

**The Future of Food and Nutrition:  
A Multidisciplinary Graduate Research Conference**

The Friedman School of Nutrition Science and Policy  
Tufts University  
Boston, MA

March 29, 2014



Gerald J. and Dorothy R.  
Friedman School of Nutrition  
Science and Policy

On behalf of the conference committee, welcome to the **8<sup>th</sup> Annual Future of Food and Nutrition Conference** at the Friedman School of Nutrition Science and Policy at Tufts University!

We are very excited to host presenters and conference attendees from schools and programs all over the country to talk about critical topics in food and nutrition research and programming.

This conference is designed to bring together students, researchers, and professionals from the broad array of institutions that study and solve food and nutrition problems around the world. We hope you will take the opportunity to meet someone new, ask questions, and start conversations on these topics that mean so much to us.

And we are so lucky to have such a wonderful keynote speaker for our conference today. **Dr. Jessica Jones-Smith** is an Assistant Professor within the Department of International Health at the Johns Hopkins Bloomberg School of Public Health. She is speaking today on one of her areas of expertise; her talk is titled "The Global Nutrition Transition and Changing Relationships Between Socioeconomic Status and Overweight."

With our call for abstracts on broader themes of food and nutrition research, we saw higher quality abstracts than ever before from all over the country. We have presentations from many different academic programs on research ranging from crop diversity to food access on the Navajo Nation to the function of Vitamin B6 in mechanisms of inflammation. We hope you will engage with all of the presenters to make these sessions dynamic and enlightening.

Lastly, we could not host this event without the support of our conference sponsors, faculty, staff, and dedicated members of the Student Research Conference Committee. Thank you all! If you have any questions or comments, please do not hesitate to reach out to a committee member throughout the day.

Enjoy!

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Conference Committee Co-Chairs

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Time	Session	Location
9:00–9:30	<b>BREAKFAST AND REGISTRATION</b>	
9:30–9:45	<b>Conference Introduction</b> Patrick Webb, Dean of Academic Affairs	<i>Behrakis Auditorium</i>
9:45–11:00	<b>Presentation Session 1</b>  1A: Nutrition and Health Outcomes in an Aging Population  1B: Health and Wealth: Factors Affecting Nutritional Well-Being in Developing Countries	<i>Jaharis 118</i>  <i>Behrakis Auditorium</i>
11:00–11:15	<b>BREAK</b>	
11:15–12:30	<b>Presentation Session 2</b>  2A: Nutrition-Related Mechanisms in Health and Disease  2B: Interventions in Food Security and Diet Quality	<i>Jaharis 118</i>  <i>Behrakis Auditorium</i>
12:30–1:30	<b>LUNCH</b>	<i>Served in Jaharis Café, overflow seating in 118/156</i>
1:00–2:00	<b>Poster Session</b>	<i>Outside Behrakis Auditorium and 155</i>
2:00–3:15	<b>Presentation Session 3</b>  3A: From the Ground to the Plate: Current Issues in International Agriculture and Food Safety  3B: Retail, Food Access, and Sugar-Sweetened Beverages: Current Topics in Nutrition Policy	<i>Jaharis 118</i>  <i>Behrakis Auditorium</i>
3:15–3:30	<b>BREAK</b>	
3:30–4:45	<b>Keynote Lecture—The Global Nutrition Transition and Changing Relationships Between Socioeconomic Status and Overweight</b>  Jessica Jones-Smith, PhD	<i>Behrakis Auditorium</i>
4:45–5:00	<b>Closing Remarks</b>	<i>Behrakis Auditorium</i>
5:30–7:30	<b>Post-Conference Networking Reception</b>	<i>TRADE—540 Atlantic Ave., Boston</i>

**Session 1A****Jaharis 118****Nutrition and Health Outcomes in an Aging Population****Faculty Moderator: Assistant Professor Elizabeth Johnson**

*“Choline and choline-related compounds are associated with cognitive performance and cerebrovascular pathology in older adults”*

*Annie Roe, Tufts University, Friedman School, Biochemical and Molecular Nutrition*

*Co-authors: S Zhang, NA Crivello, X Zhao, EJ Johnson, AH Lichtenstein, CE Smith, S Zeisel, IH Rosenberg, TM Scott*

Choline is an essential nutrient critical to brain health. Our objective was to evaluate the association of plasma choline (Cho) and Cho-related compounds with cognition and cerebrovascular pathology (CvP) in a subset of the Nutrition, Aging, and Memory in Elders cohort who had undergone MRI, cognitive testing, and had archived plasma (n=296, mean age=73.6, SD ± 8.1). We derived cognitive composite scores for memory, attention and executive domains, and used mass spectrometry to measure plasma concentration of free Cho, betaine, phosphatidylcholine (PC), and sphingomyelin (SM). Volumetric analysis of MRI resulted in measures of CvP (white matter hyperintensities (WHMI), small and large vessel infarcts) and brain atrophy (hippocampus, amygdala, ventricles). Statistical analyses were adjusted for demographics, co-morbidities, and plasma concentrations of B-vitamins, homocysteine, and cholesterol. Significance was set at  $p \leq 0.05$ . Cho concentration was positively related to executive function and amygdala volume; those in the lowest tertile of Cho had higher odds of a small vessel infarct than did those in the top two combined [OR=1.71(95%CI 0.92-3.17)]. Betaine concentration was negatively related to ventricular volume; and the ratio of SM:(SM+PC) was negatively related to the volume of WMHI. Our findings are further evidence of a role for choline in brain function and cerebrovascular health in old age.

*“Sleep duration, dietary intake and metabolic syndrome risk: a meta-analysis from the Cohorts for Heart and Aging Research in Genomic Epidemiology (CHARGE) consortium”*

*Hassan Dashti, Tufts University, Friedman School, Biochemical and Molecular Nutrition*

*Co-authors: CE Smith, T Tanaka, JM Ordovas*

Mounting evidence suggests an association between reduced sleep duration and obesity, diabetes, and several metabolic syndrome (MetS) traits. In order to identify modifiable factors to attenuate the risk of MetS, we investigated the relationships between diet, sleep, and 5 selected MetS genetic risk factors (CLOCK-rs1801260, NR1D1-rs2314339, MTNR1B-rs13876153, CRY2-rs11605924, and MTNR1B-rs10830963) in nine studies of European descent from the Cohorts of Heart and Aging Research in Genomic Epidemiology (CHARGE) consortium (n = 10,731). In fixed-effects meta-analyses, we first assessed whether sleep duration associates with macronutrient intakes, then we evaluated whether sleep duration can modulate the risk of MetS in MetS susceptible individuals. Results from adjusted cohort-specific association and interaction analyses were meta-analyzed with inverse variance weights. Sleep duration was associated with total ( $\beta \pm SE: 0.47 \pm 0.15$ ;  $P=0.002$ ), polyunsaturated ( $\beta \pm SE: 0.05 \pm 0.02$ ;  $P=0.02$ ) and total ( $\beta \pm SE: 0.18 \pm 0.09$ ;  $P=0.04$ ) fat intake, in addition to total carbohydrate ( $\beta \pm SE: -0.3 \pm 0.13$ ;  $P=0.007$ ) intake, only among women between the ages of 65 and 80. Additionally, we have identified a significant interaction between CRY2-rs11605924 with sleep duration on HDL-C concentrations ( $\beta \pm SE: 0.46 \pm 0.16$ ;  $P=0.004$ ). The

current findings suggest that sleep duration influences dietary choices and the gene-environment interactions may be of application for personalized recommendations to reduce MetS risk.

