

Proposal for Level 2 Funding

COVER PAGE

1. Title of Proposal and Name of PI:

Understanding the Impact of Online Food Advertisements and Emotions on Adolescents' Food Choices, Martina Vecchi

2. 3-5 Descriptive Keywords:

Online advertising, unhealthy food, emotions, adolescents, food choices, obesity

3. Abstract:

Worldwide, an estimated 124 million children and adolescents are affected by obesity (Abarca-Gómez et al., 2017). The new global health challenge posed by COVID-19 has caused prolonged periods of school closures, which have increased both sedentary behavior and screen time (Nagata et al., 2020). As a result, adolescents are exposed to pervasive food and beverage advertising and promotions (Kelly et al., 2015b; WHO, 2019). Prior work has shown that exposure to food advertising increases preferences, choice, purchasing behaviors, and laboratory intake for energy dense foods among youth (Cairns et al., 2013 Dahr et al., 2011; Sonntag et al., 2015; Boyland et al., 2016; Sadeghirad et al., 2016; Smith et al., 2019). We propose to study a topic that has not been examined in depth: the impact of online advertising on adolescents' food choices and how this impact is affected by emotions. Emotions influence both eating behavior (see Macht, 2008 for a review) and sensitivity to advertising (Bagozzi et al., 1999; Bronner et al., 2007; Goldberg and Gorn, 1987; Owolabi, 2009), and could be an important factor in determining adolescents' susceptibility to the negative effects of food advertising in promoting unhealthy food choices.

We have formed an inter-disciplinary team of investigators who combine expertise in the nutritional and psychological underpinnings of obesity, experimental design, and statistical data analysis. More specifically, our team has expertise in the environmental influences in food choices and experimental design (Fan, Nayga, Vecchi and Yang), assessment of individual differences in susceptibility to environmental food cues (Keller), and emotion measurement (Myruski). The results of this study would serve as proof of concept for a larger, externally funded proposal to (1) investigate the mechanisms underlying the impact of food advertising on adolescent food choice, consumption, and regulation of body weight, and (2) develop and test strategies to help adolescents achieve improved media literacy and emotional intelligence that will allow them to assess online advertising more objectively.

PROPOSAL

4. Specific Aims/Purpose:

Adolescence is a critical period for future health outcomes. Behaviors and food habits form during adolescence (Alberga et al., 2012; Blakemore et al., 2006) and track into adulthood (Bayer et al., 2011; Daniels et al., 2005; Nicklaus et al., 2004; Nicklaus et al., 2005).

Adolescents in the U.S. reportedly spent an average of 4 to 6 hours per day on digital media in 2016 (Twenge et al., 2019), with around 45% reporting that they used the internet “almost constantly” in 2018 (Anderson and Jiang, 2018). COVID-19 is forcing children and adolescents to spend even more time online (Nagata et al., 2020). As a result, the exposure to pervasive and unhealthy food and beverage advertising and promotions is likely to increase (Fleming-Milici and Harris, 2020; Kelly et al., 2015b; Sacks et al., 2020; WHO report, 2019; Zenith, 2020). *The effects of online food advertising on adolescents have not been investigated but could be of critical importance in determining their eating behaviors and risk for developing chronic conditions like obesity.* Prior work has shown that exposure to TV food advertising targeting youth increases preferences, choice, purchasing behaviors, and laboratory intake for energy dense foods (Dahr et al., 2011; Sonntag et al., 2015; Boyland et al., 2016; Sadeghirad et al., 2016; Smith et al., 2019). This has led to several regulatory measures to decrease food advertising targeting youth on TV (Galbraith-Emami and Lobstein, 2013). However, food companies are increasingly allocating their advertising budgets towards online and social media formats (e.g., Youtube, Instagram) (Cairns et al., 2013; Tatlow-Golden et al., 2016). Determining the effects of online food advertising on eating habits of adolescents is an understudied, yet critically important public health question (Tatlow-Golden et al., 2016; Qutteina et al., 2019; Zenith, 2020).

To advance the social science on this topic and address this public health problem, *we have assembled an inter-disciplinary team to assess the impact of online food advertising on adolescents’ food choices, and the mechanisms mediating this relationship. Notably, we are interested in whether positive or negative emotions exacerbate susceptibility to food advertising in adolescents.* Emotions and mood have been found to influence food preferences and intake, with negative emotions being associated with overeating and comfort eating especially in restrained eaters (Evers et al., 2018; Stice, 2001; Stice et al., 2005; Macht, 2008) and positive moods associated with a higher capacity to delay gratification and select healthier food items (Fedorikhin and Patrick, 2010; Garg et al., 2007; Garner et al., 2014). Moreover, emotions and mood have been shown to influence the content and the process of cognition, with positive mood leading to higher susceptibility to advertising (Bagozzi et al., 1999; Bronner et al., 2007; Goldberg and Gorn, 1987; Owolabi, 2009). Adolescence is a period of peak difficulties with impulse control, heightened sensitivity to reward, and large fluctuations in emotional states (e.g., Spear, 2011). Further, emotion regulation, or the ability to modulate the experience and expression of emotions, shows protracted development across adolescence (Gross, 1998; Zeman et al. 2006; Zimmermann & Iwanski, 2014). Thus, adolescents are particularly susceptible to shifts in emotional states and subsequent compensatory unhealthy behaviors (e.g., Somerville et al., 2010), and the link between emotions and food choices may depend on individual differences in emotion regulation.

While the impact of experimental emotion elicitation in adults has been examined in the literature (Gilman et al., 2017; Gross and Levenson 1995; Westerman et al., 1996), there are limited data showing whether similar methods of emotion induction will work in adolescents. Therefore, the first aim of this proposal will be to pilot methods of emotions inducement traditionally used in adults on a younger population to ensure they will evoke the emotions of interest in this proposal. Using the results of this pilot study, we will then gather preliminary data on the impact of online food advertising on food

choices and how emotions interact with the advertising effects, using a sample of 900 adolescents.

The ultimate goal is to use this pilot study as preliminary data and proof of concept to strengthen a proposal to NICHD or USDA to investigate the mechanisms underlying the impact of online food advertising on adolescent food choice, consumption, and regulation of body weight, and how emotions interact with these effects.

The following aims will be tested.

Aim 1- Emotion induction: Conduct an online experiment on 300 adolescents (13-17 years old) to identify the most effective way (i.e., film-clips) to induce positive, neutral, and negative emotions.

Aim 2 - Online food advertising and food choices: Conduct an online pilot experiment with 900 adolescents to study the impact of online food advertising on food choices, and the interaction with positive and negative emotions induced through the film-clips identified in Aim 1. *Hypothesis 2.1.* Online unhealthy food advertising increases the number of unhealthy food choices. *Hypothesis 2.2.* Emotions will influence food choices such that a greater number of unhealthy food choices will be made by adolescents if they have a negative induced affective state (particularly if they are restrained eaters). *Hypothesis 2.3.* Emotions will moderate the impact of online food advertising on food choice such that a greater number of unhealthy food choices will be made by adolescents if they have a positive induced affective state, since positive affective state increases susceptibility to advertising.

Exploratory aim 1 - Emotions and attention: Measure the effects of emotions on the attention to the food advertisement and on subsequent food choice.

Exploratory aim 2 – Emotion regulation and eating behavior: Measure the relationship between emotion regulation and unhealthy food choices subsequent to the emotion inducement procedure.

This research project would improve scientific knowledge on environmental influences on food selection and consumption. It will be the first to study the impact of food advertising on adolescents in an online environment. Moreover, it will be the first study investigating emotions as a possible moderator of this impact.

5. Significance:

Obesity is a significant global health challenge, affecting more than 124 million children and adolescents aged 5-19 years (Abarca-Gómez et al., 2017). Obesity not only poses risks of developing conditions such as diabetes, heart disease, cancer, and obesity in adulthood, but more recent evidence has shown its association with more severe complications from COVID-19 (Caci et al., 2020; Anderson et al., 2020; Hamer et al., 2020). Among the causes of obesity there is the imbalance between food intake and energy expenditure (Huang and Qi, 2015; Reedy and Krebs-Smith, 2010; Sahoo et al., 2015), incentivized by the exposure to palatable energy dense food (“unhealthy” food) in the obesogenic food environment (Harris et al., 2009, Morris et al., 2015). One of the factors contributing to creating an obesogenic environment is unhealthy food marketing, with 65 to 80% of foods marketed to youth considered “unhealthy” based on high quantity of added sugar, salt, and fat (Boyland et al., 2016; Clark et al., 2020; Dahr et al., 2011; Powell et al., 2011; Sadeghirad et al., 2016; Smith et al., 2019; Sonntag et al., 2015). With COVID-19 forcing children and adolescents to increase the screen-time and time spent online (Nagata

et al., 2020), and the large use of online advertising by food companies (Potvin Kent et al., 2019; Zenith, 2020), investigating the impact of online food advertising becomes of primary importance. This research project and the larger project we envision promise to advance scientific knowledge on environmental influences on food selection and consumption, allowing us to suggest policy interventions and address critical social and health problems in line with SSRI's mission and values.

6. Scientific Foundation:

In this proposal, we are interested in assessing the impact of online food advertising on adolescents' food choices, since adolescence is a period at high-risk of developing excess body weight (Alberga et al., 2012; Daniels et al., 2005) and given the significant increase in online advertising of unhealthy food targeting this age group. Moreover, adolescence is a period when autonomy over food choices increases (Neumark-Sztainer et al., 1999; Whitney and Rolfes, 2002) and eating habits formed in adolescent years could sustain for the rest of life and are hard to change later in adulthood (Bayer et al., 2011; Daniels et al., 2005; Nicklaus et al., 2004; Nicklaus et al., 2005). During adolescence, cognitive development is underway and cognitive control abilities have not fully matured. Susceptibility to external/social influences is high (Kelly et al., 2015a; Moses and Baldwin, 2005; van Dam and van Reijmersdal, 2019), making adolescents a good target of online advertising (Pechmann et al., 2005).

Folkvord et al. (2016) proposed a model to explain the impact of food advertising, the Reactivity to Embedded Food Cues in Advertising Model (REFCAM). The model proposes that exposure to the advertisement induces a physiological and psychological response that, over time, pairs with post ingestive positive sensations from the associated food. This, in turn increases the salience of the food advertisement itself. The strength of this relationship is influenced by differences in the environment and in individual susceptibility factors. We expect that emotions enter this model as an individual susceptibility factor, influencing susceptibility to food cues in advertisement. This susceptibility is of particular importance since adolescents experience a high degree of affective lability, greater intensity of negative emotions, accompanied by heightened difficulties with emotion regulation and impulse control (Somerville et al., 2010; Spear, 2011). The inability to sufficiently regulate emotions might induce adolescents to cope with aversive, intense, or changing emotional states by compensating with food (e.g., Rose et al., 2018). Moreover, emotion sensitivity might furthermore enhance susceptibility to food advertising, by influencing the level of attention and elaboration and/or salience of reward tied to food (Somerville et al., 2010). When adolescents use less cognitive elaboration to process the food cues embedded in the advertisement, it will have a stronger effect than when adolescents use more cognitive elaboration, since it is harder to defend against persuasion.

7. Description of Activities/Methods:

We propose two experimental studies.

7.1. Aim 1: Conduct an online experiment on 300 adolescents (13 - 17 years old) to identify the most effective film clips to induce positive, neutral, and negative emotions.

