**Working Title:**
College students' report of canned foods being used in their childhood households and their current understandings, perceptions, and usage of such goods

**Hypothesis:**
College students who reported parental usage of canned foods will have more accurate understandings of, positive perspectives towards, and more frequent consumption of canned foods

**Specific hypotheses:**
Compared with students whose parents did not frequently use canned goods in meal preparation, students whose parents did frequently use canned goods in meal preparation will:

1. Think that canned foods can count toward recommendations for good nutrition in the US
2. Think that canned vegetables, fruits, meats, and legumes are as nutritious as their fresh, frozen, or dried alternatives
3. Think that canned vegetables, fruits, meats, and legumes are more convenient than their fresh, frozen, or dried alternatives
4. Think that canned vegetables, fruits, meats, and legumes taste good
5. Feel more confident in using canned vegetables, fruits, meats, and legumes when preparing a meal
6. Consume more canned vegetables, fruits, meats, and legumes each 7d (1wk)

**Literature Review:**
Parents greatly impact what their children eat, particularly through role modeling. In general, dietary parental role modeling has been described as children's observation of parental eating behaviors and the subsequent development of similar eating patterns. Through role modeling, research has shown that parents positively impact the amount of healthy foods consumed by their offspring,[1] specifically related to children's increased consumption of fruits, vegetables,[2-5] and dairy,[5] decreased consumption of total fat,[6] and moderated intake of daily mean calories.[7] Family meals are considered to be a powerful opportunity for dietary parental role modeling.[8-9] However, even when family meals are not regularly held, parent's modeling of healthy eating has still been shown to increase their adolescent's consumption of fruits and vegetables.[4] After analyzing how various parenting styles affected the eating habits of children, Brown and Ogden[10] concluded that positive parental role modeling may be more effective at improving children's diets than attempting to control what children eat.

More recently, research has started to elucidate the affect parental role modeling has on the dietary habits of college students. After comparing the eating habits of university students and their respective mothers, it was shown that college students' food preferences were similar to their mothers' preferences.[11] Likewise, university students' diets tended to resemble what they remember their caretakers' eating habits were growing up.[12] Even when certain foods were disliked during childhood, college students were more likely to consume those foods if they saw their parents eating them during their youth.[13]

In the US, college students' eating habits have not been consistent with the Dietary Guidelines of America (DGA).[14-16] In general, the majority of college-aged adults in 2001-2004 did not meet

the recommendations for consuming nutrient-rich options within each food group.[17] More specifically, they did not meet the recommendations for consuming foods such as fruits, vegetables, and whole grains.[18] Other studies have also shown that college students consume excessive amounts of foods high in salt and fat,[19] as well as sugar-sweetened beverages.[20-21] One cross-sectional analysis revealed that 45% of students consumed food/beverages from a campus venue at least 3 times per week, significantly contributing to their higher fat and added sugar consumption.[22] Some of the barriers to healthy diets for university students included the cost of home cooking;[23-26] limited time to shop, cook, and clean up;[23-26] and the fear that spoilage will happen before home cooked foods can be eaten.[26]

Canned foods may be a plausible option of improving university student's diets while overcoming obstacles to a healthy diet. Compared with fresh or frozen goods, canned foods have been shown to be less expensive and to contain higher nutritional content.[27-29] Also, in addition to being convenient and thereby less time consuming, canned foods have been shown to extend shelf life without refrigeration, thus preventing spoilage.[30] In general, people who ate canned produce had higher nutrient intakes, better quality eating habits, and higher vegetable and fruit consumption compared with non-users.[31] Thus, these characteristics and benefits of canned foods may be helpful in overcoming barriers college students have identified in relation to healthy eating, and if consumed, can better help them meet the dietary recommendations. However, it is not known what factors influence students' perceptions and use of canned foods. One reasonable barrier may be misconceptions about their nutritional value. Surveys have shown that the nutritional value of canned foods is often misunderstood. In 2013, 42% of consumers were unaware that canned foods could contribute to a healthy diet,[32] despite the DGA stating, "All forms of foods, including fresh, *canned*, dried, and frozen, can be included in healthy eating patterns."[33]

