a self-administered version of the NVS for use in online, population-based surveys in the US and Mexico.

**Methods:** In 2018 and 2019, nationwide cross-sectional surveys were conducted with online panels of adult consumers in Mexico (N=8,445) and the US (N=8,809). For each country, reliability was assessed via the Kuder-Richardson 20 formula (i.e., KR-20 for dichotomous indicators) and linear, multinomial logistic, and logistic models were estimated for three versions of the NVS: continuous (range=0-6), ordinal (0-1; 2-3; 4-6), and dichotomous variables (0-3; 4-6), the latter two of which are recommended by NVS developers. Convergent validity was examined for socioeconomic status and engagement with nutrition labels.

**Results:** The NVS exhibited high internal reliability (KR-20 US=0.83; Mexico=0.77). In linear regression models, higher education ( $p < .001$ ), lower food insecurity ( $p < .001$ ), more frequent exposure to nutrition labels ( $p < .001$ ), more frequent use of nutrition labels ( $p < .001$ ) and greater self-reported comprehension of nutrition labels ( $p < .001$ ) were all associated with greater health literacy. Multinomial logistic and logistic regression models showed consistent results.

Conclusions: The NVS appears to have high reliability and strong construct validity for measuring nutrition label literacy in self-administered surveys among adult consumers in both Mexico and the US.



Katherine Devivo, Exercise Science

**Eating Behaviors and Grocery Shopping Experiences During the COVID-19 Pandemic Among Adults in a Weight Loss Program**

Jessica L. Unick, PhD; Courtnee E. Harpine, Christine A. Pellegrini, PhD

Objective: The purpose of this study was to explore and describe how the COVID-19 pandemic influenced dietary behaviors among adults enrolled in an internet-based weight loss program.

Methods: Adults enrolled in an internet-delivered weight loss program completed a semi-structured interview via telephone between June 1, 2020 and June 22, 2020. The interview explored how the COVID-19 pandemic has influenced dietary behaviors. Constant comparative analysis was used to identify key themes.

Results: Participants (n=30) were primarily female (83%) and white (87%), 54.6±10.0 years old, and had a mean body mass index of 31.1±4.5 kg/m<sup>2</sup>. General themes with eating were change in eating out frequency or modality (e.g., take out more, not eating at restaurants), cooking more, and changes in alcohol consumption. Themes related to shopping included change in shopping frequency, and inability and changes in ability to find certain foods. Barriers included snacking/ease of access to food, eating as a coping mechanism, and lack of routine/planning. Facilitators included calorie control, regular routine/scheduling, and self-monitoring. Conclusion: The coronavirus pandemic has influenced adults eating and grocery shopping behaviors. As the COVID-19 pandemic continues, addressing these barriers will be critical for weight management. Disseminating strategies to promote healthy snack alternatives, flexible meal plans that account for challenges purchasing food

at the grocery store, and stress management techniques to reduce stress eating may be helpful for those managing their weight. Future research is needed to understand the long term effects the pandemic may have on eating and shopping behaviors.



Kelli DuBois, Health Promotion, Education and Behavior  
**Perceptions Among Patients with Ulcerative Colitis: Treatment and Self Management Methods**

Christine Blake, PhD, RD; Caroline Rudisill, PhD; Sayward Harrison, PhD; James Hebert, ScD

Background: Patients with Ulcerative Colitis (UC) experience a range of gastrointestinal (GI) and extraintestinal symptoms that generate a significant burden on daily life. Many patients seek out complementary treatments and undertake socio-behavioral and lifestyle adaptations to self-manage disease symptoms, reduce dependence upon pharmaceuticals, and respond to the challenges of living with chronic illness. This study will describe patient perspectives and experiences with UC treatment and self-management methods.

Methods: Qualitative data were collected using individual semi-structured interviews to reflect the perspectives and experiences of individuals with UC on treatment and self-management methods. Patients were recruited through Greenville's Prisma Health Gastroenterology department, the Carolina's Crohn's and Colitis support group, and Facebook support groups. Eligibility criteria included: 1) diagnosis of UC; 2) duration of illness ≥5 years; and 3) minimum of one disease flare during the illness trajectory. Interviews were audio recorded and transcribed. Thematic analysis was conducted using NVivo 11 software.