*“Possible mechanisms for decreased immune function in old mice fed a high folic acid diet: looking at IL-10 and NK cytotoxicity”*

*Hathairat Sawaengsri, Tufts University, Friedman School, Biochemical and Molecular Nutrition*

*Co-authors: J Wang, C Reginaldo, D Smith, D Wu, SN Meydani, J Selhub, L Paul*

Natural killer (NK) cells are important for immunity against malignant and virally infected cells. High folic acid intake, which may be linked with higher risk of colon cancer, was associated with lower NK activity in older women. To study the underlying mechanisms, we created a mouse model and found that aged mice fed a high folic acid (HFA) diet had reduced NK activity. In this study, we determined if expression of cytokines that are known to activate NK activity (IL-10, IFN- $\gamma$ , TNF- $\alpha$ ) are affected by a HFA diet in aged mice.

Female C57BL/6 mice (16 mo) were fed a control (1x RDA folic acid) or a HFA diet (20x RDA folic acid) for 3 months. Splenocytes were collected and stimulated with LPS for 24 h for ex vivo production of IL-10, IFN- $\gamma$ , and TNF- $\alpha$  determined by cytometric bead array.

In HFA mice, IL-10 production was 50.7% less than that of the control mice ( $P=0.028$ ) but no differences were found in IFN- $\gamma$  and TNF- $\alpha$  production. Since IL-10 activates NK cells, we examined whether addition of IL-10 to the splenocyte cultures would restore NK activity in the HFA group.

We found that NK activity increased for both groups ( $P<0.01$ ), but the HFA group had larger percent increase in NK activity as compared to control mice ( $P=0.058$ ). These results indicate that IL-10 restored the lower NK activity in aged mice fed a HFA diet.

These findings suggest the decreased NK activity due to a high folic acid diet may in part be due to impaired IL-10 secretion.

## **Session 1B**

## **Behrakis Auditorium**

### **Health and Wealth: Factors Affecting Nutritional Well-Being in Developing Countries**

**Faculty Moderator: Professor Steven Block**

*“Predictors of undernutrition in rural and urban Tanzanian adolescents: a comparative study”*

*Nick Otis, University of Massachusetts Amherst, Human Nutrition*

*Co-authors: J Nelson-Peterman, LS Cordeiro*

Background: Urban population growth has outpaced expectations in developing countries, changing physical, social, and economic landscapes with implications on health. In Tanzania urban growth was reported to be 4.66% in 2010 and is predicted to rise. Comparative studies on nutritional status by geographic location present mixed findings. Adolescents, already representing a 1 in 4 Tanzanians, are an especially vulnerable group for poor nutritional status. Methods: This cross-sectional study examines predictors of poor nutritional status across urban and rural adolescents ( $n=892$ ) in Tanzania. Undernutrition was classified as <5th percentile according to NCHS/WHO standards. Logistic regression analysis tested the association between undernutrition, gender, and urban-rural residence after adjusting for covariates. Results: The prevalence of undernutrition was 23.7% among rural and 11.8% among urban adolescents ( $p<0.05$ ). Rural adolescents were twice as likely to be undernourished than urban youth [OR=2.11 (95%CI: 1.45, 3.06);  $p<0.05$ ] after adjusting for all other covariates in the model. Higher odds of undernutrition were associated with being

male and living in a rural setting. Males were twice as likely to be undernourished than females, after adjusting for urban/rural residence and age [OR=2.15 (95%CI: 1.49, 3.09); p<0.05].

Conclusions: Our findings suggest that adolescent males in rural settings experience higher rates of undernutrition, which further compromises their health status and social well-being. Further research should investigate the implications of urban population growth on adolescent nutritional health, particularly in the context of poverty and rising food insecurity.

*“Re-thinking the food basket: dynamic household choices and the impact of cash versus food transfers in Niger”*

*Joanna Upton, Cornell University, Dyson School of Applied Economics and Management*

Food assistance in the form of cash has increased in recent years, in part due to proven cost and timeliness advantages of cash transfers. Evidence is however limited—and mixed—as to the other hypothesized benefits of cash transfers, namely that they achieve better outcomes and meet recipients’ preferences by providing greater choice. Economic theory generally predicts that cash transfers are superior to in-kind. If a food transfer is extra-marginal, such that the food provided is more than the household would otherwise consume, then the transfer constrains recipients’ choices and they would be better off with cash. If the transfer is infra-marginal, such that the food provided is less than households would otherwise consume, there should be no difference between the two transfer types. In neither case should an in-kind transfer be superior to cash. Puzzlingly, this is not always the case, and the mechanisms behind households’ preference for food versus cash transfers are not fully understood. In this paper I develop an economic household model that integrates frictions (transaction costs) and dynamics (consumption smoothing over time through savings and credit) to show how preferences for cash versus food may vary predictably. I in turn integrate two food goods, a staple food and another food that represents dietary diversity. While focus in the past has been on the infra- or extra-marginality of a food basket as a whole, this model predicts that the relative consumption outcomes with cash versus food transfers depend on the nature, and status for the household, of each component of the food transfer. I find support for this model using a panel of household-level data from a randomized cash-food intervention in Eastern Niger, an ideal setting for examining this question. The results have important implications for the design and targeting of food assistance programs.

*“Econometric Impact Evaluation: Can Women Increase Food Consumption by Participating in Savings for Change (SfC) Program in Guatemala”*

*Prajula Mulmi, Tufts University, Friedman School, Food Policy and Applied Nutrition*

*Co-authors: V Callaway, K Dutko, C Brown, T Taneja, Y Hirose*

*Background.* The Oxfam America’s Savings for Change (SfC) program in Alta and Baja Verapaz, Guatemala was designed to reach the rural poor without access to microfinance institutions. The overarching goal of the program was to improve the livelihoods of the program participants. While the evaluation was done to measure the impact of the program on various indicators of wellbeing, the purpose of this report is to discuss the impact on food consumption.

*Methods.* In March 2010, the baseline survey was conducted among 510 women in the treatment, promotion and control villages. In December 2012, only 209 women were re-surveyed, representing a total attrition rate of 59%. Given the panel data, we employed difference-in-differences strategy to estimate the impact of SfC on women’s food consumption and calculated the treatment effect as the Intention-to-Treat (ITT). We used Inverse Mills’ Ratio in the model to control for selection bias introduced through attrition.

*Results.* Before adjusting for covariates, on average 38.8% of women in the control group reported

lack of food ( $p < 0.01$ ). On average, women in the SfC program were 37.8 percentage points more likely to report lack of food as compared to women in the control group ( $p < 0.10$ ). After controlling for covariates, the coefficient was almost twice as large (69.9) but the level of statistical significance remained the same.

*Conclusions.* The observed treatment effect may be plausible if the women in the SfC faced liquidity constraints as a result of participation in the program. Conversely, the treatment effect may be biased due to differential timing in survey implementation or due to threats to internal validity. Hence, it is difficult to conclude the impact of the program on food consumption. Moreover, the analytical constraints can be related to the design and implementation of the program, thereby emphasizing translational challenges at an organizational level.