7.1.2. Study design: We will pilot 2 positive, 2 negative and 2 neutral 5-minute film clips with a sample of 300 adolescents in a between subject design. Each adolescent

will watch a single film clip and report her emotions before and after the clip, using the Positive and Negative Affect Schedule (PANAS) developed by Thompson (2007). The film clips piloted in this study will be selected amongst those validated in Gilman et al. (2017). We will select the three film clips inducing the most positive, most negative and most neutral average change in affective state.

7.1.3. Participants: 300 adolescents aged 13 to 17 years old will be recruited with the help of Qualtrics.

7.2. Aim 2: Conduct an online experiment with 900 adolescents to study the impact of online food advertising on food choices, and the interaction with positive and negative emotions induced through the film clips identified in Aim 1.

7.2.1. Study design: We will conduct an online survey experiment with 900 adolescents aged 13 to 17 years. We will employ a 3X2 between-subjects design where we will randomly assign participants to three alternative emotion conditions (negative, neutral, and positive) and whether they are exposed to either an unhealthy food or a non-food online advertisement. After the emotion inducement procedure and the advertisement, we will show participants pictures of 20 healthy and unhealthy food items of similar price and ask them to select 5 foods out of the 20 presented. We will incentivize participants to reveal truthful choices by informing them that we will draw 180 winners (20% of the sample), who will be mailed the 5 products chosen.

7.2.2. Procedure: Potential participants will be recruited via the Qualtrics platform. Data collection will also be conducted via Qualtrics. Co-I Myruski has experience using this and other online platforms with adolescent samples, including to obtain consent/assent from participants, collect survey data, and administer computerized tasks. Before initiating the survey, the legal parent or guardian will provide consent for their child to participate in the study and their home address, that we will use to mail the 5 foods selected to the 20% of randomly drawn participants. Following parent consent, adolescents will give their assent to participate before proceeding. At the beginning of the survey, adolescents will report their emotions using the PANAS and their hunger level. We will randomly assign adolescents to one of the three emotion conditions: positive, neutral and negative. Participants will be asked to carefully watch a 5-minute film-clip validated to elicit the targeted emotion (positive, neutral or negative) in Aim 1. At the end of the film-clip, participants will be randomly assigned to one of the two advertising conditions: food advertisement and non-food advertisement. Participants will watch a 30 second advertisement either on unhealthy food items or on a non-food item. We will then collect again participants' emotions using the PANAS and hunger level. Participants will then begin a food decision phase. Twenty food items of similar prices will be displayed on the screen in random order, to avoid order effects. We will present participants with both healthy and unhealthy options: among the 20 food items, 10 will be healthy (5 sweet and 5 salty) and 10 will be unhealthy (5 sweet and 5 salty). Participants will be asked to select the 5 items they would like to eat. They will also be informed that 20% of the respondents will be randomly drawn to receive their selected food items via mail. The food choice is incentivized to motivate participants to make choices representative of their actual preferences, allowing us to identify the impact of advertising on non-hypothetical food choices. Participants will then complete a questionnaire collecting several additional outcome measures that we will employ in the heterogeneous effect analysis.

7.2.3. Outcome measures: The main outcome measure will be the number of unhealthy foods selected in the food decision phase. Secondary outcome measures are the total calories (in kcal), sodium (in grams), saturated fat (in grams) and sugar content (in grams) of the selected food items.

7.2.4. Additional measures: *Positive and Negative Affect Schedule (PANAS).* To check whether our emotion manipulation was effective, we measure participants' emotions at different times throughout the survey experiment with the Positive and Negative Affect Schedule (PANAS) developed by Thompson (2007). Participants are asked to rate on a Visual Analog Scale the extent to which they feel in a particular way described by 10 emotions at the present moment. We will then compare reported emotions before and after the film clip.

The Dutch Eating Behavior Questionnaire (DEBQ). At the end of the survey, participants will fill out The Dutch Eating Behavior Questionnaire (DEBQ) developed by Van Strien et al., 1986. The DEBQ measures restrained eating (10 items), emotional eating (13 items), and external eating (10 items) on a Likert scale ranging from 1 to 5. DEBQ will allow us to analyze whether mood and online food advertising have a different impact on food choices depending on eating behavior.

Emotion Regulation Questionnaire (ERQ-CA). To measure individual differences in emotion regulation strategies we will use The Emotion Regulation Questionnaire (ERQ-CA) developed by Gullone and Taffe (2012). The questionnaire asks about emotions management methods on a Likert scale ranging from 1 to 5. We will analyze whether emotion regulation mediates the impact of emotions on food choices and on susceptibility to the advertisement.

Film-clips and advertisement recall questions. We will ask respondents several recall questions about the film clips to analyze whether attention mediates the effectiveness of the emotions inducement procedure and recall questions about the advertisement to analyze whether attention influences the susceptibility to the advertisement and whether emotions modify the attention to the advertisement. Other outcomes. We will ask respondents their familiarity with the food presented in the study, to control for familiarity in food choices, their knowledge of healthy food, information about their screen time and several demographic characteristics (age, gender, race, State and BMI).

7.2.5. Statistical approach: We will first conduct descriptive data analysis and assess balance of observable characteristics across treatments. To analyze the impact of online food advertising and the mediating effect of emotions on food choices, we will estimate models of the following form:

$$Y_i = \gamma_0 + \gamma_1 A_i + \gamma_2 N_i + \gamma_3 A_i N_i + \gamma_4 P_i + \gamma_5 A_i P_i + \varepsilon_i$$

where Y_i denotes the outcome measure for participant i . A_i is a dummy variable for the randomly assigned advertisement, taking value of 1 if the advertisement is an unhealthy food advertisement and 0 otherwise. N_i and P_i indicate whether participant i was assigned to watch the film-clip targeted to elicit the “negative” or “positive” emotion. ε_i is an idiosyncratic error term. We will estimate the model without and with a vector of observable characteristics (e.g., demographics etc.), and check for heterogeneity in treatment effects employing the variables described in section 7.2.5 such as eating behavior, emotion regulation and attention.

8. Future Potential:

This proposed study will provide pilot data proof of concept for a future National Institute of Health (NIH) grant application. Specifically, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) are the target NIH Institutes we have contacted and that have expressed interest in our research project. Investigators for the external funding will be the same team for this SSRI proposal and the time frame for NIH funding will be 2022-2027. The title for the external funding is “Online Advertisements, Emotions and Successful Strategies to Improve Healthy Eating among Adolescents”. The project for external funding will use the results from this proposal to analyze mechanisms underlying adolescents’ eating behavior, and test strategies that parents can use to help their offspring assess more objectively of online ads, improve media literacy and emotional intelligence. Furthermore, with the external funding, in-lab interventions and longitudinal data collection through ecological momentary assessment (EMA) will be used to analyze the effectiveness of different intervention strategies to improve emotional regulation and media literacy, and as a result to encourage healthy eating habits among adolescents and body weight regulation.

SUPPLEMENTAL INFORMATION

9. Timeline:

Aims/Tasks	6 months	12 months	18 months	24 months
Study Aim 1				
IRB approval	X			
Creation of the online survey	X			
Data Collection and Analysis	X	X		
Study Aim 2				
IRB approval		X	X	
Creation of the online survey		X	X	
Data Collection and Analysis			X	X
Grant preparation and submission				X

10. Please list all pending and awarded internally-funded pilot/seed grant projects on which you have been a PI or Co-I during the past 3 years.

Title of project: The impact of Covid-19 on consumers' attitudes towards local food and the environment

Your role (PI, Co-PI, Co-I, etc.): PI

PSU Funder: SAFES Impacts of COVID-19 on Agricultural, Food, and Environmental Systems grant

11. List SSRI Services to be Used:

None

12. Budget and Justification:

Agricultural Economics, Sociology and Education (Agricultural Sciences) / The Pennsylvania State University
 SSRI Level 2 funding
 Social Science Research Institute
 Project Dates: 06/01/2021 - 05/31/2023

	06/01/2021 - 05/31/2022	06/01/2022 - 05/31/2023	Total
Direct Costs			
Salaries (Category I)			
<u>Vecchi, Martina (Principal Investigator)</u>	0	0	0
<u>Fan, Linlin (Co-Investigator)</u>	0	0	0
<u>Keller, Kathleen Loralee (Co-Investigator)</u>	0	0	0
<u>Myruski, Sarah (Co-Investigator)</u>	0	0	0
Total Salaries	0	0	0
Wages (Category III)			
<u>Wages</u>	1,501	1,499	3,000
200 hours of undergraduate assistance @ \$15 per			
Total Wages	1,501	1,499	3,000
Total Salaries and Wages	1,501	1,499	3,000
Fringe			
<u>Category I @ 34.88%</u>	0	0	0
<u>Category III @ 7.94%</u>	120	120	240
Total Fringe	120	120	240
Total Salaries, Wages and Fringe	1,621	1,619	3,240
Modified Total Direct Costs			
<u>Participant Food Costs</u>	1,800	1,800	3,600
\$20 x 180 Participants			
<u>Qualtrics</u>	2,250	10,800	13,050
Study 1: \$7.5 x 300 Participants - Study 2: \$12 x 900 Participants			
Total Modified Total Direct Costs	5,671	14,219	19,890
Total Direct Costs	5,671	14,219	19,890
F&A Costs (MTDC basis)			
Total Requested From Sponsor	5,671	14,219	19,890
Total Project Costs	5,671	14,219	19,890

Proposal: 75603

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Budget Justification:

Aim 1: \$7.5 for 300 adolescents, to be paid to Qualtrics.

Aim 2: \$12 for 900 adolescents, to be paid to Qualtrics.

\$20 of food and delivery costs, for the 20% of the participants selected in Aim 2. Qualtrics will recruit participants for the study, manage parents' consent and the survey distribution.

200 hours of undergraduate assistance at \$15 per hours for data cleaning and for managing the food purchase and delivery.

Name and phone number of your department's budget coordinator: Jane Gardner, 814-865-5462

Budget and fund number: IO# 150000001223
Administrative area number: 2120710000

13. Investigator Information:

Principal Investigator:

Name: Martina Vecchi

Title: Assistant Professor

Department/Organization: Agricultural Economics, Sociology and Education
department

College/Campus: College of Agricultural Science / University Park

Phone: 814-863-7105

Email: mmv5343@psu.edu

Tenure Track: tenure track from the Agricultural Economics, Sociology and
Education department

Expertise related to this project: Dr. Vecchi has expertise in experiment
conceptualization and design and has conducted several laboratory and online studies on
food choices.

Collaborating Investigator(s):

Name: Linlin Fan

Title: Assistant Professor

Department/Organization: Agricultural Economics, Sociology and Education

College/Campus: College of Agricultural Science / University Park

Phone: 814-863-5575

Email: lpf5158@psu.edu

Tenure Track: Yes, Department of Agricultural Economics, Sociology and Education

Expertise related to this project: Dr. Fan has expertise with experimental design, data
analysis and results interpretation.

Role on this project: Co-PI

Name: Kathleen L. Keller, PhD

Title: Associate Professor

Department/Organization: Department of Nutritional Sciences / Department of Food
Science

College/Campus: Health and Human Development / University Park

Phone: 814-863-2915

Email: klk37@psu.edu

Tenure Track: Yes, tenured in Nutritional Sciences

Expertise related to this project: Dr. Keller has expertise in childhood and adolescent
nutrition and eating behavior.