Herein, we seek to analyze if dietary parental role modeling affects college students' usage of canned goods. It has previously been illustrated that parents' eating habits affected the dietary practices of both children and university students. Thus, it is plausible that parents' perceptions and usage of canned foods during one's childhood may be a positive influence on their feelings towards and utilization of such goods later in life. However, it has not yet been investigated if parental usage of canned foods influences college student's usage of them. With the impact of dietary parental role modeling in mind, the purpose of this study is to investigate whether parental usage of canned foods affects university students' understanding, perceptions, and usage of such goods. The findings of this initiative could give further insight into why college students eat what they do and potentially elucidate how to help college students overcome misconceptions regarding canned goods, thereby improving their overall diets.

**Methods:**

This study is a secondary data analysis of data acquired from college students via a validated survey: The Perceptions and Use of Canned Foods (PUCF).[34] This survey questionnaire was pilot tested and shown as valid and reliable through cognitive interviews, university reviewers, and test retesting procedures.[34] The subjects in our study consisted of a convenience sample of college students (n=658) enrolled in an introductory nutrition course. The original study analyzed whether implementing a class assignment to prepare a home-cooked meal using a canned good as one of the ingredients helped students become more confident with both cooking

and using canned foods. Though student participants in the original study participated in both pre- and post-test intervention surveys about canned foods, we will only use the pre-test intervention data in our present study, besides demographic information which is only found in the post-intervention survey.

A brief overview of the PUCF online questionnaire will be provide herein; a more detailed description of survey development can be found in Richards, et al.[34] The survey consisted of 65 total items, which were organized into 5 theoretic constructs: knowledge (9 items), attitude (30 items), self-efficacy (12 items), canned food use (8 items), and environment (6 items).[34] On the PUCF questionnaire, canned foods were defined as foods that are shelf-stable after being processed in bottles, plastic containers, or metal cans. Canned legumes included beans that are already softened and cooked, packaged in cans, and ready-to-use, such as kidney, pinto, black, garbanzo, and lento. However, green beans or peas were not included in canned legumes. Canned meats included tuna, chicken, Vienna sausages, SPAM, etc. Canned fruits and vegetables were not defined.

Within each theoretic construct, we selected questions from the original questionnaire whose answers would reasonably be influenced by a student's parent's use of canned goods. Within the knowledge construct, we used 1 item: "I think that canned foods can count toward recommendations for good nutrition in the US" (item #1). Using a 5-point Likert scale, students selected answers ranging from "strongly agree" to "strongly disagree." Within the attitude construct, we used 17 items, such as, "I think that canned vegetables are as nutritious as fresh vegetables" (items #7,15-30). The same 5-point Likert scale as above was used, as well as an additional 5-point Likert scale which included answer options ranging from "I am not sure if I like" to "I really like" for 4 items. Within the self-efficacy construct, we used 5 items, such as, "I am confident that I can prepare recipes using canned vegetables" (items #8-12). The same 5-point Likert scale that was used for the knowledge construct was used for the self-efficacy construct. Within the canned food use construct, we used 4 items, such as, "Over the past 7 d (1 wk), estimate how often you ate canned vegetables" (items #1-2, 5, and 7). Answer options ranged from "Never" to "More than 7 times in the past 7 days (more than 1 time per day)". Within the environment construct, we used 1 item: "As I was growing up, canned foods were frequently used in meal preparation" (item #1). The same 5-point Likert scale as the knowledge construct was used to answer the environment construct. This last construct was used to analyze the potential influence of parental role modeling on the students' usage of canned foods.

**Data Analysis:**

We classified and subsequently separated into groups students who had and had not been exposed to canned foods in their adolescence by the following means: In response to the question, "As I was growing up, canned foods were frequently used in meal preparation," students who responded with either "Strongly Agree" or "Agree" were classified as having experienced parental expose to canned foods, while students who responded with "Strongly Disagree," "Disagree," or "I don't know" were classified as not having experienced parental exposure to canned foods.