Presentation Session 2

11:15 am – 12:30pm

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**Session 2A**

**Jaharis 118**

### **Nutrition-Related Mechanisms in Health and Disease**

**Faculty Moderator: Ligi Paul Pottenplackel**

*“High refined carbohydrate and high fat diets induced comparable hepatic tumorigenesis in male mice”*

*Blanche Ip, Tufts University, Friedman School, Biochemical and Molecular Nutrition*

*Co-authors: C Liu, DE Smith, LM Ausman, X Wang*

Previous studies demonstrated that diet-induced obese mice fed a semi-purified high fat diet (HFD) promoted greater liver tumorigenesis than mice fed a non-semi-purified diet. Since ingredients present in standard unpurified diets may elicit potential chemopreventative properties that are not present in semi-purified diets, the present study evaluated hepatic tumorigenic effects of dietary fat by replacing it with refined carbohydrates (digestible saccharides; high carbohydrate diet [HCD]) in a semi-purified diet without altering other components. Two-week-old C57Bl/6J male mice were randomly injected i.p. either with the liver-specific carcinogen diethylnitrosamine (25 mg/kg body weight) to induce liver cancer, or with saline as the non-tumor control. At 6 weeks of age, mice with or without cancer initiation were further randomized to a HFD (26% and 60% energy from carbohydrates and fat, respectively) or a HCD (66% and 12% energy from carbohydrates and fat, respectively), and were fed ad-libitum for 24 weeks. Results showed that HCD-fed mice had a comparable degree of hepatic tumorigenesis (tumor number and volume) as HFD-fed mice, despite having significantly reduced body weights. HCD-feeding induced greater hepatic endoplasmic reticulum (ER) stress-mediated protein kinase RNA-activated like kinase (PERK) activation and oncogenic IL-6/signal transducer and activator of transcription 3 signaling than HFD-feeding. HCD-stimulated PERK signaling was associated with elevated expression of pro-survival markers in tumors, including induced protein kinase B activation, increased extracellular signal-regulated kinases 1/2 phosphorylation and elevated cyclin D1 protein expression. However, HCD-mediated PERK activation in tumors was also positively associated with markers of pro-apoptosis, which included elevated CCAAT/enhancer-binding protein homology protein expression, and increased cleaved caspase-3. HCD-fed mice had greater severity in hepatic steatosis than HFD-fed mice. HCD-induced steatosis exacerbation was associated with increased expression in hepatic de novo lipogenic markers that can promote ER stress. Taken together, these data indicated that chronic HCD consumption can produce comparable severity of hepatic tumorigenesis as HFD, potentially through up-regulating PERK-mediated ER stress.



*“Where did all the B6 go? The possible function of Vitamin B6 in mechanisms of inflammation”*

*Christina Reginaldo, Tufts University, Friedman School, Nutritional Epidemiology*

Evidence suggests that vitamin B6 may play an important part in immune tolerance. Previous studies have observed an inverse association between circulating pyridoxal 5'-phosphate (PLP), which is the coenzyme form of vitamin B6, and inflammatory state. Furthermore, PLP is required for many reactions in the degradation of tryptophan into kynurenines, which are known to modulate immune cell functions and inflammatory response. To date, there have been no studies to determine if the relationship between PLP and inflammation could be explained at least in part due to PLP's role in the production of kynurenines.

This project was designed to investigate the association between PLP, kynurenines, and inflammation in three ways using a top down approach: 1) by using observational data to characterize the association between PLP, prevalent CVD, and kynurenines using data from the Framingham Heart Study, Offspring Cohort; 2) to determine the association between concentrations of inflammatory markers, plasma PLP levels, depression and cognitive decline in a secondary analysis of the Nutrition and Memory in Elders Study; and 3) experimentally by examining tissue specific differences in PLP, kynurenines, and inflammatory marker concentrations in heart tissues and blood samples from a porcine model of CVD with and without statin medication.

Preliminary results from Aim 1 are presented. PLP is inversely associated with CVD prevalence. The association between anthranilic acid, one of the immunomodulatory intermediates in the kynurenine pathway, and CVD is modified by PLP status.

Data collected to date suggest that the inverse association between PLP and inflammation previously observed may be due to the role of PLP in the production of immunomodulatory kynurenines. These data may provide important points of intervention in future research concerning management of disease and treatment of inflammation.

*“Dynamic regulation of hepatic vitamin E secretion by the  $\alpha$ -tocopherol transfer protein”*

*Stacey Chung, Case Western Reserve University, Department of Nutrition*

*Co-authors: V Thakur, J Atkinson, R Parker, D Manor*

Vitamin E, a plant-derived neutral lipid, is an essential nutrient for all vertebrates that scavenges free radicals in biological membranes, thereby preventing oxidative stress. Of the eight naturally-occurring forms of vitamin E,  $\alpha$ -tocopherol is the most biologically active. This discrimination is achieved by the selective retention of  $\alpha$ -tocopherol by the hepatic  $\alpha$ -tocopherol transfer protein ( $\alpha$ -TTP), and by the selective degradation of other vitamin E isoforms by the hepatic cytochrome P450 CYP4F2. In hepatocytes,  $\alpha$ -TTP facilitates the secretion of  $\alpha$ -tocopherol to the circulation for uptake by extrahepatic target tissues.  $\alpha$ -TTP has also been shown to bind to phosphatidylinositol phosphates *in vitro*, which may constitute a mechanism for regulation of the protein's activity. We aim to understand how the actions of  $\alpha$ -TTP are regulated *in vivo*. Specifically, we study how  $\alpha$ -tocopherol status affects the intracellular localization of  $\alpha$ -TTP, and whether phosphorylation of tyrosines in  $\alpha$ -TTP affects its activity. Using live-cell fluorescence imaging, we found that localization of  $\alpha$ -TTP in hepatocytes is dynamic: in the absence of  $\alpha$ -tocopherol, the protein is found in a punctate perinuclear pattern, but upon addition of vitamin E, the protein redistributes to a diffuse cytosolic pattern. In addition, we found that tyrosine residue(s) of  $\alpha$ -TTP are phosphorylated, and that this modification is necessary for  $\alpha$ -TTP's activity. These findings suggest that trans-localization and tyrosine phosphorylation of  $\alpha$ -TTP are regulated under physiological conditions. Thus, dynamic and homeostatic mechanisms regulate the body-wide distribution of  $\alpha$ -tocopherol.

**Interventions in Food Security and Diet Quality**

**Faculty Moderator: Assistant Professor Jennifer Coates**

*"Is cooking at home associated with better diet quality or weight loss intention?"*

*Julia Wolfson, Johns Hopkins, Bloomberg School of Public Health*

*Co-author: S Bleich*

*Objective:* To examine national patterns in cooking frequency and diet quality among adults in the USA, overall and by weight loss intention.

*Design:* Analysis of cross-sectional 24-hour dietary recall data. Diet quality measures included total calories/day, grams of fat, sugar and carbohydrates/day, fast food meals/week, and frozen and ready to eat meals consumed in the past 30 days. Multivariable regression analysis was used to test for associations between frequency of cooking dinner/week (low (0-1), medium (2-5) and high (6-7)) and these dietary outcomes.

*Setting:* The 2007-2010 National Health and Nutrition Examination Survey.