Results: Progressive use of medications in response to disease flares was common. Participants identified stress as a precursor to disease flares. While some patients doubted the effect of diet on disease activity, the majority of participants spoke about foods as culprits for

GI symptoms. Other participants described making changes to their dietary intake to manage their overall health. Patients who underwent colorectal surgery described a continuing need to self-manage gastrointestinal symptoms.

Conclusion: Participants expressed a spectrum of attitudes and approaches towards dietary change. Greater understanding is needed to identify how diet can influence immune functioning and overall health among UC patients.



Shirelle Hallum, Health Promotion, Education, and Behavior

**Positive and negative food environments are linked with neighborhood socioeconomic disadvantage: An innovative geospatial approach to understanding food access inequities**

S. Morgan Hughey, PhD; Marilyn E. Wende, MSPH; Ellen W. Stowe, MPH; Andrew T. Kaczynski, PhD

Objective: This study examined 1) the separate relationships between socioeconomic disadvantage and the density of multiple types of food outlets, and 2) the relationships between socioeconomic disadvantage and composite positive and negative food outlet indices. Methods: Cross-sectional data were analyzed using geospatial kernel density techniques. Food outlet data included convenience stores, discount and drug stores, fast food and fast-casual restaurants, and grocery stores. Multivariate linear regression was used to examine the relationships between socioeconomic disadvantage and density of food outlets. The unit of analysis was block groups, and all data about neighborhood socioeconomic disadvantage and food outlets were publicly available. Results: Convenience store density, negative food environment index, and positive food environment index were positively associated with block group socioeconomic disadvantage, while total food environment index was negatively associated with block group socioeconomic disadvantage.

Conclusions: Those who reside in more disadvantaged block groups have greater access to both positive and negative food outlets. Although disadvantaged populations have greater access to all types of food outlets, the density of unhealthy establishments was greater than the density of grocery stores in these areas. Structural changes are needed to address access to healthy food outlets to combat environmental injustice and reduce obesity risk.



Ubong James, Nursing

**Associations between consumer behavior habits and dietary inflammatory potential using data from the National Health and Nutrition Examination Survey (2005-2016)**

Michael D. Wirth, PhD; James Hébert, ScD

Objective: The objective of this study was to investigate the association between consumer behaviors related to purchasing of food/meals and Dietary Inflammatory Index (DII®) scores.

Methods: Cross-sectional data from adults over 12 years (N = 27,438) from the 2005 through 2016 National Health and Nutrition Examination Survey (NHANES) were used. DII scores were assessed according to 24-hour dietary recalls, while consumer behaviors were evaluated according to participants' responses to NHANES items related to food shopping and food expenditures. Regression analyses were conducted to examine the association between consumer behaviors and DII scores

Results: While controlling for covariates, those in quartile 1 for spending money on groceries in a month (i.e., lowest amount) compared to quartile 4 for money spent on groceries has statistically significant higher DII scores (0.38 vs. 0.13, p<0.01). The converse was true for money spent dining out. Also, statistically significant higher DII scores were associated with having no fruits at home compared to always having fruits at home, as well as always having soda at home versus never having soda

at home. Eating at restaurants, not using myPyramid, not using nutrition facts labels and not buying organic foods also were significantly associated with higher DII scores. Conclusions: These findings suggest that consumers who spend less on grocery food, spend more money dining out, or do not use food nutrition information/education are more likely to consume more pro-inflammatory diets.



Rubaiya Jesmin, Environmental Health Sciences

### **Mycotoxin Mitigation in Baby Foods is Key to Food Safety and Nutrition**

Geoffrey I. Scott, PhD; Paramita Chakraborty, PhD; Anindya Chanda, PhD.