Demographic variables will be analyzed for means and frequencies. We will use t-tests to detect differences between those who had and those who had not experienced parental exposure to

canned foods, in reference to their perceptions and use of canned food. A statistician consultant will be used to counsel with us and confirm our analysis.

**Qualifications of Thesis Committee:**

In addition to Dr. Jeffrey Tessem, PhD, who is the NDFS Department Honors Coordinator, the following two professors will be a part of my Thesis Committee:

A) Rickelle Richards, PhD, MPH, RDN—*faulty advisor*—Dr. Richards has an exceptionally thorough background in nutritional science. She received her bachelors in Nutritional Science from Utah State University, Master of Public Health from Tulane University School of Public Health and Tropical Medicine, and later received her PhD in Human Nutrition from University of Minnesota. This background will be of great use as we, in an effort to potentially use canned foods to help remedy the nutritional deficiencies of university students, study what affect parental usage of canned foods has on college students' usage of such goods. Some of her relevant publications in this field include:

- "Developing a questionnaire to evaluate college students' knowledge, attitude, behavior, self-efficacy, and environmental factors related to canned foods." *J Nutr Educ Behav. 2017*
- "College students' perceived differences between the terms 'real meal,' 'meal,' and 'snack.'" *J Nutr Educ Behav. 2017*
- "Evaluation of emotion-based messages designed to motivate Hispanic and Asian parents of early adolescents to engage in calcium-rich food and beverage practices." *Nutr Res Pract. 2016*
- "Influence of parenting practices on eating behaviors of early adolescents during independent eating occasions: implications for obesity prevention." *Nutrients. 2015*
- "Parents' calcium knowledge is associated with parental practices to promote calcium intake among parents of early adolescent children." *Journal of Extension. 2015*
- "Dietary sources of calcium among parents and their early adolescent children in the United States by parent race/ethnicity and place of birth." *J Immigr Minor Health. 2015*
- "Perceptions of how parents of early adolescents will personally benefit from calcium-rich food and beverage parenting practices." *J Nutr Educ Behav. 2014*
- "Environmental, behavioral, and personal factors influencing body mass index and dietary intake among homeless women in Minnesota." *J Hunger Environ Nutrition 2010*
- "Food store access and household fruit and vegetable use among participants in the US Food Stamp Program." *Public Health Nutr. 2004*

Dr. Richards' specialized training in public health will be very beneficial to our project, as we will analyze a population-based survey to perform our research. Lastly, I had the opportunity to take NDFS 424, "Nutrition Throughout the Life Cycle," from Dr. Richards. Also, I was the online TA for NDFS 100 from February 2016-August 2016, during which I worked with Dr. Richards

B) Curtis Child, PhD, MPA—*faculty reader*—Dr. Child has continuously taught SOC 111, "Introductory Sociology." This course covers a broad range of topics, including how one's primary socialization affects every aspect of someone's life. With my honors thesis focusing on how parental dietary habits affect a child's future dietary habits, we are studying an aspect of a child's primary socialization, which may in turn affect the child's future use of canned foods.

Thus, Dr. Child would add a dynamic perspective on how socialization can affect one's use of canned goods.

On a personal note, I took SOC 111 from Dr. Child. Because I enjoyed his teaching and personality, I debated doing a sociology minor. However, I also debated if I should do the honors program. I actually went to Dr. Child to receive his counsel on the matter, and we both thought that doing an honors thesis would provide me with a unique experiential learning opportunity. Thus, with how I am now doing my honors thesis in part thanks to Dr. Child's counsel, I would find it "poetically rewarding" to have Dr. Child on my honors thesis committee.