*Subjects:* Adults aged 20 years and over (N=9,569).

*Results:* In 2007-2010, 8% of adults cooked dinner 0-1 times/week and consumed, on an average day, 2301 total calories, 84 grams of fat, 135 grams of sugar. Overall, compared to low cookers (0-1 times/week), a high frequency of cooking dinner (6-7 times/week) was associated with lower consumption of daily calories, (2164 kcal vs. 2301 kcal,  $p=0.002$ ), carbohydrates 262 grams vs. 284 grams,  $p<0.001$ ), fat (81 grams vs. 86 grams,  $p=0.016$ ), and sugar (119 grams vs. 135 grams,  $p<0.001$ ). Individuals trying to lose weight consumed fewer calories than those not trying to lose weight, regardless of cooking frequency (2111 kcal vs. 2281 kcal,  $p<0.006$ ).

*Conclusions:* Adults who frequently cook dinner at home consume a healthier diet whether or not they are trying to lose weight. Strategies are needed to both enable and encourage more cooking among the general population and help infrequent cookers better navigate the food environment outside the home.

*"Home visits with mobile apps increase family members' support for maternal and child nutrition in India"*

*Nisha Mohamed, Tufts University, Friedman School, Food Policy and Applied Nutrition*

*Co-authors: N Lesh, L Findlater*

One of the goals of mobile health (mHealth) is to create behavior change among beneficiaries. This includes promoting recommended maternal health behaviors, such as ensuring that pregnant mothers adhere to proper nutritional standards along with their children. In places like India, it is common for pregnant women's family members to have more influence in making maternal and newborn health-related decisions than the pregnant women themselves. Thus, family pressure is an important determinant in food choice and adherence to proper nutrition behavior. Thus, a successful home visit would empower a pregnant woman to access the care from the counseling that is offered, and would likely engage other family members.

We hypothesize that CommCare increases the number of family members— specifically mothers-in-law and husbands— present during ASHAs' home visits. CommCare is a mobile platform designed to support community health workers globally in gathering and distributing information. It contains multimedia features, including audio and images, to aid in counseling on health information.

To assess this statement's validity, quantitative and qualitative research methods were used, including phone calls, in person unstructured interviews, and informal observations. ASHAs in the CommCare group reported higher attendance during visits than those in the non-CommCare group. The fixed factor of CC vs. NCC was statistically significant: number of attendees ( $F_{1,260} = 12.11, p = .001$ ) and visit duration ( $F_{1,260} = 12.35, p = .001$ ). The results also showed that the husband, sister-in-law, and mother-in-law were significantly more likely to attend the sessions with CommCare. Qualitative interviews confirmed this and mothers-in-law and husbands' respective roles in making health-related decisions.

This research demonstrates the value of ICT systems in helping to engage decision makers in the family. Specifically, the data show that key decision makers in the family are more likely to participate in counseling sessions when CommCare is used. These family members end up being a powerful social force that can positively or negatively affect nutrition interventions. This gives a pathway to engage key decision makers and ultimately, allow beneficiaries to access care.

*"Linking Agriculture and Health: A cross-sectoral approach to measure and improve nutrition and food security in Southern Ethiopia"*

*Tobias Lunt, University of Wisconsin Madison, Agroecology and Plant Pathology*

*Co-authors: F Mariama, J Wellington, S Steffen, B Heidi*

Agriculture and health influence each other in many ways. How a society produces, distributes, consumes, and disposes of food impacts the nutrition of individuals and whole communities, and can either enhance or impede environmental, economic, and social well-being and food security. Moreover, food security is essential for robust local and regional economies, political stability, effective education, and a resilient environment. Consequently, measuring food security and understanding its influencing factors are important tasks for stakeholders across a variety of important sectors.

This presentation will summarize the prevalence of household food insecurity among 5 woredas (zones) from the Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia, and evaluate the potential predictive factors specific to this region. Since 2012, the International Potato Center (CIP) has worked with stakeholders from agriculture, nutrition and health in the SNNPR to improve nutrition and food security for smallholder farmers and their households by improving the production and consumption of potato and orange-fleshed sweet potato (OFSP) as part of nutritious, diversified diets. Data were taken from baseline surveys conducted in 150 SNNPR households. The surveys were conducted in April-May 2013 with heads of households by trained Ethiopian enumerators. Survey data were analyzed to assess what variables may predict food insecurity. Ten predictive factors were compared against responses from mild and severe food insecure households to assess their ability to serve as accurate and significant variables. Consistent with extant literature, wealth indicators and education strongly predict food security levels, while other traditionally important variables such as family size and technical assistance did not have statistically significant association. Understanding predictive associations, and consideration of cross-sectoral relationships, can inform the design of integrated agriculture and nutrition programs and policies – a necessary component of simultaneously strengthening community health and agricultural outcomes, while concurrently protecting environmental resources.

Presentation Session 3

2:00 pm – 3:15pm

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**Session 3A**

**Jaharis 118**

## **From the Ground to the Plate: Current Issues in International Agriculture and Food Safety**

**Faculty Moderator: Professor Bea Rogers**

*“They say that wealth in the soil’: Local Knowledge and Agricultural Experimentation in Malawi”*

*Michele Hockett, Michigan State University, Community Sustainability*

For smallholders in central Malawi, farm management is complex and dynamic. The decisions made by a farmer in any given season are determined by a range of factors including resource availability, environmental changes, farm conditions, and farmer priorities. Moreover, management decisions are often influenced by a combination of local knowledge, traditional practice, and expert recommendations. Although local knowledge is developed over centuries of experimentation with and adaptation to changing agro-ecological systems, it is not well documented in literature and underutilized in agricultural development projects.

This study aimed to: (1) identify innovative, smallholder Malawian farmers who are experimenting with new crops and technologies (“folk” experimentation); (2) draw distinctions between methods used in folk experiments; and, (3) explore the motivations that drive farmers to experiment independently. The study used a multi-sequence, mixed methods design that incorporated field observations, survey data, and in-depth interviews, where the quantitative and qualitative threads had several points of interface, including: at the design level, during data collection, and during the interpretation of results.

This study found that Malawian farmers across a range of socio-economic characteristics are inclined to experiment, and therefore neither farmers nor farm systems can be easily categorized into an experimentation typology. Commonalities do exist, however, in the methods used by farmers in their experiments, such as small experimental plots and the repetition of unsuccessful experiments. Additionally, smallholders experiment for similar reasons, such as food production, household nutrition, and crop intensification. These commonalities should be incorporated into agricultural development projects in order to boost smallholder agricultural production, increase household nutrition, and preserve traditional agricultural practices.

*“Agro-ecosystems of Northern Malawi: Crop diversity and agricultural intensification”*  
*Valerie Ota, Tufts University, Friedman School, Food Policy & Applied Nutrition*

In sub-Saharan Africa where food insecurity persists and smallholder farmers are a population majority, intensifying agriculture is commonly considered an engine for economic growth and a sign of progress. Many governments and extension agencies promote hybrid seeds and intensive use of fertilizer to produce cash crops for export. Recently, spurred by the threat of an increasingly unstable climate, new pathways of intensification are gaining traction, as evidenced by farmer adoption of cropping strategies. In Malawi, experimental cropping practices include agroforestry and intercropped legumes.