Role on this project: Co-Investigator

Name: Sarah Myruski

Title: Assistant Research Professor
Department/Organization: Psychology
College/Campus: University Park
Phone: 860-977-0304
Email: sfm6016@psu.edu
Tenure Track: No

Expertise related to this project: Dr Myruski studies emotion regulation as a predictor of psychological adjustment throughout the lifespan.

Role on this project: Co-Investigator

Name: Rodolfo M. Nayga, Jr.
Title: Distinguished Professor and Tyson Endowed Chair
Department/Organization: Department of Agricultural Economics and Agribusiness
College/Campus: University of Arkansas
Phone: 479-575-2299
Email: Rnayga@uark.edu

Tenure Track: tenured, Department of Agricultural Economics and Agribusiness

Expertise related to this project: Dr. Nayga has expertise on food and health economics, on experimental conceptualization and design.

Role on this project: Co-Investigator

Name: Wei Yang

Title: Program associate

Department/Organization: Department of Agricultural Economics and Agribusiness, University of Arkansas

College/Campus: Dale Bumpers College of Agricultural, Food and Life Sciences/ University of Arkansas, Fayetteville Campus

Phone: 479- 575-2379

Email: wxy008@uark.edu

Tenure Track: No

Expertise related to this project: Mr. Yang has expertise on experimental design, development of survey of choice experiment, data analysis of choice experiment.

Role on this project: Co-Investigator

14. Pre-Submission Checklist:

1. Which agency or foundation officials (e.g., project officer) have you spoken with to determine their interest in this project or project area? What feedback did you receive on your concept and approach?

We have spoken with the Program Officer Voula Osganian at the National Institutes of Health, National Institutes of Diabetes and Digestive and Kidney Disorders (NIH/NIDDK) about this idea and line of research. She was interested about the line of work and also suggested that DK and other ICs, including

NICHD, NIMHD, CA, and HL, fund research on this topic. She also suggested to contact Layla Esposito, a program officer at the National Institute of Child Health and Development (NIH/NICHD), who confirmed this research would be appropriate for her program at NIH.

2. Are you responding to a specific request for proposal (RFP/RFA), program announcement, or other special funding initiative? If yes, which one and how is your Level 2 a good match for it?

No

3. Is this Level 2 being undertaken in response to feedback from a prior external proposal? If so, how does this project address reviewer concerns?

No, this is a new line of research and not a response to a prior external proposal

4. How does your study compare with projects in similar domains that have been funded by your targeted agency? In particular, how does the scope of your methodology appear similar to other funded projects (in terms of the size and representativeness of the sample, measurement strategies, design and planned analytic approach, etc.)?

Foundation search sites: NIH: <http://crisp.cit.nih.gov/>
NSF: <http://www.nsf.gov/awardsearch/>

This project is similar in terms of scope, design, analytic approach, and measurement to several ongoing areas of interest at the National Institute of Health. Several projects are related to effect of exposure to food advertisements on children eating. For example, Gilbert-Diamond et al. (2017) analyze the impact of television food advertisement exposure with 200 children aged 9-10 years old from a local community, to study the interaction of the food ad effect on consumption by Fat Mass and Obesity Associated Gene rs9939609. Emond et al. (2016a) also investigate the associations between children exposure to fast food advertisements and frequency of family visits to the restaurants, and a study by Emond et al. (2016b) explore the impact of food advertisements on preschoolers eating behavior in the absence of hunger. Most of the related proposals are interdisciplinary, focus on children and collect local samples of 150 – 350 participants. Our project differentiates by focusing on sample of adolescents that we will recruit across the U.S. using a panel company, and larger sample size will be obtained. Moreover, we will analyze the impact of food advertising online and introduce emotions as a possible mediator of the impact of food advertisement on choices.

5. What criteria will be used to evaluate your proposal and what do you know about the likely reviewers?

The criteria used to evaluate this proposal will be:

1) Significance – the positive effect this research will have on solving a health-related problem, 2) Innovation – a new and substantially different way of considering/addressing an important, public-health relevant problem that results in substantive departure from the status quo, 3) Approach – The research design, methods, rationale, and population for completing the study, 4) Environment – the research setting, and 5) Investigators – the strengths of the team established for conducting the study.

6. What input/advice/support have you received from your department head and/or college research dean?

We have discussed the idea with Department Head Laszlo Kulcsar Laszlo who is highly supportive of this project and line of research. A letter of support from Dr. Kulcsar is included.

15. Translational Research Potential (if applicable):

N/A

16. Letters of Support from All Collaborators:

Attached

17. NIH or NSF Biosketches:

Attached

References:

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College of Agricultural Sciences
The Pennsylvania State University
Armsby Building
University Park, PA 16802-5600

RE: SSRI Level 2 Grant Proposal

15 April 2021

Dear Professor Vecchi,

I am writing to express my strong support for the SSRI Level 2 grant proposal “Understanding the Impact of Online Food Advertisements and Emotions on Adolescents’ Food Choices” by Drs. Martina Vecchi and Linlin Fan at the Department of Agricultural Economics, Sociology, and Education, in collaboration with several colleagues at Penn State. The proposed project focuses on online food advertisements and their impact on adolescents’ food choices with a particular emphasis on the role of emotions. As we know, this age is uniquely important in consuming advertisements that shape food choices and preferences. Understanding how these preferences are formed and being manipulated by advertisements is crucial to assess their impact on health outcomes later in life, especially as those are grounded in emotional responses triggered by advertisements. The proposal is an experiment, serving as pilot data collection and proof of concept towards a larger grant, potentially funded by the NIH.

This project fits well with the department’s strategic initiatives along Agriculture and Food Systems, which focuses on scholarship as it both influences and reflects food choices and health outcomes and presents opportunities for entrepreneurial and innovative activities. The department is striving to become a center of excellence for scholarship on food, behavior, and health and this project is a natural fit to that goal. Drs. Vecchi and Fan are well prepared to carry out this project, and I support their proposal without any hesitation.

Sincerely,



László J. Kulcsár, Ph.D.
Professor of Rural Sociology and Demography
Head, Department of Agricultural Economics, Sociology, and Education
The Pennsylvania State University



Linlin Fan, PhD

Department of Agricultural Economics, Sociology and Education
Assistant Professor of Agricultural Economics

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April 11, 2021

Dr. Martina Vecchi
Department of Agricultural Economics, Sociology, and Education
The Pennsylvania State University
207A Armsby Building
University Park, PA 16802

Dear Dr. Vecchi,

I am writing to express my earnest support for the SSRI Level 2 grant proposal entitled *Understanding the Impact of Online Food Advertisements and Emotions on Adolescents' Food Choices*. The proposed project assesses the impact of online food advertisements on adolescents' food choices, and the mechanisms mediating the relationship. Interestingly, this study investigates whether positive or negative emotions exacerbate susceptibility to food advertisements in adolescents. Given that adolescence is a critical period in determining future health outcomes and the pervasive online ads exposed by adolescents, this proposal addresses a critical research question.

I am experienced in doing econometric analysis based on experimental data. My research has focused on healthy eating and obesity. I will contribute to the success of the proposed project based on my expertises.

I enthusiastically look forward to working on this important project.

Sincerely,

Linlin Fan, Ph.D.
Assistant Professor of Agricultural Economics



April 1st, 2021

Dear Martina,

The purpose of this letter is to express my enthusiastic support of your Level 2 proposal to the Social Science Research Institute entitled “Understanding the Impact of Online Food Advertisements and Emotions on Adolescents’ Food Choices” This proposal addresses a very timely public health challenge because over the past year, both screen time and poor eating behaviors have increased among children and adolescents. Adolescence is also a critical period for the development of obesity, making it essential to understand the impact of food advertising on food choices and dietary intake during this time. The proposed research from the inter-disciplinary team you have assembled will be the first in a line of studies to identify biobehavioral mechanisms that increase adolescent’s susceptibility to making poor dietary choices in response to food advertisements. The long-term goal is to use this research to identify potential modifiable targets for interventions to improve eating behavior and media literacy in this population.

As a co-investigator, I will contribute expertise, time, and support to helping you successfully bring this project to a completion. My expertise is in childhood nutrition, and more specifically, understanding the impact of the obesogenic food environment on the development of eating behaviors and obesity in youth. I will contribute insights that we have learned from our ongoing studies in children to help your team develop experimental protocols to test your research questions. I will also facilitate discussions with external funders, including the National Institutes of Health, to help you successfully position this project for future funding success. I will also contribute insights to data analysis, interpretation, and publication.

I look forward to being involved with this project. Best of luck!

Regards,

A handwritten signature in cursive script that reads 'Kathleen Keller'.

Kathleen L. Keller, PhD



Sarah Myruski, PhD
Department of Psychology
Assistant Research Professor of Psychology

The Pennsylvania State University
140 Bruce V. Moore Building
University Park, PA 16802

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March 29, 2021

Dr. Martina Vecchi
Department of Agricultural Economics, Sociology, and Education
The Pennsylvania State University
207A Armsby Building
University Park, PA 16802

Dear Dr. Vecchi,

I am writing with enthusiastic support for the SSRI Level 2 grant proposal entitled *Understanding the Impact of Online Food Advertisements and Emotions on Adolescents' Food Choices*. The proposed project addresses critical questions regarding links between online advertisement exposure and food choices, as well as the moderating role of affective state. This project is particularly relevant given the pervasive use of online digital technologies during adolescence, a key developmental period during which foundations for future self-regulation and food habits are forged.

I am experienced in the study of emotion regulation and psychological adjustment in youth as well as how digital technology (e.g., social media) use is associated with mental health. My recent work has focused on adolescents, including investigations of online behavior and cognitive and emotional functioning. I will leverage this expertise to contribute to the success of the proposed project.

I look forward to working with the team on this exciting project.

Sincerely,

Sarah Myruski, Ph.D.
Assistant Research Professor of Psychology

217 Agriculture Building, University of Arkansas, Fayetteville, AR 72701-1201
479-575-2256 • Fax 479-575-5306

March 25, 2021

Dr. Martina Vecchi
Department of Agricultural Economics, Sociology and Education
The Pennsylvania State University
207A Armsby Building
University Park, PA 16802

Dear Dr. Vecchi,

I am writing this letter to signify my commitment to actively participate as one of the co-PIs of our SSRI Level 2 proposal entitled, "Understanding the Impact of Online Food Advertisement on Adolescents' Food Choices".

This is an important topic given the significant increase in online advertisement of unhealthy foods targeting adolescents and the high childhood obesity rates in the country. Our other objective aiming to examine how emotions can mediate the online food advertising effects on adolescents' food choices is also an important research question given that emotions can also influence food preferences and intake.

Thank you.

Sincerely,



Rodolfo M. Nayga, Jr.
Distinguished Professor and Tyson Endowed Chair

217 Agriculture Building, University of Arkansas, Fayetteville, AR 72701-1201
479-575-2256 • Fax: 479-575-5306 • agribus.uark.edu

March 29, 2021

Dr. Martina Vecchi

Department of Agricultural Economics, Sociology and Education
The Pennsylvania State University
207 A Armsby Building
University Park, PA 16802

Dear Dr. Vecchi,

I am so excited to be a part of SSRI Level 2 proposal entitled, "Understanding the Impact of Online Food Advertisements and Emotions on Adolescents' Food Choices". This letter is to signify my commitment to participate and offer support as co-Investigator on this proposal.