Mycotoxin contamination of baby foodstuffs is considered one of the most important chemical contaminants, as it causes many chronic health risks. This contamination leads to the spread of foodborne pathogens and infant death. Baby food microbial contamination may be a result of the incomplete manufacturing process and lack of knowledge about its preparation. Our studies explored the presence of mycotoxins produced by *Aspergillus* (Aflatoxin B1, B2, G1, G2 & M1), *Fusarium* (Deoxynivalenol) and *Penicillium* (Antibiotics) in baby food products manufactured and produced in lower and middle-income countries such as India. These studies also reveal that mycotoxin mitigation is key to improving child nutrition and growth, and that action is urgently required. A total of seventeen commercially available food samples manufactured by different manufacturers were obtained randomly from different retail stores in India and analyzed for this study. These food samples were of various types that included infant food (5 products-cereals, cornflakes, cerelac, milk powder), nutritional drinks (5 products), snacks, and breakfast foods (7 products). A total of 70 g from each sample were used for quantitative analysis of aflatoxins B1, B2, G1, G2, and aflatoxin M1 by using a previously established direct competitive enzyme-linked

Immunoassay (ELISA). Mycotoxins in the samples were extracted using a chloroform: methanol extraction method. Our findings showed that all of the analyzed baby food samples were contaminated with aflatoxin M1 at a level exceeding the recommended European Union level of 25ng kg<sup>-1</sup>. Several (75%) of them contained detectable concentrations of deoxynivalenol and 51.7% samples with DON levels that can lead to dietary intake higher than 1 µg kg<sup>-1</sup> recommended by the joint FAO/WHO expert committee on food additives. Our significant research on mycotoxins suggests that chronic exposure to mycotoxin contaminated complementary foods can put infants and toddlers at risk of acute aflatoxicosis and liver disease. It also reveals the urgent need for the global community to act now to reduce mycotoxin contamination and exposure to help some of our most vulnerable populations, infants, and children.



Leila Larson, Health Promotion Education and Behavior

### **Biopsychosocial correlates of early child development in Bangladesh: evidence from the Benefits and Risks of Iron Supplementation in Children (BRISC) trial**

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Objective: Identifying the predictors of early child development in populations is important to inform the design of interventions and programs. Using data from the BRISC trial, we examined the biopsychosocial correlates of development in 8 month-old Bangladeshi children.

Methods: This study includes children who participated in a baseline survey for a randomized controlled trial to study the effects of iron supplements and multiple micronutrient powders on child development. We recruited 3300 children at 8 months of age. Child

development was assessed using the Bayley Scales of Infant and Toddler Development-III, psychosocial stimulation was measured using the Family Care Indicators (FCI), and maternal depression using the short version of Centre for Epidemiological Studies-Depression questionnaire. Anthropometry and hemoglobin concentrations were measured using standard procedures. A multiple variable linear regression model was used to examine significant correlates of cognitive, language, and motor development.

Results: In this population of 8 month old children, prevalence of anemia was 44.6% and stunting was 21.8%. In the adjusted model, length-for-age z-score (LAZ) and FCI score were significantly ( $p$ -value $<0.01$ ) associated with the cognitive development score [b (95%CI): LAZ = 0.94 (0.59, 1.28); FCI score = 0.12 (0.03, 0.21)]. Results were similar for language and motor development. Hemoglobin concentration was significantly associated with motor development [b (95%CI): LAZ = 0.39 (0.04, 0.73)], but not with cognitive and language development after adjustment for confounders.

Conclusions: Strategies to address the underlying causes of growth faltering and programs to improve parenting and home stimulation could have important implications for child development in Bangladesh.



Hannah Parker, Exercise Science

### **Food Insecure Households Report Decreased Access to Healthy Foods in the Home as the COVID-19 Pandemic Continues**

Sarah Burkart, PhD; Glenn Weaver, PhD; Bridget Armstrong, PhD

Objective: This study examined the presence of healthy foods in the home at different time points during the COVID-19 pandemic among food insecure (FI) and food secure (FS) households.

Methods: Parents of elementary age children (2-5th grade) were surveyed in April 2020 and July 2020 about

the presence of food items currently in their home. Food items were identified as 'healthy' according to the Healthy Eating Index. FI was assessed using the two-item USDA screener. A 2x2 repeated measures ANOVA was conducted to examine changes in the presence of healthy food in the household by FI status.

Results: Data were obtained from 62 households; 30% (n=19) were classified as FI. There were no significant main effect differences in the presence of healthy foods between April and July ( $f(1,60) = 0.02$ ,  $p > 0.05$ ,  $\eta^2 < 0.01$ ). There was a significant time by FI interaction ( $f(1,60) = 4.94$ ,  $p < 0.05$ ,  $\eta^2 = 0.08$ ), such that FI households reported significant decreases in healthy foods from April to July 2020 compared to FS households.