In 2010 a baseline survey was conducted in 5 villages in northern Malawi, as part of a longitudinal study and a larger participatory-action research initiative. Surveys were administered to 198 smallholder farms to evaluate farmer decision-making regarding cropping choices, and on-farm management practices, including synthetic input use and intercropping practices. This presentation will focus on the statistical analysis and results of the survey, as well as draw upon qualitative data from farmer feedback meetings conducted in 2013. Results indicate that fertilizer use varies between crop type, with cash crops, maize and tobacco, as main drivers for intensive application. Interestingly, many farmers pursue intercropping strategies, and these practices coincide with

intensive use of fertilizer. Cropping patterns varied between villages, and during farmer feedback meetings, farmers indicated climate and proximity to extension offices as reasons for these differences. In conclusion, regardless of synthetic input use, smallholder farmers pursue a variety of polyculture practices, thus highlighting the importance of crop diversity.

This study explores farmer preference for mixed and intercropped farming systems and that increasingly include food legumes of diverse growth habits, from annuals to semi-perennials. Pursuing supportive policies would provide a sustainable pathway for development, one that addresses the multiple ecosystem service requirements for local food, cultural needs and environmental sustainability.

*“Harmonization of sanitary and phytosanitary measures through the WTO”*

*Monique Marez, New York University, Food Studies*

The World Trade Organization (WTO) developed an Agreement on the Application of Sanitary and Phytosanitary Measures (SPS agreement) across its member and observer countries in 1995. A chief aim of this agreement is to harmonize rules and regulations relating to human, animal, and plant health and the impact those rules have on commercial trade activities of WTO member countries. The goal of the SPS agreement is to prevent disingenuous regulations that cite public health concerns which are actually intended to negatively impact free trade. This long-term harmonization project poses major concerns. First, harmonization itself presents an irony in application and adoption related to increasing public safety. Next, the convergence of food safety standards on a global scale limits the rights of sovereign nations to protect and promote consumer-citizen interests. Finally the standard setting boards and dispute resolution system endorsed and established by the WTO disproportionately impact developing countries. In short, harmonization of SPS rules is asymmetric and affords wealthier nations the ability to shape and institutionalize a global governance structure that may reduce overall food safety and food sovereignty. This presentation will briefly outline the structure of the WTO SPS agreement and dissect the article on harmonization. Next, critiques of the harmonization project and the current networks supporting this system are presented. Then, disputes filed under violations of the SPS agreement, specifically citing violations to the principles of harmonization are discussed. Results from a survey administered by the WTO to developing country member on SPS are reviewed. This topic is of critical importance to understanding how international trading, especially in agriculture, can impact a country's ability to achieve economic, social, and political security.

**Session 3B**

**Behrakis Auditorium**

**Retail, Food Access, and Sugar-Sweetened Beverages: Current Topics in Nutrition Policy**

**Faculty Moderator: Associate Professor Parke Wilde**

*“Expanding food purchasing resources in low-income communities: a framework for policy-making based on shoppers' perspectives”*

*Drew Zachary, Brandeis University, Heller School for Social Policy and Management, Social Policy*

*Co-author: P Surkan*

*Background:* Diet-related illness and obesity disproportionately affect low-income, African American communities, which often have limited access to affordable healthy foods. Studies have

documented environmental and economic factors that lead to unhealthy diets. We examined the inter-relationships among these factors in order to develop effective coordinated policies to facilitate healthy food purchasing in low-income urban communities in the United States. By using assets theory, this analysis builds on existing frameworks for developing policy to promote healthy eating, by focusing on the perspectives of low-income community residents, their constraints, and how they use resources in their environments to make decisions about food purchasing.

*Methods:* We reviewed the existing literature on how qualities of the food environment influence food purchasing in low-income communities, in order to develop policy recommendations. We applied assets theory to identify key food-purchasing resources used by shoppers in the study community.

*Results:* Common individual-level resources were the amount and schedule of household food budgets, personal transportation options, and financial assistance for healthy food purchasing. Community-level resources were the location and number of stores, availability of public transportation, and selection of food at accessible stores. Task-environment resources were store layout and product placement, in-store advertising and shelf labeling, and the quality of food at accessible stores. Together, these factors influenced the perceived value of healthy and unhealthy products and led to infrequent shopping and purchasing of less healthy items.

*Conclusion and Implications:* Policy strategies that increase healthy food purchasing in low-income communities will be most effective if they are informed by the perspectives of residents of those communities. Policies should aim to increase individual and community-level food purchasing resources and create task environments geared toward healthy purchasing.

*“Consumer and retail perspectives of food access on the Navajo Nation”*

*Emily Piltch; Tufts University; Friedman School; Agriculture, Food, and the Environment*

*Co-author: J Van Wassenhove*

The Navajo Nation, in the rural and arid southwest US, has about 200,000 members living on 27,000 square miles. Some Navajo experience living conditions similar to those of developing countries: over half of residents live below the poverty line, 42% are unemployed and many lack electricity and running water. These dimensions contribute to general poor diet quality and extraordinarily high rates of overweight, obesity and chronic disease. This presentation will highlight two assessments of food access on the Navajo Nation that are contributing to the knowledge base on how to progress with appropriate food access programs, projects and policies. The first assessment engaged local Community Health Representatives who documented community members' assets and challenges obtaining healthy food. Results from the 230 surveys emphasized that obtaining food is a considerable challenge: half of respondents travel more than one hour to shop and about two-thirds feel that healthy food is generally unaffordable: they utilize a variety of coping strategies to compensate. Although only about 20% have grown some of their food, there is interest in reestablishing this Native tradition. The second project was a collaboration between the Navajo Division of Health and the Centers for Disease Control and Prevention using a modified Nutrition Environment Measurement Survey (NEMS) to document availability, affordability and promotion of healthy foods at grocery and convenience stores on and boarding the reservation. Among the 80 stores assessed, pertinent results include: healthier food items are limited at Navajo convenience stores and those items tend to be more expensive per unit than less healthy options. A store managers survey was also conducted to gauge supports and barriers to supplying healthy food. Project results will be shared as will implications for next steps.

*“Sugar-sweetened beverage intake and fatty liver in the Framingham Offspring Study”*

*Jiantao Ma, Tufts University, Friedman School, Nutritional Epidemiology*

*Co-authors: C Fox, E Speliotes, U Hoffman, C Smith, E Saltzman, P Jacques, N McKeown*

Nonalcoholic fatty liver disease (NAFLD) affects 20-30% of US adults, yet its underlying cause is unknown. Excess intake of sugar-sweetened beverages (SSB), the largest source of added sugar intake in the American diet, is a potential risk factor for NAFLD. We examined the cross-sectional association between SSB intake and fatty liver in members of the Framingham Offspring cohort (n=1,061; 57% women; mean age 59 y). Liver fat was measured using CT scan, and fatty liver was defined as a liver to phantom ratio <0.33. Cumulative intakes of SSB and diet soda were estimated from FFQ collected at 3 exam cycles over 7 years. Participants were defined as SSB non-consumers or consumers (3 categories: 1 drink/mo to <1 drink/wk, 1 drink/wk to < 1 drink/d, and ≥1 drink/d). Participants were also categorized into 4 groups according to diet soda intake as described above. Covariates examined included age, sex, BMI, smoking status, energy intake, alcohol intake, dietary fiber, total fat, and fruit and vegetable intake. After multivariate adjustment, 14.3% (95%CI: 9.1, 19.5%) of non-SSB consumers and 26.9% (95%CI: 19.5, 34.2%) of daily SSB consumers had fatty liver, P for trend =0.02. No significant association was observed between diet soda intake and fatty liver. In this study sample, daily SSB consumers had nearly 2 fold higher prevalence of fatty liver compared to non-SSB consumers. Our observational data provide further evidence to support the association between daily SSB consumption and increased cardiometabolic risk.