I will offer my expertise in experimental design of food choice, development of experimental survey, and data analysis.

Sincerely,

Wei Yang

Wei Yang

Program associate
Department of Agricultural Economics and Agribusiness
University of Arkansas

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Linlin Fan

eRA COMMONS USER NAME (credential, e.g., agency login): lfan

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Renmin University of China	BS	07/2010	Trade Economics
University of Illinois at Urbana-Champaign	MS	08/2012	Agricultural Economics
University of Illinois at Urbana-Champaign	PhD	08/2018	Agricultural Economics

A. Personal Statement

I am actively building a research program at the intersection of food policy, health economics and international trade. My work utilizes large datasets such as household and store scanner data as well as household surveys. Using both structural and reduced-form econometric estimation methods along with experimental designs, my research seeks to understand how households and businesses are affected by various food policies, health interventions and international trade. The findings of my research have provided scientific insights relevant to current policy debates on food geography, diet quality and international trade. I am a PI for three ERS collaborative agreements that separately analyze the impact of Supplemental Nutrition Assistance Programs (SNAP) on diet quality, the interrelationships between when, where and what to buy by SNAP participants, and how COVID-19 affects the racial and income inequality in nutrition. I am also a co-PI of two large NIFA grants that investigate the cost/nutrition tradeoffs of low-income Americans, and assess the impact of time scarcity on heterogeneous households' food choices through both structural analysis and experimental studies. Some of the most important publications include:

- a. Fan, L., C. Gundersen, K. Baylis and M. Saksena. 2021. "The Use of Charitable Food Assistance Among Low-Income Households in the United States" *Journal of the Academy of Nutrition and Dietetics*, 121(1): 27-35.
- b. Mullin, G., L. Fan, S. Sulo and J. Partridge. 2019. "The Association between Oral Nutritional Supplements and 30-Day Hospital Readmissions of Malnourished Patients at a US Academic Medical Center" *Journal of the Academy of Nutrition and Dietetics*, 119(7):1168-1175.
- c. Baylis, K., L. Fan and L. Nogueira. 2019. "Agricultural Market Liberalization and Household Food Security in Rural China" *American Journal of Agricultural Economics*, 101(1): 250-269.
- d. Fan, L., K. Baylis, C. Gundersen and M. Ver Ploeg. 2018. "Does a Nutritious Diet Cost More in Food Deserts?" *Agricultural Economics*, 49(5): 587-597.

B. Positions and Honors**Positions**

2018-2019 Assistant Professor of Agricultural Economics, Mississippi State University

2019-present Assistant Professor of Agricultural Economics & Pennsylvania State University

Honors

- 2018 Outstanding PhD Dissertation Award, Dept. of ACE, University of Illinois
- 2017 Best Paper Award of Parenteral and Enteral Nutrition Society of Asia (PENSA) Annual Meeting
- 2012-2015 Henry Fellowship for PhD Students, University of Illinois
- 2014 Outstanding Second Year Paper Award, Dept. of ACE, University of Illinois
- 2013 Pass Ph.D. Core Examination with Distinction, Dept. of ACE, University of Illinois
- 2012 Outstanding Master Thesis Award, Dept. of ACE, University of Illinois

C. Contributions to Science

1. **Food Access and Food Choices.** My first area of research is focused on understanding the implications of food deserts, i.e. low-income communities with limited access to affordable and healthy foods. In a paper published in *Agricultural Economics* (2018), we find that food deserts have only a 3.5% higher food price index than non-food deserts. Demand factors are important in affecting store prices. This study suggests that policies aimed at improving access alone may not be effective and efforts to increasing consumers' purchasing power may be worthwhile to pursue. This paper has direct policy impact and is summarized and published in a policy brief report in the USDA *Amber Waves* and nominated as the best *Amber Waves* article in 2019. Recent publications include:
 - a. Fan, L., K. Baylis, C. Gundersen and M. Ver Ploeg. 2018. "Does a Nutritious Diet Cost More in Food Deserts?" *Agricultural Economics*, 49(5): 587-597.
2. **Diet Quality and Food Security.** My second area of research focuses on diet quality and food security. In a paper published in the *Journal of the Academy of Nutrition and Dietetics*, I find that Charitable Food Assistance (CFA) programs provide a substantial portion of the diets of their clients and, in particular, for foods that constitute components of healthy diets. This is of particular importance since the use of CFAs rise when the use of SNAP benefits decline. Following this work, I was recently awarded two USDA ERS cooperative agreements to study (1) the impact of public and private food assistance programs on the healthfulness of food choices; and (2) the inter-relationships between when, where and what to buy by SNAP participants. I have also won a \$500,000 grant from the National Institute of Food and Agriculture (NIFA) to analyze how the nutrition/cost tradeoffs influence food security and diet quality. Published papers include:
 - a. Fan, L., C. Gundersen, K. Baylis and M. Saksena. 2021. "The Use of Charitable Food Assistance Among Low-Income Households in the United States" *Journal of the Academy of Nutrition and Dietetics*, 121(1): 27-35.
3. **Malnutrition and Health Outcomes** Complementary with my research on government food policy, another area of research is evaluating the impact of malnutrition and malnutrition interventions by healthcare providers. This work has resulted in six publications including two papers winning the 1st and 4th place in the best paper competition out of over 200 papers worldwide from the 2017 Parenteral and Enteral Nutrition Society of Asia Annual Meeting (PENSA). In these papers, I demonstrate the negative functional, clinical and economic impact of malnutrition (*Journal of Ageing Research and Healthcare* 2017; *Chinese Health Economics* 2017; *Chinese Journal of Geriatrics* 2017; *Asia Pacific Journal of Public Health* 2018). Given the adverse health and economic outcomes of malnutrition, a natural question to ask is what we can do to better treat malnutrition. We find that screening every patient for malnutrition risk at hospital admission and prompt ordering of Oral Nutritional Supplements upon evidence of malnutrition risk reduces patients' hospital length of stay and decrease hospital readmissions (*Journal of Nursing Care Quality* 2019; *Journal of the Academy of Nutrition and Dietetics* 2019). Selected publications include:
 - a. Mullin, G., L. Fan, S. Sulo and J. Partridge. 2019. "The Association between Oral Nutritional Supplements and 30-Day Hospital Readmissions of Malnourished Patients at a US Academic Medical Center" *Journal of the Academy of Nutrition and Dietetics*, 119(7):1168-1175.

- b. Siegel, S., L. Fan, A. Goldman, J. Higgins, S. Goates, J. Partridge. 2019. "Impact of a Nutrition-Focused Quality Improvement Intervention on Hospital Length of Stay" *Journal of Nursing Care Quality*, 34(3): 203-209.
 - c. Zhang, Y., L. Fan, P. Chai, J. Partridge, L. Claytor, S. Li, S. Goates. 2017 "Analysis on the Impact of Malnutrition on Outpatient and Inpatient Costs among the Elderly in China" *Chinese Health Economics*, 36(12): 91-94.
 - d. Wei, J., L. Fan, Y. Zhang, J. Partridge, L. Claytor, S. Li, S. Sulo. 2017. "The Impact of Malnutrition on Health Outcomes and Healthcare Cost among Chinese Older Adults" *Chinese Journal of Geriatrics*, 36(8): 929-933.
4. **International Food Security and Trade.** Extending my work on food policy and health economics to an international context, I analyze how market liberalization affects household food security in rural China (*American Journal of Agricultural Economics* 2019). This study finds that while many rural households benefit from liberalization, some food insecure households producing import-competing products have lower food security as a result of agricultural market liberalization. Published work include:
- a. Baylis, K., L. Fan and L. Nogueira. 2019. "Agricultural Market Liberalization and Household Food Security in Rural China" *American Journal of Agricultural Economics*, 101(1): 250-269.

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

NIFA-AFRI-USDA

Jaenicke (PIs)

01/01/21 – 12/31/23

The overall objective of the proposed research is to investigate the behavior foundation of the role of time scarcity and food choices and to explore how particular mechanism, neoclassical or behavioral, may influence the effectiveness of potential food policies. We investigate the impact of time scarcity on heterogeneous households' food choices and the trade-off between time and healthfulness through reduced-form and structural analysis of consumer-level food-purchase data. Further, we identify and evaluate the effectiveness of policies aimed at improving the healthfulness of food choices under alternative behavioral mechanisms.

Role: Co-PI

Project Title: Investigating Mechanisms between Time Scarcity and Healthfulness of Food Choices – Evidence from Scanner Data and Lab Experiments.

NIFA-AFRI-USDA

Wilde (PI)

04/15/21-04/14/23

This study answers three critical questions that are central to understanding drivers of unhealthy eating for Americans with low income:

1. What are the food aspirations of consumers with low income, and are they similar to or different from those of consumers with higher income?,
2. What nutrition perspectives, motivations, or theories do consumers with low income use when making food decisions?, and
3. What economic and non-economic constraints prevent consumers from achieving their food aspirations?

Role: Co-PI

Project Title: From Scarcity to Prosperity: Nutrition and Food Spending Goals and Constraints for Low-Income Americans

This collaborative agreement pursues three aims:

1. To compare the acquisition of fruits, vegetables, grains, protein foods, dairy, snacks and sugar-sweetened beverages by SNAP, WIC, NSLP and SBP participation status of low-income households;
2. To compare the purchase patterns of fresh foods that needs cooking at home, vs. prepared foods such as frozen meals by SNAP, WIC, NSLP and SBP participation status of low-income households;
3. To analyze various public and private food assistance programs' contributions as a percentage of total household food acquisitions by low-income households. We will further decompose the importance of both public and private food assistance programs by demographics such as household size, number of children and income.

Role: PI

Project Title: The Food Assistance Programs Participation and Food Choices of Low-Income Households

To date, the location and timing of SNAP purchases have received a great deal of policy attention but analyses have suffered from the lack of joint analyses of the location, timing and types of food purchases by SNAP recipients. We use a novel and extant data set, the USDA's National Household Food Acquisition and Purchase Survey (FoodAPS) that have all three types of information to fill in the gap and shed new insights on the important policy discussions between food geography and the use of SNAP. Specifically, we study how food geography affects the location, timing and types of SNAP purchases.

Role: PI

Project Title: The Inter-relationships between When, Where and What to Buy by SNAP Households

Understanding the impact of SNAP on racial and income inequality in nutrition under COVID-19 is critical to designing effective anti-hunger programs. However, limited research analyzes this issue. The few existing studies on the impacts of COVID-19 on food spending often lack detailed analysis on how COVID-19 affects racial and income inequality. Therefore, this study have three specific three aims:

1. How does COVID-19 affect racial inequality in nutrition? For example, how does the impact of COVID-19 on purchases of healthy and unhealthy foods differ by race?
2. How does COVID-19 influence income inequality in nutrition? Specifically, how households from different income group respond differently to COVID-19, such as purchases of healthy vs. unhealthy foods and perishable vs. prepared foods?
3. What roles does SNAP play in changing the relationship between COVID-19 and income and racial inequality in nutrition?