Conclusion: Our findings indicate significant decreases in healthy foods in FI households compared to FS households. Results are concerning as FI is increasing across the nation. Further, the impact of disease and economic burden from the COVID-19 pandemic disproportionately affects low-income families. Results may be informative regarding policy measures to ease the economic burden caused by the pandemic, such as increased SNAP benefits.



Christine Pellegrini, Exercise Science

### **Role of Stress on Weight Management Behaviors during the COVID-19 Pandemic among those Enrolled in an Internet-Delivered Weight Loss Program**

Jennifer Webster, Korina R. Hahn, Tiffany L. Leblond, Jessica L. Unick, PhD

Objective: This study examined how stress experienced during the COVID-19 pandemic influenced mental well-being and weight loss behaviors among adults enrolled in an internet-based weight loss program.

Methods: Participants enrolled in a weight loss program completed a brief survey on how the COVID-19 pandemic influenced their current behaviors between April 14, 2020 and April 21, 2020. Participants were categorized based on stress level (High Stress: moderate to extreme

stress, Low Stress: not at all to slightly stressed). Weight management behaviors were examined by stress category using independent sample t-tests for continuous variables or Chi-square tests for categorical variables.

Results: A total of 99 participants completed the survey (79% female, 91% white, 52.2±9.8 years, 34.0±5.2 kg/m<sup>2</sup>, 72% classified as High Stress). Individuals with High Stress were more likely to have school age children at home (p=0.004), experience higher levels of anxiety and concern regarding COVID-19 (p<0.05), have less time to spend on weight loss efforts (p<0.001), and more difficulty staying on track with eating habits (p<0.05) than those with Low Stress. No differences were seen for exercise habits.

Conclusions: Many individuals enrolled in a weight loss program experienced high stress during COVID-19. These high levels of stress were related to more difficulties finding time for weight management efforts and staying on track with eating habits, but not exercise habits.



Mary Quattlebaum, Department of Psychology  
**Interaction of Emotional Eating and Parental Feeding Practices on Dietary Intake among African American Adolescents**

Allison M. Sweeney, Ph.D.; Dawn K. Wilson, Ph.D.

Objectives: Emotional eating has been associated with overeating and greater consumption of energy-dense foods among youth. The current study examined the interactive effects of parental feeding practices and adolescent emotional eating on fruit and vegetable (F&V) intake among African American (AA) adolescents and hypothesized that more positive parenting practices (less restriction) would buffer the effects of emotional eating on dietary outcomes.

Methods: Overweight AA adolescents (N=125; M age 12.82±1.728; M BMI %ile 96.69±4.00) provided baseline data for the Families Improving Together for weight loss trial. Adolescents completed the Three-Factor Eating Questionnaire to assess emotional eating. F&V intake was assessed with random 24-hour dietary recall on two

weekdays and one weekend day. Adolescents' perspective on parental feeding practices was measured with the Child Feeding Questionnaire.

Results: A hierarchical linear regression demonstrated that the overall model was marginally significant (F(16,124)=1.576, p=0.088, R<sup>2</sup>=0.189) and indicated a significant interaction between emotional eating and parental monitoring ( $\beta=0.313$ , p=0.011), parental restriction ( $\beta=-0.241$ , p<0.05), and parental weight-related concerns ( $\beta=-0.293$ , p=0.008). Simple slope analyses showed that at high levels of parental monitoring, emotional eating was positively associated with greater F&V intake, at low levels of parental restriction, emotional eating was positively associated with higher F&V intake, and at low levels of parental concern, emotional eating was positively associated with higher F&V intake.

Conclusions: These findings expand past research and indicate that future studies may need to take parental feeding practices into account when evaluating the relationship between emotional eating and dietary outcomes among overweight AA adolescents.