Poster Presentation Session

1:00 pm – 2:00 pm

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*“Effects of chicory caffeoylquinic acids and metabolites on hepatic glucose metabolism”*

*Kimberly Palatini, North Carolina State University, Food, Processing, and Nutritional Sciences*

*Co-authors: D Esposito, T Rathinasabapathy, S Komarnytsky*

Chicory (*Cichorium intybus* L.) is a perennial herb commonly consumed as a vegetable, while the ground and roasted roots are sometimes blended as a coffee substitute. Chicory root contains large amounts of the complex carbohydrate, inulin, which improves postprandial glucose response, along with a natural library of mono- and di-caffeoylquinic acids that suppress hepatic glucose production. In this study, we compared 3 dicaffeoylquinic acids (1,5; 3,4; and 3,5 DCQAs), with monocaffeoylquinic acid (3-chlorogenic acid, 3CQA), and metabolic breakdown products (caffeic, furulic, sinapic, and quinic acids); assessing their ability to modulate glucose metabolism in H4IIE hepatocyte cell culture. 1,5DCQA was the most effective at inhibiting glucose production and gene expression of gluconeogenic enzymes, G6P and PEPCK, in a dose-dependent manner. This activity was also observed in 3CQA and caffeic acid, confirming the putative role of DCQA metabolites in regulating hepatic glucose metabolism. Further analysis suggested the activation of PI3K and MAPK pathways as a method of controlling gene expression. These results strengthen the case for the future development of novel functional ingredients from chicory roots that will combine inulin with DCQA's to achieve improved control over hyperglycemia and other diabetes risk factors.

*“It's just so much waste’: A qualitative investigation of food wastage in a universal free School Breakfast program”*

*Stacy Blondin, Tufts University, Friedman School, Food Policy and Applied Nutrition*

*Co-authors: C Economos, S Anzman-Frasca, H Djang*

Objective: To understand stakeholders' perspectives on food wastage in a universal free School Breakfast Program implementing a Breakfast in the Classroom model.

**Design:** Semi-structured focus groups and interviews were conducted with school district stakeholders. Inductive methods were used to code resulting transcripts, from which themes were identified. This analysis provides a thematic analysis of stakeholder's perspectives on food wastage in the Program.

**Setting:** 10 elementary schools in a large urban US school district implementing a universal free Breakfast in the Classroom model of the School Breakfast Program.

**Subjects:** Elementary school students (n=85), parents (n=86), teachers (n=44), cafeteria managers (n=10) and school principals (n=10).

**Results:** Stakeholders perceived food waste as a problem and expressed concern regarding the amount of food wasted. Reported explanations for food waste included food-related (palatability and accessibility), child-related (taste preferences and satiation), and program-related (duration, reimbursement rules, and coordination) factors. Milk and fruit were perceived as foods particularly susceptible to wastage. Several food waste mitigation strategies were identified by participants: saving food for later, actively encouraging children's consumption, assisting children with foods during mealtime, increased staff support, serving smaller portion sizes, and composting and donating uneaten food.

**Conclusions:** Stakeholders recognize food waste as a problem, report myriad contributing factors, and have considered and employed multiple and diverse mitigation strategies. Changes to the menu and/or program logistics, as well as efforts to use leftover food productively, may be possible strategies of reducing waste and improving the Program's economic, environmental, nutritional impact.

*"Women's empowerment & child nutrition outcomes in Nepal: Evidence using nationally representative data from Nepal"*

*Valerie Ota, Tufts University, Friedman School, Food Policy and Applied Nutrition*

*Co-author: Winnie Bell*

This paper analyzes data from the 2011 Nepal Demographic and Health Survey in order to determine the relationship between women's empowerment and child nutritional outcomes in Nepal. More specifically, dimensions of women's empowerment are examined, including indicators that relate to decision-making power, mobility, and attitudes toward negotiating safe sex, as well as the age at marriage and the age differential. All models in the analysis control for maternal height, wealth, education, region and the age and sex of the child. Ultimately this analysis shows that while women's empowerment in Nepal correlates with improved dietary diversity for children, it is not associated with reduced odds of stunting for children under five. Furthermore the largest predictor of improving stunting is wealth status, while mothers with higher levels of education tend to have children with better dietary diversity. Though further research is needed, these preliminary findings translate into clear policy implications that relate to increased investments in income generating livelihoods and women's education.

*"The impact of supermarkets on contract farming in Malaysia"*

*Denise Chin, Tufts University, School of Arts and Sciences, Urban and Environmental Policy and Planning*

Rapid urbanization, growing incomes and changing diets have facilitated the growth of supermarkets in developing countries. As the second most urbanized country in the Southeast Asia, Malaysia led the pack in supermarket growth in the region. The role of agriculture, as "an engine of growth" was re-emphasized under the Ninth (2006-2010) and Tenth Malaysia Plans (2011-2015). Along with this, government programs incorporated supermarkets into contract farming to help



small- to medium-sized farmers improve livelihoods. The relationship between suppliers (farmers) and buyers (supermarkets) is mediated through the Federal Agricultural Marketing Authority (FAMA). In this supermarket-supplier relationship, an agreement on quantity and price is made with the intention of equally benefiting both parties, yet control is often shifted to supermarkets as a result of a new supermarket supply chain. This has consequently impacted national policy, displaying that the mechanism for increasing the role of agriculture as an engine of growth is influenced by the supermarket boom. The purpose of this study is to examine the impact of supermarkets on contract farming and its implications for relevant food and agricultural policies in Malaysia. Through an extensive literature review and interviews with FAMA and supermarkets with and without contract agreements, this project examines the influence of supermarkets on suppliers just as it brought changes to Malaysia's distributive trade, understanding the linkages to Malaysia's food system and relevant policies. It is worthwhile to understand the impact supermarkets have made on the food system, as their increasing numbers indicate their continuing dominance in distributive food retail. This study finds that contract farming is a useful effort to increase farmer incomes and involvement in the food chain, yet newer incentives are needed for greater involvement from Malaysian supermarkets, as farmers face tough competition from global sourcing and larger farms that respond better to supermarket demands.

*"Dietary restraint modulates food image processing: an ERP study"*  
Winnie Zhuang, Tufts University, School of Arts and Sciences

Previous studies have shown that dietary restraint may be associated with enhanced attention to food cues, but the neural correlates of this remain unclear. The present study investigated behavioral and event-related potential (ERP) responses to food cues in female restrained (RES, n=14) and unrestrained eaters (UR, n= 14). Participants performed a visual search task involving arrays of healthy food, unhealthy food, and neutral nonfood images with and without a categorically inconsistent target image (e.g. healthy food target in an array of neutral nonfood images). The task required participants to indicate the absence or presence of a target. Behavioral results showed that for both groups, target arrays with unhealthy distracters elicited longer reaction times and lower accuracy than those with healthy distracters. While we did not find an N2pc effect as typically seen in visual search paradigms, there was a late posterior positivity (LPP) effect, where amplitudes were greater for food arrays compared to nonfood arrays. Examining the LPP effect for each group revealed that only the RES group showed a LPP effect to food items compared to neutral items, whereas the UR group did not. In food appeal ratings, the RES group rated unhealthy foods as less appealing than healthy foods while UR showed the opposite pattern. These results suggest that the LPP reflects differential processing of food cues: the RES group processes images of food as more arousing or emotionally salient than the UR group. Thus, RES may allot more neurocognitive resources to process food images.