Role: PI

Project Title: COVID-19, SNAP and Racial and Income Inequality in Nutrition

Recently Completed Research Support

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Keller, Kathleen L.

eRA COMMONS USER NAME (credential, e.g., agency login): KLKELLER

POSITION TITLE: Associate Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Marquette University, Milwaukee, WI	B.S.	05/1995	Biology
Rutgers University, New Brunswick, NJ	PhD	05/2002	Nutritional Sciences
New York Nutrition Obesity Research Center, New York, NY	Post-Doc	06/2005	Pediatric Obesity

A. Personal Statement: I have a doctorate in Nutritional Sciences from Rutgers University and I am presently an Associate Professor at The Pennsylvania State University with dual appointments in the Department(s) of Nutritional Sciences and Food Science. I am also co-funded by the Social Science Research Institute. I am the Director of the Metabolic Kitchen and Children's Eating Behavior Laboratory, a research facility dedicated to studying the neurobiological, behavioral, and biological mechanisms of eating behavior in youth. My research is focused on understanding individual differences in childhood eating behavior and the development of obesity. As part of my hire at Penn State in 2012, I began incorporating functional magnetic resonance imaging (fMRI) to delineate the neural contributions to pediatric eating behaviors and obesity. To date, our neuroimaging work has generated 13 peer-reviewed manuscripts and a 5-year R01 funded by the National Institutes of Health (1R01DK10060-01 – Brain Mechanisms of Overeating in Children). A second 5-year longitudinal cohort study will begin in May 2021 (R01DK126050_01 Characterizing Resilience to Food-cue Induced Overeating in Children). Our research studies combine techniques and principles from genetics, neuroscience, psychology, nutrition, physiology, cognitive development, and intervention science to answer complex questions about how the food environment impacts both risk and resilience to pediatric obesity. Given my interdisciplinary training and program of research, I will be able to contribute strengths to this research team in relationship to advertising exposure and the assessment of eating behavior.

- Kling SM, **Pearce AL**, Reynolds ML, Garavan H, Geier CF, Rolls BJ, Rose EJ, Wilson SJ, **Keller KL**. Development and pilot testing of standardized food images for studying eating behaviors in children. *Frontiers in Psychology: Eating Behavior*. 2020;21:1729. PMID: 32793062.
- **Keller KL**, Kling SM, Fuchs B, **Pearce AL**, Reigh NA, Masterson TD, Hickok K. A biopsychosocial model of sex differences in children's eating behaviors. *Nutrients*. 2019;11:DOI: 10.3390/nu11030682.
- **Pearce AL**, Adise S, Roberts NJ, White C, Geier CF, **Keller KL**. Individual differences in the influence of taste and health impact successful dietary self-control: A mouse tracking food choice study in children. *Physiology & Behavior*. 2020;223:112990.

B. Positions and Honors

- 2017-pres. NIH Study Section Member for Fellowship Applications ZDK1 GRB-7
- 2014 Norman Kretchmer Memorial Award for a substantial body of research in nutrition and development – given by the American Society for Nutritional Sciences
- 2014 Roy C. Buck Award in the College of Agricultural Sciences for the best research paper Published by a non-tenured faculty member in 2013
- 2013 Mark T. Greenberg Early Career Professorship in Children’s Health and Development
- 2010 NIH Funded Training Fellowship in Clinical Nutrition
- 2007 Science Unbound Foundation, Best Paper Award in Obesity Related Research
- 2004 Invited Keynote speaker for Science Research Night at John F. Kennedy High School in Bellmore, NY
- 2001 National Institutes of Health Extramural Loan Repayment Grant in Pediatric Nutrition
- 2001 Association for Chemoreception Travel Award
- 2001 Gerber Foods Fellowship in Pediatric Nutrition
- 2000 Society for the Study of Ingestive Behavior Young Investigator Award
- 2000 National Science Foundation K-12 Teaching Fellowship
- 1998 Association for Chemoreception Travel Award
- 1996 Bunting-Cobb Graduate Fellowship for Women in Math and Science

C. Contributions to Science

My research is focused on understanding the role of individual variation in the development of children’s eating and weight-related behaviors. We use a number of methodologies to study eating behaviors, including genetics, characterization of the built environment, sensory phenotyping, laboratory test-meals, and most recently, functional magnetic resonance imaging.

1. My early contributions to science helped to characterize the relationship between genetic variation in the ability to taste bitter thiourea compounds and eating behaviors and weight status in preschool children. Prior to these studies, the majority of research had focused on characterizing the relationship between taste phenotypes and eating behaviors in adults. Our research group was the first to report a relationship between genetic variation in the ability to taste 6-n-propylthiouracil (PROP) and weight status in children. Our follow-up studies characterized the relationship between the PROP taster phenotype, genetic variation at the *TAS2R38* gene, and children’s eating behaviors. We were the first research group to assess the interaction between genetic taste variation and the built environment on children’s taste preferences and weight status. In this study, we determined that the interaction between taste genetics and the food environment plays a greater role in determining children’s food preferences than either factor alone. Example publications from this research are listed below:
 - **Keller KL**, Steinmann L, Nurse RJ, Tepper BJ. Genetic taste sensitivity to 6-n-propylthiouracil influences food preferences and reported intake in preschool children. *Appetite*. 2002;38(1):3-12. PMID: 11883912.
 - **Keller KL**, Tepper BJ. A possible role for taste sensitivity to 6-n-propylthiouracil (PROP) in dietary patterns and body weight differences in young children. *Obesity Res*. 2004;12:904-12. PMID: 15229328.
 - **Keller KL**, Reid A, MacDougall MC, Cassano H, Song JL, Deng L, Lanzano P, Chung WK, Kissileff HR. Sex differences in the effects of inherited bitter thiourea sensitivity on body weight in 4-6 year-old children. *Obesity*. 2010;18(6):1194-1200. PMCID: PMC2877149.
 - Burd C, Senerat A, Chambers E, **Keller KL**. PROP taster status interacts with the built environment to influence children’s food acceptance and body weight status. *Obesity*. 2013;21:786-94. PMCID: PMC3661723.
2. A second line of research in my laboratory is understanding the role of oral fatty acid sensors in dietary intake of high-fat foods and chronic disease. Historically, dietary fat was thought to be perceived by texture, but not taste mechanisms. Work from other laboratories in animals and humans, however, demonstrated that it was possible to detect oral fatty acids even when olfactory and texture cues were masked, which suggests a putative role for basic taste in fat perception. However, no taste receptor for

fatty acids had been identified. In animals, the fatty acid translocase CD36 was reported to be necessary for oral fat detection and preference. Our laboratory was the first to report a relationship between common variation at the *CD36* gene and reported acceptance of high-fat foods in African-American adults. Furthermore, we developed a quick screening procedure to phenotype adults based on their ability to discriminate oral fat concentrations in salad dressings. Based on this methodology, we were able to identify a relationship between poor oral fat discrimination and usual intake patterns for dietary fat. Example publications from this line of research are included below.

- **Keller KL**, Liang L, Sakimura-McLean J, May D, van Belle C, Breen C, Driggin E, Tepper BJ, Lanzano P, Deng L, Chung WK. Common variants in the *CD36* gene are associated with reported fat preferences and obesity in African-Americans. *Obesity*. PMID: PMC3743670.
- Liang L, Sakimura-McLean J, May D, Breen C, Driggin E, Tepper BJ, Chung WK, **Keller KL**. Fat Discrimination: A phenotype with potential implications for studying fat intake behaviors and obesity. *Physiol Behav*. 2012;105(2):470-5. PMID: PMC3743656.

3. In 2006, my laboratory began a series of studies to determine the impact of food marketing on children's eating behaviors. The impetus for these studies was historical work from Stanley Schachter who hypothesized that obesity was in part due to an increased responsiveness to external environmental cues. By the 1980s, this hypothesis had largely been discounted, however, more recent evidence from our laboratory and others suggested that overweight children might be more responsive to environmental cues like food marketing. Our initial studies in this area supported the hypothesis that overweight children were more responsive to external food cues than non-overweight children. In addition to continuing laboratory studies to understand the mechanisms underlying these differences, we have also started a line of research to apply these strategies to developing more effective feeding practices for parents. We have recently integrated neuroimaging into these studies to identify traits of children who are susceptible or resilient to the effects of food marketing on food intake. Publications included within this line of research are below.

- Forman J, Halford JC, Summe H, MacDougall MC, **Keller KL**. Food branding influences ad libitum intake differently in children depending on weight status: results of a pilot study. *Appetite*. 2009;53:76-83. PMID: 19481125.
- **Keller KL**, Kuilema LG, Lee N, Yoon J, Mascaro B, Combes A-L, Deutsch B, Sorte K, Halford JCG. The impact of food branding on children's eating behavior and obesity. *Physiol Behav*. 2012;106(3):379-86. PMID: 22450261.
- Cravener TL, Schlechter H, Loeb KL, Radnitz C, Schwartz M, Zucker N, Finkelstein S, Wang YC, Rolls BJ, **Keller KL**. Feeding strategies derived from behavioral economics and psychology can increase vegetable intake in children as part of a home-based intervention: results of a pilot study. *J Acad Nutr Diet*. 2015; doi: 10.1016/j.jand.2015.03.024. PMID: 26014476
- Masterson TD, Stein WM, Bermudez M, Beidler E, English LK, **Keller KL**. Brain response to food brands correlates with increased intake from branded meals in children: an fMRI study. *Brain Imaging and Behavior*. 2019;13:1035-1048. PMID: 29971684
- Masterson TD, Bermudez M, Austen M, Lundquist E, Bruce AS, **Keller KL**. Food commercials do not affect energy intake in a laboratory meal but do alter brain response to visual food cues in children. *Appetite*. 2019;132:154-65. PMID: 30312738

4. Our most recent studies have focused on understanding the neural mechanisms of overeating in children. Brain imaging methodologies like functional magnetic resonance imaging (fMRI) have become the gold standard for understanding neural function in complex traits like eating behavior and obesity. Studies primarily done in adults showed the importance of reward processing, decision making, and inhibitory control in food intake and the development of obesity. However, few laboratories have successfully conducted these studies in children. We are presently conducting several studies in middle childhood age groups (age 7-10 years) to characterize the neural mechanisms of children's response to portion size and energy density. In addition, we have an ongoing research in this age group to investigate the role of self-control in dietary decisions. These studies will

“Healthy Bodies Project: Modifying family and preschool environments to prevent obesity“

The goal of this project is to test the effectiveness of self-regulation training, repeated exposure and tasting, parent education, and physical activity on childhood obesity prevention at Head Start. The candidate is supervising the development and administration of lessons designed to assess self-regulation in children.

Role: Co-I

2011-67001-30117

Rolls, B. (Director)

2/15/11-2/14/17

USDA National Institute of Food and Agriculture

The Pennsylvania State University Childhood Obesity Prevention Graduate Training Program

This grant will establish a sustainable comprehensive, problem-based graduate PhD training program in child obesity prevention (COP) that meets the goals of Agriculture and Food Research Initiative (AFRI) to “improve nutrition and end childhood obesity.”

Role: Co-Director

McCormick Science Institute

Keller (PI)

01/15/15 – 01/14/17

“Using herbs and spices to increase children’s acceptance and intake of school lunches”

The goal of this project is to teach school food service workers to prepare vegetables with herbs and spices to increase intake among middle and high school students in Central, PA.