Lauren Reid, Epidemiology and Biostatistics

**Household food security is associated with hypoglycemia fear among young adults with type 1 and type 2 diabetes and parents of youth with type 1 diabetes**

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Objective: For individuals with diabetes and household food insecurity (HFI), uncertain availability of food may increase fear of hypoglycemia (FOH). FOH may prevent individuals from optimal diabetes management. Methods: We analyzed data from 1,603 adults (80% type 1 diabetes [T1D], 20% type 2 diabetes [T2D]) and 592 youth (100% T1D) participants in the SEARCH for

Diabetes in Youth Study. Adult participants and parents of youth completed the US Household Food Security Survey, where  $\geq 3$  food insecure conditions indicate HFI. Adults, youth, and parents of youth completed the Hypoglycemia Fear Survey that provides a behavior subscale, worry subscale, and total score. We examined the association of HFI with FOH with general linear models, adjusting for covariates.

Results: Adults with T1D reporting HFI had increased FOH (+3 units for behavior, +11 units for worry, +14 units for total), after adjustment (all  $p < 0.0001$ ). Parents of youth with T1D reporting HFI had a 3 unit increase in worry FOH ( $p = 0.03$ ). Adults with T2D reporting HFI had increased FOH (+8.9 units for total, +6 units for worry; all  $p < 0.01$ ). Youth with T1D reporting HFI did not differ in FOH than those not reporting HFI.

Conclusion: This research suggests among adults with diabetes and parents of youth with T1D, those with HFI are more likely to experience FOH than those without HFI. Implementation of common approaches to ameliorate risk of hypoglycemia such as carrying snacks is problematic for people who are food insecure. Providers could consider HFI when discussing hypoglycemia and fear thereof with their patients.



Sharraf Samin, Health Promotion, Education and Behavior

#### **Current situation and needs of adolescent nutrition services in hard-to-reach areas of Bangladesh**

Md. Khalequzzaman, PhD; Maruf Haque Khan, PhD; Fahmida Afroz Khan, MPH; Shahrin Emdad Rayna, MPH; Syed Shariful Islam, PhD;

Objective: This study examined the situation of existing adolescent nutrition services and needs of the service providers and recipients in hard-to-reach areas in Bangladesh.

Methods: This cross-sectional study design has used a mixed-method approach in five different types of hard-to-reach areas: haor, char (alluvial lands), islands, hilly and coastal areas spreading over 12 districts in Bangladesh. Situation analysis was large dependent on

quantitative data which were collected by face-to-face interviews from 293 adolescent boys and girls. Need assessment was mostly appraised by qualitative data collection tools like Focus Group Discussions (FGDs), Key Informant Interviews (KIIs) and observations in 29 government health facilities.

Results: Approximately, 71% of adolescent girls sought nutrition services from government health facilities whereas no boys were found receiving any nutrition services from any kind of facilities. The coverage of IFA supplementation (66.7%), counseling on reproductive health and personal hygiene (33.3%) was found higher in the coastal areas though utilization of Behaviour Change Communication (BCC) materials while counseling was nil at all. The ceaseless demands for regular supply of nutrients, logistics and increasing skilled manpower at the field level were strongly uttered by both healthcare providers and recipients. Establishment of community nutrition clubs and improving school based nutrition services can play significant role in this regard. Conclusion: Nutrition interventions implemented in hard-to-reach areas targeted the adolescent girls, leaving the adolescent boys bereft of the advantages of interventions. Strengthening the provision of nutrients supplementation and increasing the coverage of training are indispensable to improve nutrition services in hard-to-reach areas.



William Tucker, Exercise Science

#### **Sodium Consumption and Arterial Stiffness in Women 6 Months – 3 Years After Delivery**

Catherine O'Byrne, Abby Heinichen, Chloe Caudell, Paige Wilbanks, Abbi Lane-Cordova, PhD

Introduction: Restricting dietary sodium consumption decreases arterial stiffness in adults, partially due to the blood pressure lowering effect of sodium restriction. We have shown that sodium consumption and blood pressure were not associated in women soon after delivery, but the relationship of sodium consumption and arterial stiffness in women shortly after pregnancy is unclear.

**Objectives:** The purpose of this investigation was to determine whether self-reported sodium consumption was associated with arterial stiffness in women 6 months to 3 years after a singleton birth.