*"Quinoa popularity in international markets and the association on the nutritional status of indigenous children under-6 in the Bolivian Altiplano"*  
Jennifer Mendoza, George Washington University, Global Health

*Background:* In recent years, the news media has blamed the popularity of quinoa on consumer trends in international markets' on inadvertently leading Bolivians to alter their eating habits, as they can no longer afford this nutritious food. From 1990 to 2011, the national production of quinoa increased from 19,651 to 38,257mt. From 2000 to 2013, Bolivia's export of quinoa to the United States increased from an estimated 544 to 21,296mt—making it the largest importer of quinoa throughout the world. This issue opens a door for discussion concerning the Indigenous

People of the Bolivian Altiplano, who are the cultivators of quinoa, and the nutrition status of their indigenous children.

*Objective:* The aim of this case study is to review the impact of the increased production and exports of quinoa to international markets and the causality to household consumption and chronic malnutrition trends among children under-5 in quinoa-growing communities.

*Method:* Quinoa production and export data was compared against chronic malnutrition trends within the last twenty years nationally, and in the departments of Oruro and Potosí where quinoa is predominantly cultivated in Bolivia. Also, quinoa consumption was reviewed among producing households for casual and contextual factors to agriculture and chronic malnutrition.

*Results:* Preliminary findings revealed that while the production and exports of quinoa increased to international markets and decreased at the domestic level, the chronic malnutrition rate at the national level and within quinoa-growing communities decreased due to interventions implemented by the Malnutrition Zero program. By April of this year, summary of findings will be complete.

*Conclusion:* Current interventions implemented by the Malnutrition Zero program has been beneficial to control and lower malnutrition trends among children under-5 at the national level, and in quinoa-growing communities, but vague to conclude an association to the increase production and export of quinoa to international markets.

#### *“Access to Food Safety Net in Massachusetts”*

*Megan Lehnerd; Tufts University; Friedman School; Agriculture, Food, and Environment*

Since 2008, the rate of food insecurity in Massachusetts (MA) has grown by over 43%. Beyond a lack of financial resources, there is a complex network of factors that create disparities and barriers to accessing food, especially healthy food. Geographic information systems (GIS) analysis was used to explore the distribution of WIC and SNAP retailers and emergency food programs (i.e. food pantries and meal programs) in Massachusetts, with the intention of visualizing where gaps in the safety net might exist. Comparing this to the distribution of low income individuals throughout the state and the specific areas of low income/low access to supermarkets, the maps included offer a visualization of where there may be unmet food security needs in Massachusetts. Based on the analysis, there seem to be the largest deficits in western and central Massachusetts. The strongest concentrations of food safety net access points appear to be in areas more densely populated with low income residents, which would imply that many low income residents have adequate access to the food safety net in Massachusetts. These maps do not serve as a formal conclusion that an increase in food safety net access points is needed in the western and central Massachusetts. They do raise questions for further analysis, including how the total population distribution in MA and transportation access for food insecure and lower income families could relate to the ability of residents to access healthy, affordable food.

#### *“Relationship between diet quality perception and certain healthful and unhealthful dietary practices, and implications for public health messaging”*

*M.E. Malone, Tufts University, Friedman School and School of Medicine, Food Policy and Applied Nutrition and Public Health*

*Co-author: K Olender*

Most Americans do not meet federal recommendations for a healthy diet. Yet almost 75% of adults aged 20 and older viewed their diet as good, very good, or excellent, according to NHANES survey data from 2009-2010. The incongruence between consumption and diet perception is especially relevant to efforts to improve diets because perception is considered a determinant to behavior

change. And while multiple interventions and programs aim to help individuals make healthier food choices, few are informed by the role of diet perception. Still, public health messaging around healthy eating is complex and involves both encouraging healthful dietary behaviors and discouraging less healthful ones. This study seeks to identify which dietary behaviors are associated with positive and negative perceptions of individuals' diets. These associations will further determine if individuals' perceptions of their diet is consistent with public health messaging related to healthful and unhealthful diet behaviors. The frequency of engagement in six dietary behaviors, measured on a 5-point Likert scale, and their association with healthfulness of diet perception, measured as a binary variable, were examined using logistic regression. Respondents who regularly read Nutrition Facts panels, limited fast food intake, and had dark green vegetables available in their home most frequently were about 1.5 times as likely to have a positive perception of their diet compared with those who engage in those behaviors less frequently. Frequency of keeping fruit, soda, or salty snacks in the home was not strongly correlated with diet perception. This study affirms that some progress has been made linking a limited number of healthy behaviors, as well as the absence of less healthy behaviors, to a nutritious diet. With this and other research, the nutrition and public health communities can more effectively determine the messaging strategy based on associations between specific behavior and perception of dietary quality.

*"Family contributors to the development of obesity in Arab children: Reliability study"*

*Suzan Tami, Texas Tech University, Nutritional Sciences*

*Co-authors: D Reed, E Trejos, M Boylan, N Kolyesnikova, S Wang*

Family factors and parenting styles can be a major determinant of obesity risk in children. Several validated surveys and screening tools have been developed and used to identify family nutrition and physical activity behaviors that contribute to excessive weight in children. The Caregiver's Feeding Styles Questionnaire (CFSQ) and the Family Nutrition and Physical Activity Assessment (FNPA) have been used with Whites/ Caucasians, Hispanics, African Americans, and Asians. However, there is need for validated such surveys with the growing population of Arabs in the United States. To test the reliability of these surveys in Arab populations, 18 Arab mothers (35.17 ± 7.11 years, M ±SD) in Lubbock, Texas completed the surveys twice, with at least one-week interval between the two administrations. Reliability analysis for the 17-item scale (demandingness) and the 7-item scale (responsiveness) of the CFSQ were 0.95 and 0.86, respectively, suggesting strong internal reliability. Compared to other populations, Arab mother participants in this reliability study showed high demandingness (3.54) and low responsiveness (1.1). The items on the FNPA tool showed good internal reliability (alpha = 0.61). Overall, Arab mothers' responses to each item/question of the FNPA had good correlations for the two administrations. The estimated reliabilities (cronbach's alpha) of the CFSQ increased from 0.86 for the first administration to 0.95 for the second administration while the estimated reliabilities of the FNPA did not change (0.64) for both administration 1 and administration 2. Findings of this study suggested that the CFSQ and FNPA are valid and reliable to be used with Arab populations in future research.