Role: PI

PENDING:

1R01 DK126050_01 (Keller)

05/01/21 – 05/01/26

3.6 Calendar Months

Characterizing resilience in food-cue induced overeating in children

This is a longitudinal cohort based study to characterize cognitive, neural, and behavioral traits that protect children from overeating in response to food cues like advertising.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Sarah Myruski (former name Sarah Babkirk)

eRA COMMONS USER NAME (credential, e.g., agency login): sbabkirk

POSITION TITLE: Assistant Research Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Connecticut	B.S.	05/2007	Psychology
The New School for Social Research	M.A.	05/2011	Psychology
The Graduate Center, The City University of New York	Ph.D.	02/2018	Psychology, Behavioral and Cognitive Neuroscience
Hunter College, The City University of New York and New York University	Post-Doctoral Researcher	05/2020	Adolescent Psychopathology and Neuroscience
Hunter College, The City University of New York	Post-Doctoral Researcher	09/2020	Adolescent Psychopathology and Neuroscience

A. Personal Statement

My training, experience, and interests provide me with the skills and motivation to contribute to the proposed project. I have a strong foundation in the multi-method (i.e., subjective, behavioral, biological) measurement of cognitive and emotional processes as predictors of psychological adjustment in children, adolescents, and adults. My work examines emotion regulation, or the ability to flexibly modulate emotional experiences and expressions, as a mechanism underlying the emergence and maintenance of mental health difficulties. In my work with youth, I have developed experimental procedures to induce emotions via visual stimuli, experience directly relevant to the proposed study. I have a specific interest in how the pervasive and growing use of digital social technologies (e.g., social media) relates to social-emotional development and well-being. My research has shown that a preference to communicate emotions via technology rather than face-to-face is associated with elevated emotional reactivity and blunted emotion regulation, and that passive versus active use of social media predicts emotion regulation difficulties. I have experience conducting large-scale online research studies with adolescents in my current role as an Assistant Research Professor in the Department of Psychology (Emotion Development Lab, Director: Kristin Buss). Taken together, my experience in developmental psychology, cognitive and affective science, and online behaviors position me to support the goals of the proposed study.

- **Myruski, S.** & Dennis-Tiway, T.A. (2021). Biological signatures of emotion regulation flexibility in children: Parenting context and links with child adjustment. *Cognitive, Affective, and Behavioral Neuroscience*.
- **Myruski, S.**, Quintero, J.M., Denefrio, S., Dennis-Tiway, T.A. (2020). Through a screen darkly: Use of computer-mediated communication predicts emotional functioning. *Psychological Reports*, 123(6), 2305-2332. doi: 10.1177/0033294119859779

- **Myruski, S.**, Gulyayeva, O. Birk, S., Perez-Edgar, K., Buss, K.A., & Dennis-Tiway, T.A. (2018). Digital disruption?: Maternal mobile device use is related to infant social-emotional functioning. *Developmental Science*, 21(4), e12610.
- **Babkirk, S.**, Luehring-Jones, P., & Dennis-Tiway, T. A. (2015). Computer-mediated communication preferences predict biobehavioral measures of social-emotional functioning. *Social neuroscience*, 1-15. doi: 10.1080/17470919.2015.1123181

B. Positions and Honors

2020 – Present	<u>Assistant Research Professor</u> Emotion Development Laboratory (PI: Kristin Buss) The Pennsylvania State University, Department of Psychology, University Park, PA
2019 – 2020	<u>Post-Doctoral Researcher</u> Investigating Difficult Emotions in Adolescents (IDEA) Study Collaboration across the Miranda Lab (PI: Dr. Regina Miranda, Hunter College, CUNY) and the Emotion Regulation Laboratory (PI: Dr. Tracy Dennis-Tiway; Hunter College, CUNY)
2018 – 2020	<u>Post-Doctoral Researcher</u> Teen Anxiety and Brain (TAB) Study Collaboration across the Pediatric Emotion Regulation Laboratory (PI: Dr. Amy Roy; Fordham University and NYU Langone Medical Center) and the Emotion Regulation Laboratory (PI: Dr. Tracy Dennis-Tiway; Hunter College, CUNY)
2018 – 2020	<u>Assistant Research Technician</u> New York University Langone School of Medicine, Dr. Amy Roy Department of Child and Adolescent Psychiatry
2011 - 2018	<u>Graduate Research Fellow</u> Emotion Regulation Laboratory, Dr. Tracy Dennis-Tiway Hunter College, CUNY
2011	<u>Research Assistant</u> Communication and Play Laboratory, Dr. Michael Siller Hunter College, CUNY
2009 – 2011	<u>Research Assistant</u> Steele Center for Attachment Research, Drs. Miriam and Howard Steele The New School for Social Research, Department of Psychology, New York, NY

Honors and Professional Service

2020	NYC Neuromodulation 2020 Outstanding Presentation by an Early Career Scientist
2019, 2018	CUNY Academy Adjunct Travel Award
2018 - 2019	Society for Personality and Social Psychology (SPSP) Small Research Grant
2017	Society for Research in Child Development Travel Grant
2017, 2013	Graduate Student Conference Travel Award
2011 - 2016	Graduate Assistant Teaching Fellowship
2016, 2013	Society for Physiological Research Travel Award
2003 - 2007	Nutmeg Academic Scholarship
2003 - 2007	National Merit Scholarship

C. Contributions to Science

- I. **Emotion Regulation and Psychological Adjustment.** Emotion regulation profoundly contributes to mental health across the lifespan, yet open questions remain regarding what precisely characterizes adaptive emotion regulation and underlying biological processes. My work takes a multi-method approach, integrating subjective, behavioral and biological measures of ER to capture individual differences in the ability to recruit cognitive resources to manage emotions. I have a specific interest in how the adaptiveness or maladaptiveness of emotion regulation may be most

effectively measured in terms of emotion regulation flexibility, or the ability to dynamically modify emotions based on situational demands.

- **Myruski, S.,** Denefrio, S., Dennis-Tiway, T.A. (2018). Stress and emotion regulation: The Dynamic fit model. In K. Harkness and E. P. Hayden (Eds.), *The Handbook of Stress and Mental Health*. Oxford University Press: Oxford, UK. doi: 10.1093/oxfordhb/9780190681777.013.19
- **Myruski, S.,** Bonanno, G., Gulyayeva, O., Egan, L., Dennis, T.A. (2017). Neurocognitive assessment of emotional context sensitivity. *Cognitive Affective and Behavioral Neuroscience*. doi: 10.3758/s13415-017-0533-9.
- **Myruski, S.,** Bonanno, G., Cho, H., Fan, B., Dennis-Tiway, T.A. (2019). The Late positive potential as a neurocognitive index of emotion regulatory flexibility. *Biological Psychology*, 148. doi: 10.1016/j.biopsycho.2019.107768

II. **Technology, Emotion Regulation, and Social-Emotional Well-Being.** Since the explosive rise of social media and computer-mediated communication (CMC) has transformed interpersonal interactions, a focus of my research is to identify how technology use is related to emotion regulation and social-emotional well-being. In adults, I have examined how individual differences in emotional sensitivity to faces, neural emotion processing and emotion regulation are associated with CMC use. In children, I study how parental mobile device use disrupts face-to-face interactions between parents and infants, crucial early experiences which form the foundation for social-emotional functioning.

- **Myruski, S.,** Quintero, J.M., Denefrio, S., Dennis-Tiway, T.A. (2020). Through a screen darkly: Use of computer-mediated communication predicts emotional functioning. *Psychological Reports*, 123(6), 2305-2332. doi: 10.1177/0033294119859779
- **Myruski, S.,** Gulyayeva, O. Birk, S., Perez-Edgar, K., Buss, K.A., & Dennis-Tiway, T.A. (2018). Digital disruption?: Maternal mobile device use is related to infant social-emotional functioning. *Developmental Science*, 21(4), e12610.
- **Babkirk, S.,** Luehring-Jones, P., & Dennis-Tiway, T. A. (2015). Computer-mediated communication preferences predict biobehavioral measures of social-emotional functioning. *Social neuroscience*, 1-15. doi: 10.1080/17470919.2015.1123181

III. **Emotion Regulation in Childhood: The Role of Social Context.** My research focuses on the development of emotion regulation, and associated neurocognitive, physiological, and behavioral correlates. In particular, using event-related potentials (ERPs) I was able to distinguish between school-aged children who showed a degree of cognitive reappraisal capacity, and those who did not. I also showed that this neurocognitive emotion regulation capacity predicted behavioral emotion regulation strategy use concurrently and longitudinally. My work has also demonstrated that neurocognitive emotion regulation is sensitive to parent-child social context, with parent presence or active support bolstering child neurocognitive emotion. I have replicated these findings in a cross-cultural comparison with Japanese families, indicating that neurocognitive emotion regulation is significantly influenced by multiple spheres of social context.

- **Myruski, S. & Dennis-Tiway, T.A.** (2021). Biological signatures of emotion regulation flexibility in children: Parenting context and links with child adjustment. *Cognitive Affective and Behavioral Neuroscience*.
- **Myruski, S.,** Birk, S., Karasawa, M., Kamikubo, A., Kazama, M., Hirabayashi, H., Dennis-Tiway, T.A. (2019). Neural signatures of child cognitive emotion regulation are bolstered by parental social regulation in two cultures. *Social Cognitive Affective Neuroscience*, 14(9), 947-956. doi: 10.1093/scan/nsz070
- **Babkirk, S.,** Rios, V., & Dennis, T. (2015). The Late positive potential predicts emotion regulation strategy use in school-aged children concurrently and two years later. *Developmental Science*. doi: 10.1111/desc.12258
- **Babkirk, S.,** Saunders, L.V., Solomon, B., Kessel, E.M., Crossman, A., Gokhan, N., Dennis, T.A. (2015). Executive function and temperamental fear concurrently predict deception in school-aged children. *Journal of Moral Education*, doi: 10.1080/03057240.2015.1087393

IV. **Affect-Biased Attention and Anxiety.** My research examines behavioral and neurophysiological markers for core affective processes underlying the emergence and maintenance of anxiety. This work identifies individual differences in attention bias, or the selective and exaggerated attention toward or away from threat, and conflict and error monitoring, reflecting abnormal recruitment of

cognitive control capacities. My recent research has used innovative neuroscience techniques, including transcranial direct current stimulation and trial-level neural variability, to work toward clarifying the mechanisms and individual differences relevant to anxiety severity and treatment.