**Methods:** Sodium consumption was measured using a validated scored sodium questionnaire. Arterial stiffness (pulse wave velocity) was obtained by dividing the distance between carotid and femoral arterial waveforms by the R wave of a simultaneously recorded ECG using a SphygmaCor machine and software. Associations were determined using robust linear regression, unadjusted and adjusted for age and race. **Results:** 44 participants completed the study (20.45% African American, age=33±1 yrs, BMI=26±1 kg/m<sup>2</sup>). Pulse wave velocity was negatively associated with sodium consumption ( $r=-0.01$ ,  $p=0.04$ ) in an unadjusted analysis. After adjusting for race and age, the association was no longer significant ( $r=-0.01$ ,  $p=0.11$ ).

**Conclusion:** Arterial stiffness and sodium consumption were negatively and significantly associated, but the significance was lost after adjusting for age. Our data suggest that the negative association was likely mediated by age-related differences in arterial stiffness and sodium consumption in women in our study. Future work should investigate associations of arterial stiffness and sodium consumption in a larger cohort or determine the effect of sodium restriction on arterial stiffness of women soon after delivery.



Lauren Wallace, Public Health Sciences

**How Are Community Socio-Economic Factors Associated with the Sales of Unhealthy Products: Alcohol, Tobacco and Unhealthy Snack Food in Low Income Communities**

Elizabeth Racine, DrPH, RD; Rajib Paul, PhD; Shafie Gholizadeh; Caitlan Webster, MA, MPH

**Objectives:** People under stress tend to use unhealthy coping mechanisms including using products like alcohol, tobacco and unhealthy snacks. The purpose of this study is to assess how measures of community socio-economic status, which may be proxies for community stress, are

associated with the sales of unhealthy products (alcohol, tobacco, and unhealthy snacks) at a discount variety store chain. Specifically, we consider the following measures of community socio-economic status: population racial/ethnic composition, percent of households on SNAP, percent of households without a vehicle, walkability score and median community income.

**Methods:** Mixed effects linear regressions with random effects were used to examine the relationship between the weekly unit sales (per 1000 population) of three outcome variables (tobacco, alcohol, unhealthy snacks) and community socio-economic factors: percent of households on SNAP, percent of households without a vehicle, and median community income. Alcohol, tobacco, and unhealthy snack sales were collected over a 20-month period in 2017 and 2018 in 16 discount variety stores.

**Results:** The sales of alcohol, tobacco, and unhealthy snacks increased as the percent of the population participating in SNAP increased. Other measures of community socio-economic status were not significantly (at 5% significance level) associated with tobacco or unhealthy snack sales. However, for alcohol sales, increases in: the median household income, walkability score and percent of African American residents, were associated with a decrease in alcohol sales.

**Conclusions:** Low income neighborhoods frequently experience greater health burden compared to higher income neighborhoods. Understanding and quantifying the relationship between financial stress and unhealthy product consumption can help public health professionals intervene before chronic diseases manifest.



Long-gang Zhao, Epidemiology and Biostatistics

**The consistency of associations between dietary and serum antioxidant nutrients with cancer risk: a systematic review**

Nadeesha Vidanapathirana, MAppStat.; Anwar T. Merchant, DrPH; Susan E. Steck, PhD

**Objectives:** Serum biomarkers are a common measurement of exposure to dietary antioxidants and may be considered superior to dietary assessment data given their relative objectivity. However, their associations with cancer risk have not been systematically reviewed and compared within the same study population. Therefore, we aimed to evaluate the consistency of the associations with cancer risk between dietary and serum antioxidant nutrients.

**Methods:** We searched the database of PubMed, Web of Science, and Embase to obtain studies that investigated the association between dietary and serum vitamins A, C, and E, and total carotenoids with cancer risk using the same study population in prospective designs. We abstracted the results from each paper using a standard data extraction table and compared the results for dietary intake and serum concentration of the antioxidant nutrients in relation to all cancer types.

**Results:** After scanning 17,394 records from the literature search, we obtained 28 prospective studies involving 54 associations focused on both dietary intake and serum level of antioxidants within the same study population. The associations between cancer risk and antioxidants assessed by dietary intake and serum antioxidant concentration were consistent in 38 results (total observed agreement = 0.704) when using p-value linear trend  $\leq 0.05$  as the cut-point. Cancer risk was not associated with extreme categories of antioxidants measured by dietary intake or serum levels.

**Conclusions:** Generally, associations between dietary antioxidants intake and cancer risk are consistent with those for serum antioxidants when examined within the same study population.