*"Importance of traditional local varieties of Finger Millet Eleusine corocana (Poacea) for climate change adaptation: a case study in Anuradhapuraya, Sri Lanka"*

*Imesh Bandara, Brandeis University, Heller School for Social Policy and Management, Sustainable International Development*

*Co-authors: C Amarasinghe, T Gunathilaka*

An indigenous cultivation method of sowing combination of local Finger millet varieties with different physio-ecological characteristics has created food security resilience among some rural

communities in Anuradhapura, Sri Lanka, during unexpected local weather changes. Since ancient times, the staple diet of Sinhale (today Sri Lanka) was Kurahan (Finger millet). According to our study, some rural communities in Sri Lanka still consume Kurahan in two major meals, usually breakfast and lunch. We identified four traditional varieties of Kurahan with significant values for food security resilience of rural households. The growth and yield of these traditional varieties have an interrelation with local weather conditions, primarily temperature and precipitation. Therefore, traditional farmers select a combination of Kurahan varieties to sow that could provide a good harvest under unpredictable or extreme weather conditions. In this system, even under severe climatic conditions, a good yield can be obtained from at least one variety. Moreover, since maturation time varies among the four varieties, at least one harvest is protected if a sudden adverse climatic condition affects the area. Thus, this practice is an advantage for protecting at least a portion of the crop. Additionally, food security for poor farmers' households is maintained until the next season. This is an early adaptation practice of traditional farmers for creating food security and livelihood resilience and for overcoming unexpected weather conditions. Today, this practice has become rare, and regrettably, forces and trends of the modern market economy, agro-industry, and higher consumerism have changed most such traditional practices beyond recognition. However, we could employ these simple but productive and successful traditional techniques, incorporating modern technology, to ensure food security and for climate change adaptation.

*“Water for food: Assessing the feasibility of a household gardening nutrition intervention under water scarcity”*

*Megan Keegan; Tufts University; Friedman School; Agriculture, Food, and the Environment*

Food security is achieved “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life.” Household fruit and vegetable gardening is a nutrition intervention with potential to improve food security in Palestinian West Bank refugee camps, where rising poverty and unemployment drive significant food insecurity and food system vulnerability. The household gardening nutrition intervention has been successfully implemented in the urban Middle East and developing countries worldwide, but West Bank refugee camps face political and physical water scarcity. This preliminary study uses both social and agronomic research methods to determine extent of food insecurity and feasibility of harvested rainwater for irrigation of household gardens in West Bank refugee camps. Food security and dietary diversity were assessed using standardized survey methods for 40 households and a focus group was held to further investigate the issues of water scarcity and food insecurity. CROPWAT and CLIMWAT models were used to determine crop water requirements for a standard household garden under varying cropping patterns and the feasibility of rainwater harvesting and storage to fulfill these requirements. Out of the 40 homes surveyed, 36 (89%) were considered food insecure; dietary diversity varied greatly between families. Crop water requirements were low enough for the majority of crops to be satisfied by winter rainfall harvesting and storage for irrigation during planting season.

*“Impact evaluation of an at-scale handwashing behavior change intervention in Vietnam”*

*Winnie Bell, Tufts University, Friedman School and School of Medicine, Food Policy and Applied Nutrition and Public Health*

Handwashing with soap has been shown to be one of the most effective and inexpensive ways of saving children's lives by reducing the incidence of diarrhea. Yet rates of handwashing remain low throughout the world due to a combination of social and environmental barriers. Despite the omnipresent handwashing with soap campaigns in developing countries little is known about their

actual effectiveness, as few have been rigorously evaluated with econometric impact evaluations. This paper uses data collected by the World Bank from the “Global Scaling Up Handwashing Campaign” which sought to stimulate and sustain handwashing behavior with soap at critical junctures, such as after defecation and cleaning a child’s bottom, and before preparing food, eating and feeding children. The program targeted primary caretakers of children under five through interpersonal communication and a mass media campaign in over 3000 households in three provinces in Vietnam from 2010 through 2012. The preliminary evaluation by World Bank found that exposure to the handwashing campaign resulted in a slight increase in the availability of handwashing materials and that caregivers in the treatment group were more likely to report handwashing at critical junctures. This analysis takes the original impact evaluation one step further by researching heterogeneous impacts of the intervention across income quintiles and household vulnerability, as measured by the presence of having a stunted child in the household, in order to understand how the intervention had differential impacts on behavior change across various subsets of the population.

*“Engaging urban youth in sustainable agriculture: A case study of the Real Food Farm internship program”*

*Liana Przygocki, Tufts University, Friedman School, Food Policy and Applied Nutrition*

Urban farming and gardening programs provide a setting for nutrition and health education through hands-on learning, and are a promising strategy for increasing access to fresh produce. Sustaining the urban agriculture movement and increasing demand for healthy food requires local youth involvement. However, engaging urban youth and maintaining their long-term involvement can be difficult. Examining the high school internship program at Real Food Farm in Baltimore, Maryland provides an opportunity to identify successful youth engagement strategies.

This year-long case study followed a group of six interns, all high school students from low-income areas in Baltimore City, who began the program in the spring or fall of 2012. It consisted of observation, a participatory photography project, multiple in-depth interviews with each intern over the course of the program, and interviews with program staff.

Analysis of photos, field notes and interview transcripts using a framework informed by Self-Determination Theory suggests several ways that the internship engages participants by meeting their needs for relatedness, competence, and autonomy. Key strategies include providing interns with their own plots of land to cultivate, involving interns in teaching farm skills and meal preparation for volunteers, providing stipends and “job skills” feedback, and intentional teambuilding within the intern cohort.

Through program components that meet key adolescent psychological needs specified by Self-Determination Theory, the Real Food Farm internship program increases participants’ intrinsic motivation to participate in urban agriculture. Strategies described could increase the ability of other programs to effectively engage youth.

*“Urban farming in Boston: A survey of opportunities”*

*Valerie Oorthuys, Tufts University, School of Arts and Sciences, Urban and Environmental Policy and Planning*

The city of Boston has made strides to prioritize food issues, centering on the Boston Redevelopment Authority’s citywide urban agriculture rezoning initiative. Convened in spring 2013 by the Trust for Public Land (TPL), working closely with municipal officials, a team of graduate students from the Tufts Department of Urban and Environmental Policy and Planning (UEP) took on the task of demonstrating that the city of Boston offers vacant properties well-suited to urban

farming. The team developed a customized process for assessing urban farming potential, focusing on stakeholder input, accessible results and replicability. The goal was to provide a comprehensive, on-the-ground look at sites at which urban agriculture could take place, and to develop a framework for further assessment.

The team interviewed local urban farmers, urban farming advocates and planning professionals in order to develop a set of suitability criteria such as the availability of sunlight, the absence of trees, and favorable slope. Application of the criteria required a multi-stage filtration process done by conducting spatial analysis with ArcGIS, aerial verification of sites and “groundtruthing” – visiting sites in person.

This project demonstrated that farmable land is available in Boston. The team identified 717 acres of publicly owned vacant land that met the size criteria. Of these, at least 100 acres are considered suitable for farming. This knowledge has advanced urban agriculture initiatives in the city. The Trust for Public Land, in collaboration with municipal government, the Urban Farming Institute, and Dudley Neighbors, Inc., is working to acquire publicly owned vacant lots in historically underserved areas for conversion to urban farms. The Mayor’s Office of Food Initiatives has formed a cross-departmental committee using the UEP team’s data and analytic methods as the basis for site selection and the development of urban agriculture policies. The Massachusetts chapter of the American Planning Association awarded the Student Project Award to the team in December 2013.