**Project Timeline:**

1. Have thesis proposal approved by October 9th, 2017
2. Finish cleaning data by October 16th, 2017
3. Meet with statistician consultant by the end of October 16th, 2017
4. Fill data into tables and finish writing the "Discussion" section by October 23rd, 2017
5. For subsequent 3 weeks, finish all editing and revisions of project
6. Have the paper submitted to committee members by November 6th, 2017
7. Meet for thesis defense the week of November 12th, 2017
8. Make all final editing's and revisions for thesis submission by December 8th, 2017

**IRB Approval:**

I have obtained IRB approval to be added to this research project (see below.)
Date: August 29, 2017
IRB#: X14539

Title: *"Effectiveness of an NDFS 100 Homework Option Using a Canned Ingredient"*

Brigham Young University's IRB has reviewed the amendment submitted on August 29, 2017.
Robert Drury is approved as a research assistant on this project.
The approval of this protocol expires on **December 22, 2017**.
All conditions for continued approval period remain in effect. Any modifications to the approved protocol must be submitted, reviewed and approved by the IRB before modifications are incorporated in the study.
IRB Secretary
A 285 ASB
Brigham Young University

**Funding:**

No funding is requested for this project.

**Culminating Experience:**

The goal for this project is to have it published in the Journal of Nutrition Education and Behavior. Since this research initiative is predicated on a project that was already published in that same journal, it would follow suite that my thesis will be of the quality and substance to be published therein as well.

good!

**Conclusion:**

I am very grateful to have Dr. Richards' support and mentorship throughout this project. I would recommend to the honors office that if any NDFS students need a faculty advisor, Dr. Richards is a great professor to work with for one's honors thesis.

**Works Cited:**


1. Ostbye T, Malhotra R, Stroo M, et al. The effect of the home environment on physical activity and dietary intake in preschool children. Int J Obes. 2013;37(10):1314-21.
2. Melbye EL, Overby NC, Ogaard T. Child consumption of fruit and vegetables: the roles of child cognitions and parental feeding practices. Public Health Nutr. 2012;15(6):1047-55.
3. Fisher JO, Mitchell DC, Smiciklas-Wright H, Birch LL. Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. J Am Diet Assoc. 2002;102(1):58-64.
4. Watts AW, Loth K, Berge JM, Larson N, Neumark-Sztainer D. No Time for Family Meals? Parenting Practices Associated with Adolescent Fruit and Vegetable Intake When Family Meals Are Not an Option. J Acad Nutr Diet. 2017;117(5):707-714.
5. Arcan C, Neumark-Sztainer D, Hannan P, van den Berg P, Story M, Larson N. Parental eating behaviours, home food environment and adolescent intakes of fruits, vegetables and dairy foods: longitudinal findings from Project EAT. Public Health Nutr. 2007;10(11):1257-65.
6. Eisenberg CM, Ayala GX, Crespo NC, et al. Examining multiple parenting behaviors on young children's dietary fat consumption. J Nutr Educ Behav. 2012;44(4):302-9.
7. Robson SM, Couch SC, Peugh JL, et al. Parent Diet Quality and Energy Intake Are Related to Child Diet Quality and Energy Intake. J Acad Nutr Diet. 2016;116(6):984-90.
8. Draxten M, Fulkerson JA, Friend S, Flattum CF, Schow R. Parental role modeling of fruits and vegetables at meals and snacks is associated with children's adequate consumption. Appetite. 2014;78:1-7.
9. Berge JM, Wall M, Larson N, et al. Youth dietary intake and weight status: healthful neighborhood food environments enhance the protective role of supportive family home environments. Health Place. 2014;26:69-77.
10. Brown R, Ogden J. Children's eating attitudes and behaviour: a study of the modelling and control theories of parental influence. Health Educ Res. 2004;19(3):261-71.
11. Unusan N. University students' food preference and practice now and during childhood. Food Qual Prefer. 2016;17(5):362-86.
12. Branen L, Fletcher J. Comparison of college students' current eating habits and recollections of their childhood food practices. J Nutr Educ. 1999;31(6):304-10.
13. Wadhera D, Capaldi Phillips ED, Wilkie LM, Boggess MM. Perceived recollection of frequent exposure to foods in childhood is associated with adulthood liking. Appetite. 2015;89:22-32.
14. Nelson MC, Larson NI, Barr-Anderson D, Neumark-Sztainer D, Story M. Disparities in dietary intake, meal patterning, and home food environments among young adult nonstudents and 2- and 4-year college students. Am J Public Health. 2009;99(7):1216-9.