- **Myruski, S.**, Cho, H., Bikson, M., Dennis-Tiwary, T.A. (2020). Transcranial direct current stimulation (tDCS) augments the effects of gamified, mobile attention bias modification, *medRxiv*, <https://doi.org/10.1101/2020.04.20.20057141>.
- Dennis-Tiwary, T.A., Roy, A.K., Denefrio, S., & **Myruski, S.** (2019). Heterogeneity of the anxiety-related attention bias: A Review and working model for future research. *Clinical Psychological Science*, 1-21. doi: 10.1177/2167702619838474
- Denefrio, S., **Myruski, S.**, Mennin, D., Dennis-Tiwary, T.A. (2018). When neutral is not neutral: Neurophysiological evidence for reduced discrimination between threat and non-threat in generalized anxiety disorder. *Motivation and Emotion*, 1-14. doi: 10.1007/s11031-018-9732-0

A full list of published work can be found at:

<https://www.ncbi.nlm.nih.gov/myncbi/1RE5cY-dx9xQY/bibliography/public/>

D. Research Support

SSRI COVID Emergency Grant, The Pennsylvania State University 2021 - 2023

Role: Co-PI

Remote Measures of Attention, Emotion, and Social Interactions in Anxious Adolescents:
A Supplement to the Temperament, Evolving Emotions, and Neuroscience Study (TEENS)
(PI: Kristin Buss)

Society for Personality and Social Psychology (SPSP) Small Research Grant 2018 – 2019

Role: PI

Social Regulation of Emotion in Adolescents: The Role of Technology-Mediated Peer Presence
(PIs: Tracy Dennis-Tiwary & Sarah Myruski)

Association for Psychological Science (APS) Student Grant 2016

Role: Awardee

PSC-CUNY Research Award, City University of New York 2015 - 2016

Role: Graduate Research Fellow and grant preparer

Doctoral Student Research Grant, The Graduate Center, CUNY 2014, 2016

Role: Awardee

Biological Signatures of Emotion Regulation in Children (PIs: Tracy Dennis-Tiwary & Sarah Myruski)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Rodolfo M. Nayga, Jr.

eRA COMMONS USER NAME (credential, e.g., agency login): rmayga

POSITION TITLE: Distinguished Professor and Tyson Endowed Chair

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of the Philippines, Los Banos	BS	04/1985	Agribusiness
University of Delaware, Newark	MS	06/1988	Agricultural Economics
Texas A&M University, College Station	PhD	12/1991	Agricultural Economics

A. Personal Statement

My research is focused on the economics of food consumption, policy, and health and on the application of econometric and behavioral economics methods to obtain an understanding of how food programs, initiatives, and policies affect people's behavior and health outcomes of various segments of the population, namely children and historically disadvantaged groups. Over the past decade, a major portion of my research program has been focused on examining the effect of the food and built environment as well as school programs on childhood obesity. I directed a USDA-AFRI project to examine factors contributing to obesity among young children in pre-school and early elementary grades. I am currently a mentor and collaborator on a project funded through Center for Childhood Obesity Prevention, an NIH-COBRE funded center at Arkansas Children's Research Institute. We are using a unique longitudinal dataset resulting from a legislatively mandated BMI screening program of Arkansas public schoolchildren to understand relationships between environmental influences and obesity outcomes. My research program throughout my career has mainly focused on critical issues related to poverty, nutrition, obesity, and the effects of important federal food programs such as the National School Lunch Program, WIC and the Supplemental Nutrition Assistance Program (SNAP) on food consumption and obesity. This work provided crucial information on the causal effects of important federal food programs/policies on health outcomes of various segments of the population including children and historically disadvantaged groups. Some of my most important publications include:

- a. Fang, D., M. Thomsen, R.M. Nayga, Jr., and A. Novotny, "WIC Participation and Relative Quality of Household Food Purchases: Evidence from FoodAPS", *Southern Economic Journal*, 86(2019): 83-105.
- b. Thomsen, M.R., R.M. Nayga, Jr., P.A. Alviola, IV, and H.L. Rouse. "The Effect of Food Deserts on the Body Mass Index of Elementary Schoolchildren." *American Journal of Agricultural Economics* 98(January 2016):1-18.
- c. Kyureghian, G. and R.M. Nayga, Jr., "Food Store Access, Availability, and Choice When Purchasing Fruits and Vegetables", *American Journal of Agricultural Economics*, 95(2013): 1280-1286.
- d. You, W., P. Mitchell, and R.M. Nayga, Jr., "Improving Food Choices Among Supplemental Nutrition Assistance Program Recipients", *Health Economics*, 21(2012): 852-864.
- e. Campbell, B., R.M. Nayga, Jr., J. Park, and A. Silva, "Does the National School Lunch Program Improve Children's Dietary Outcomes?", *American Journal of Agricultural Economics*,

B. Positions and Honors

Positions

1992-1993	Lecturer of Applied Economics, Massey University, New Zealand
1993-1997	Assistant Professor of Agricultural Economics, Rutgers University
1997-1999	Assistant Professor of Agricultural Economics, Texas A&M University
1999-2003	Associate Professor of Agricultural Economics, Texas A&M University
2003-2008	Professor of Agricultural Economics, Texas A&M University
2009-2017	Professor of Agricultural Economics & Tyson Endowed Chair in Food Policy Economics, University of Arkansas
2017-present	Distinguished Professor of Agricultural Economics & Tyson Endowed Chair in Food Policy Economics, University of Arkansas

Honors

2007	American Agricultural Economics Association Presidential Recognition Award
2008	Taiwan National Science Council Fellow, National Taiwan University
2010	Outstanding Alumnus Award given by College of Economics and Management, University of the Philippines, Los Banos, Philippines
2010	Distinguished Alumnus Award given by University of the Philippines at Los Banos Alumni Association
2012	Outstanding Leadership through Sensory Research Award, Society of Sensory Professionals
2013	Fellow of the Agricultural and Resource Economics Review
2016	Distinguished Professional Contribution Award, Southern Agricultural Economics Association
2016	National Bureau of Economic Research (NBER) Research Economist Appointment
2016	Southeastern Conference (SEC) Faculty Achievement Award – University of Arkansas
2017	Distinguished Professional Contribution Award, Southern Agricultural Economics Association
2018	Waseda Institute of Advanced Studies Visiting Senior Researcher Award, Tokyo
2019	Centennial Outstanding Alumni Award, University of the Philippines, Los Banos, July 2019

C. Contributions to Science

2. **Effect of food, physical, and school environment on childhood obesity.** Food, physical and school environments are important factors affecting childhood obesity. My research program in this area has exploited a unique panel dataset developed through an ongoing BMI screening program in Arkansas. In collaboration with my colleagues, we have been able to examine the effect of several features of the food and build environment (fast foods, food deserts) and school environment including a school-based food program as well as differences in school grade configurations. Selected published papers include:
 - a. Asirvatham, J., M. Thomsen, R.M. Nayga, Jr., and A. Goudie, "Do Fast Food Restaurants Surrounding Schools Affect Childhood Obesity?", *Economics and Human Biology*, 33(2019): 124-133.
 - b. Qian Y., M. R. Thomsen, R. M. Nayga Jr., and H.L. Rouse. "The Effect of Neighborhood Fast Food on Children's BMI: Evidence from a Sample of Movers" *B.E. Journal of Economic Analysis & Policy* 17(2017).
 - c. Thomsen, M.R., R.M. Nayga, Jr., P.A. Alviola, IV, and H.L. Rouse. "The Effect of Food Deserts on the Body Mass Index of Elementary Schoolchildren." *American Journal of Agricultural Economics* 98(January 2016):1-18.
 - d. Qian, Y., R.M. Nayga, Jr., M.R. Thomsen, and H.L. Rouse. "The Effect of the Fresh Fruit and Vegetable Program on Childhood Obesity." *Applied Economics Perspectives and Policy* 38(June 2016):260-75.

3. **Social influences and childhood weight outcomes.** Peers are an important source of influence on health behaviors and have been shown to affect behaviors such as smoking, alcohol, and substance abuse. Peer effects are of interest to policy makers because their existence raises the possibility of gaining greater benefits from health interventions via a social multiplier effect, whereby individuals affect each other through social interactions. My work has involved models of peer influence within schools and has exploited potentially exogenous assignments of peers via a court-mandated reorganization of Arkansas public schools using spatial econometric methods. Published papers include:
 - a. Zare, S., M. Thomsen, R.M. Nayga, Jr., and A. Goudie, "Use of Machine Learning to Determine the Information Value of a Body Mass Index Screening Program", *American Journal of Preventive Medicine*, accepted and forthcoming.
 - b. Fang, D., M.R. Thomsen, R.M. Nayga, Jr. and A. Goudie. Association of Neighborhood Geographic Factors with Rates of Childhood Obesity. *JAMA Network Open* 2018;1(4):e180954. doi:10.1001/jamanetworkopen.2018.0954
 - c. Asirvatham, J., M.R. Thomsen, R. M. Nayga, Jr., and H.L. Rouse. "Obese Peers' Influence on Student's BMI: Heterogeneity in Race and Gender" *Health Behavior and Policy Review* 5,5(2018): 3-12.
 - d. Asirvatham, J., M.R. Thomsen, R.M. Nayga, Jr., and H.L. Rouse. "Do Peers Affect Childhood Obesity Outcomes? Peer-Effect Analysis in Public School." *Canadian Journal of Economics* 51(February 2018): 216-235.
 - e. Asirvatham, J., R.M. Nayga, Jr., and M.R. Thomsen. "Peer-effects in Obesity Among Public Elementary Schoolchildren: A Grade-level Analysis." *Applied Economics Perspectives and Policy* 36(September 2014):438-459.

4. **Food Labels and Food Choice.** I have examined the effect of different types of food labels (organic, natural, ecolabels, GM) on food choice. In my studies, consumers' valuation for different types of food labels are estimated using hypothetical and non-hypothetical preference elicitation techniques such as choice experiments and experimental auctions. This important strand of my work has been instrumental in greatly expanding policy makers' understanding of how people use and value food labels and how these influence food choice and health-related outcomes. Recent publications include:
 - a. Shew, A., H. Snell, R.M. Nayga, Jr., and M. Lacity, "Consumer Valuation of Blockchain Traceability for Beef in the United States", *Applied Economic Perspectives and Policy*, accepted and forthcoming.
 - b. Gilmour, D., C. Bazzani, R.M. Nayga, Jr., and H. Snell, "Do Consumers Value Hydroponics? Implications for Organic Certification", *Agricultural Economics*, accepted and forthcoming.
 - c. Drichoutis, A., A. Vassilopoulos, J. Lusk, and R.M. Nayga, Jr., "Consumer Preferences for Fair Labour Certification", *European Review of Agricultural Economics*, 44,3(2017): 455-474.
 - d. Bazzani, C., V. Caputo, R.M. Nayga, Jr., and M. Canavari, "'Revisiting Consumers' Valuation for Local Versus Organic Food Using a Non-Hypothetical Choice Experiment: Does Personality Matter?", *Food Quality and Preference*, 62(2017): 144-154.
 - e. Akaichi, F., R.M. Nayga, Jr., and L. Nalley, "Are there Trade-offs in Valuation with Respect to Greenhouse Gas Emissions, Origin and Food Miles Attributes?", *European Review of Agricultural Economics*, 44(2017): 3-31.

5. **Studies on Stated and Revealed Preference Methods.** This strand of my research is crucial in determining whether a proposed food program/policy or novel food product would be valued by the public or a target population. This information is used by policy analysts and policy-makers not only for cost-benefit analysis, but also to assess the public's propensity to support a proposed food program or policy. A well-known phenomenon in the use of stated preference methods in valuation research is the so called "hypothetical bias". My major contribution in this literature is the discovery of new ways to mitigate this "hypothetical bias" in stated preference studies, particularly those involving choice

experiments and contingent valuation methods. I also examined how important behavioral issues such as commitment cost, reference points, attribute non-attendance, and time/risk preferences can influence valuation estimates from choice experiments and experimental auctions. The findings from his numerous studies are instrumental in improving research design as well as providing useful and reliable willingness to pay estimates for food policy and welfare evaluations. Recent publications include:

- a. Lee, J., R.M. Nayga, Jr., C. Deck, and A. Drichoutis, "Cognitive Ability and Bidding Behavior in Second Price Auctions: An Experimental Study", *American Journal of Agricultural Economics*, doi:10.1002/ajae.12082.
- b. Fang, D., R.M. Nayga, Jr., G. West, C. Bazzani, W. Yang, B. Lok, C. Levy, and H. Snell, "On the Use of Virtual Reality in Mitigating Hypothetical Bias in Choice Experiments", *American Journal of Agricultural Economics*, 103(2021): 142-161
- c. Caputo, V., J. Lusk, and R.M. Nayga, Jr., "Am I Getting a Good Deal? Reference Dependent Decision Making when the Reference Price is Uncertain", *American Journal of Agricultural Economics*, 102(2020): 132-153.
- d. Caputo, V, J. Lusk, and R.M. Nayga, Jr., "Choice Experiments are Not Conducted in a Vacuum: The Effects of External Price Information on Choice Behavior," *Journal of Economic Behavior and Organization*, 145(2018): 335-351.
- e. Bazzani, C., R.M. Nayga, Jr., V. Caputo, and M. Canavari, "Testing Commitment Cost Theory in Choice Experiments", *Economic Inquiry*, 55(2017): 383-396.