15. Nelson Laska M, Larson NI, Neumark-Sztainer D, Story M. Dietary patterns and home food availability during emerging adulthood: do they differ by living situation? Public Health Nutr. 2010;13(2):222-8.
16. Laska MN, Hearst MO, Lust K, Lytle LA, Story M. How we eat what we eat: identifying meal routines and practices most strongly associated with healthy and unhealthy dietary factors among young adults. Public Health Nutr. 2015;18(12):2135-45.
17. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. J Nutr. 2010;140(10):1832-8.
18. Kasparek DG, Corwin SJ, Valois RF, Sargent RG, Morris RL. Selected health behaviors that influence college freshman weight change. J Am Coll Health. 2008;56(4):437-44.
19. Larson N, Neumark-Sztainer D, Laska MN, Story M. Young adults and eating away from home: associations with dietary intake patterns and weight status differ by choice of restaurant. J Am Diet Assoc. 2011;111(11):1696-703.
20. Nelson MC, Neumark-Sztainer D, Hannan PJ, Story M. Five-year longitudinal and secular shifts in adolescent beverage intake: findings from project EAT (Eating Among Teens)-II. J Am Diet Assoc. 2009;109(2):308-12.
21. Nelson MC, Story M. Food environments in university dorms: 20,000 calories per dorm room and counting. Am J Prev Med. 2009;36(6):523-6.
22. Pelletier JE, Laska MN. Campus food and beverage purchases are associated with indicators of diet quality in college students living off campus. Am J Health Promot. 2013;28(2):80-7.
23. Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better diet quality. J Am Diet Assoc. 2006;106(12):2001-7.
24. Larson NI, Nelson MC, Neumark-Sztainer D, Story M, Hannan PJ. Making time for meals: meal structure and associations with dietary intake in young adults. J Am Diet Assoc. 2009;109(1):72-9.
25. Jones SA, Walter J, Soliah L, Phifer JT. Perceived motivators to home food preparation: focus group findings. J Acad Nutr Diet. 2014;114(10):1552-6.
26. Murray DW, Mahadevan M, Gatto K, et al. Culinary efficacy: an exploratory study of skills, confidence, and healthy cooking competencies among university students. Perspect Public Health. 2016;136(3):143-51.
27. Miller SR, Knudson WA. Nutrition and cost comparison of select canned, frozen, and fresh fruits and vegetables. Am J Life-style Med. 2014;8:430-37.
28. Rickman JC, Bruhn CM, Barrett DM. Nutritional comparison of fresh, frozen, and canned fruits and vegetables II. Vitamin A and carotenoids, vitamin E, minerals and fiber. J Sci Food Agric. 2007;87:1185-196.
29. Durst RW, Weaver GW. Nutritional content of fresh and canned peaches. J Sci Food Agric. 2013;93(3):593-603.
30. Canned Food Alliance. The science behind canned food. http://www.mealtime.org/~/media/files/fact-sheets/03_canned_food_research_cfa.pdfila=en. Accessed October 2, 2017.
31. Freedman MR, Fulgoni VL 3rd. Canned Vegetable and Fruit Consumption Is Associated with Changes in Nutrient Intake and Higher Diet Quality in Children and Adults: National Health and Nutrition Examination Survey 2001-2010. J Acad Nutr Diet. 2016;116(6):940-8.

32. Canned Food Alliance. Canned food myths—busted! http://www.mealtime.org/~/media/files/fact-sheets/10_canned_food_myths_vs_facts_cfa.pdf?la=e. Accessed October 4, 2017.
33. US Department of Health and Human Services, US Department of Agriculture. 2015–2020 Dietary Guidelines for Americans. 8th ed. http://health.gov/dietaryguidelines/2015/guidelines/. Accessed May 18, 2016
34. Richards R, Brown LB, Williams DP, Eggett DL. Developing a Questionnaire to Evaluate College Students' Knowledge, Attitude, Behavior, Self-efficacy, and Environmental Factors Related to Canned Foods. J Nutr Educ Behav. 2017;49(2):117-124.