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

NIFA-AFRI-USDA Huang, Nayga, Henry, Mane (PIs) 08/01/21 – 07/31/24

This project aims to examine the effect of performance feedbacks and peer comparisons in irrigation management.

Role: Co-PI

Project Title: Performance Feedbacks and Peer Comparisons in Irrigation Management

NIH/NIGMS (5P20GM109096) Weber (PI) 08/01/16-07/31/21

The Center for Childhood Obesity Prevention focuses on developing research infrastructure around the theme of childhood obesity prevention and providing junior investigators with formal mentoring, training and research project funding to help them acquire preliminary data to successfully compete for independent research grant support around this theme.

Role: Project Mentor

Project Title: Informing Policies to Address Childhood Obesity: A Systems Approach.

USDA-ERS (58-4000-6-0057-R) Nayga, Thomsen (PIs) 10/15/16-08/31/21

The objective of this cooperative research agreement is to determine the extent to which WIC eligibility affects the market placement of branded processed foods. WIC targets specific nutrients via vouchers for nutrient-rich foods. As a consequence, recipients have little incentive to consider price when selecting WIC approved food items. This increases food costs and may lead to strategic behaviors on the part of food manufacturers and retailers. In order to document or understand these behaviors, it is first necessary to clarify the ways in which WIC affects retail food markets.

Role: PI

Project Title: Does inclusion on the WIC Food List Expand Placement of Food Brands? USDA-ERS

USDA-ERS

Nayga (PI)

09/01/2019-08/31/2021

The objective of this cooperative research agreement is to investigate the effect of how SNAP recipients' eating patterns (i.e., time of the day of meals, time spent eating, frequency of eating) influence their risk of obesity compared to comparable non-recipients.

Role: PI

Project Title: The Impact of SNAP on Obesity: Findings from the ATUS-EHM

Recently Completed Research Support

NBER (51230.00.04.00)

Fang, Nayga, Thomsen (PIs)

09/29/15-09/30/19

This project is using the Food Acquisition and Purchase Survey (FoodAPS) to better understand the role of the Special Supplemental Program for Women Infants and Children in improving the dietary quality of overall food purchases.

Role: PI

Project Title: The Economic Geography of WIC

USDA-ERS

Nayga (PI)

09/01/2017-08/31/2019

The objective of this cooperative research agreement is to revisit the SNAP benefit cycle issue by using time use data to investigate if SNAP participants have a higher likelihood of not eating over the day at the end of the benefit cycle than comparable non-SNAP participants.

Role: PI

Project Title: Time Use and Eating Patterns over the Benefit Month: A Comparison of SNAP and Non-SNAP Participants Using the ATUS-EHM Data

UA Center for Human Nutrition Pilot Grant Program

Fang (PI)

02/01/18-06/30/19

This project evaluated a program in farmers' markets and participating supermarkets that incentivizes SNAP recipients to purchase local fruits and vegetables by matching local purchases dollar-for-dollar with additional benefits that can be used to purchase any other fresh fruit or vegetable item at the participating retailer.

Role: Co-PI

Project Title: Evaluation of Double Up Food Bucks In Arkansas

USDA-NIFA-AFRI (2011-68001-30014)

Nayga (PD)

02/01/11-01/31/16

The objectives of this project were to (1) characterize food environments and determine the role of environmental attributes on weight outcomes of young children; (2) assess social marketing interventions targeted to young children, their parents, and caregivers/teachers that de-market unhealthy, and promote healthy, dietary behaviors; (3) promote and facilitate increased access to, variety of, and consumption of, fresh vegetables and fruits in schools; (4) develop and assess a comprehensive educational program for Head Start, kindergarten, and first grade classrooms to promote and facilitate healthy dietary behaviors; and (5) increase awareness and understanding of the childhood obesity crisis among undergraduate and graduate students preparing for careers in child care, early elementary education, public policy, and the food industry.

Role: PD

Project Title: Interventions for Obesity Prevention Targeting Young Children in At-Risk Environments: An Integrated Approach.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Martina Vecchi

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Catholic University of Milan, Italy	BS	07/2009	Economics and Business Administration
Catholic University of Milan, Italy	MS	02/2012	Economics and International Finance
Barcelona Graduate School of Economics	MS	07/2014	Economics of Public Policy
The University of Edinburgh	PhD	06/2019	Economics

A. Personal Statement

I am actively building a research program at the intersection of food policy, health economics and experimental economics. I have a strong foundation in behavioral and experimental economics. My work utilizes field, laboratory, and online experiments to collect primary data and investigate the impact of environmental factors on food choices and eating behavior. I have conducted interdisciplinary research with several "non-standard" populations (as first graders, farmers and mothers with a low socioeconomic status). I am a co-PI of a large NIFA grant to assess the impact of time scarcity on heterogeneous households' food choices through both structural analysis and experimental studies. Taken together, my experience in behavioral economics, experimental design and eating behavior position me to support the goals of the proposed study.

- a. Bauer, J.M., Schröder, M., Vecchi, M., Bake, T., Dickson, S.L. and Belot, M., 2021. Rewarding behavior with a sweet food strengthens its valuation. Plos one, 16(4), p.e0242461.
- b. Belot, M., James, J., Vecchi, M. and Vitt, N., 2019. Stress and Food Preferences: A Lab Experiment with Low-SES Mothers (No. 12674). IZA Discussion Papers.

B. Positions and Honors**Positions**

2019-present Assistant Professor of Agricultural Economics & Pennsylvania State University

Honors

2020 SAFES Impacts of COVID-19 on Agricultural, Food, and Environmental Systems grant
2017 School of Economics research grant by the University of Edinburgh
2016 Visiting research scholarship by the University of Edinburgh

C. Contributions to Science

1. One line of research is in the area of behavioural health economics. We study the impact of rewarding with food on its appeal and consumption. We conduct a field experiment with 214 first graders in Germany and find that rewarding children with food increases their liking for the food reward. We also explore whether is the effort to obtain the food-reward to induce higher liking, finding instead that effort weakens the effect of rewarding. These findings suggest that the common practice of using certain foods (typically high in calorie) as rewards may contribute to their appeal. We have teamed up with a team of biologists who have done a similar experiment with rodents and find similar evidence.
 - a. Bauer, J.M., Schröder, M., Vecchi, M., Bake, T., Dickson, S.L. and Belot, M., 2021. Rewarding behavior with a sweet food strengthens its valuation. Plos one, 16(4), p.e0242461.

2. Another line of research investigates the impact of environmental factors on food choices and preferences. We investigate whether short-term everyday stressors lead to unhealthier dietary choices among low socioeconomic status mothers. We propose a novel stress protocol that aims to mimic everyday stressors experienced by this population, involving time and financial pressure. We evaluate the impact of stress on immediate (lab consumption of low and high calorie snacks) and planned (incentivized shopping task) food choices, comparing a group exposed to our stress protocol relative to a control group. We find no evidence of an effect of stress on the nutritional content of immediate or planned food consumption, thus no support for the hypothesis that everyday stressors are a likely explanation for unhealthy food choices (Belot et al., 2019). In the same experiment, we also investigate via a questionnaire the impact of in utero exposure to maternal stress on child’s future preferences for obesogenic foods. The resulting paper is currently under review. To further investigate whether the impact of stress is moderated by failure, I am currently conducting an online experiment with a sample of 300 students.
 - a. Belot, M., James, J., Vecchi, M. and Vitt, N., 2019. Stress and Food Preferences: A Lab Experiment with Low-SES Mothers (No. 12674). IZA Discussion Papers.

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

NIFA-AFRI-USDA

Jaenicke (PIs)

01/01/21 – 12/31/23

The overall objective of the proposed research is to investigate the behavior foundation of the role of time scarcity and food choices and to explore how particular mechanism, neoclassical or behavioral, may influence the effectiveness of potential food policies. We investigate the impact of time scarcity on heterogeneous households’ food choices and the trade-off between time and healthfulness through reduced-form and structural analysis of consumer-level food-purchase data. Further, we identify and evaluate the effectiveness of policies aimed at improving the healthfulness of food choices under alternative behavioral mechanisms.

Role: Co-PI

Project Title: Investigating Mechanisms between Time Scarcity and Healthfulness of Food Choices – Evidence from Scanner Data and Lab Experiments.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Wei Yang

eRA COMMONS USER NAME (credential, e.g., agency login): wxy008

POSITION TITLE: Program associate

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Shanxi Agricultural University, Shanxi, China	BS	06/2004	Plant protection
University of Arkansas, Arkansas	MS	12/2014	Agricultural Economics
University of Arkansas, Arkansas	MS	05/2019	Statistics

A. Personal Statement

My research is related to the economics of food security, health, and consumption. Since hired as program associate in Department of Agricultural Economics and Agribusiness in 2017, I mainly focus on deploying choice survey, using different choice models to explore consumers' choice behavior in research areas of food and environment, and on developing new methods for choice study and developing statistical and computer programming toward data management, data analysis, and decision support systems. Some of my most important publications include:

- a. Fang, D., Nayga, RM, West, G, Bazzani, C, Yang, W, Lok, B, Levy C and Snell H. (2019). On the Use of Virtual Reality in Mitigating Hypothetical Bias in Choice Experiments. *American Journal of Agricultural Economics*. DOI: 10.1111/ajae.12118.
- b. Pappalardo, G., Cerroni, S., Nayga, R. M., Jr, & Yang, W. (2020). Impact of Covid-19 on Household Food Waste: The Case of Italy. *Frontiers in nutrition*, 7, 585090. <https://doi.org/10.3389/fnut.2020.585090>

B. Positions

2017-present Program associate, Department of Agricultural Economics and Agribusiness, University of Arkansas

C. Contributions to Science

1. Discovering of new ways to reduce "hypothetical bias", a commonly issue in hypothetical choice experiments in stated preference studies. Recent publication include:

- a. Fang, D., Nayga, RM, West, G, Bazzani, C, Yang, W, Lok, B, Levy C and Snell H. (2019). On the Use of Virtual Reality in Mitigating Hypothetical Bias in Choice Experiments. *American Journal of Agricultural Economics*. DOI: 10.1111/ajae.12118.

2. Exploring the effect of COVID-19 on people's food purchasing and consumption habits, and the consequence of the effect to the environment.
 - a. Pappalardo, G., Cerroni, S., Nayga, R. M., Jr, & Yang, W. (2020). Impact of Covid-19 on Household Food Waste: The Case of Italy. *Frontiers in nutrition*, 7, 585090.
<https://doi.org/10.3389/fnut.2020.585090>