8-2022

An Exploration of System Level Dimensions of Nutrition in Relation to Health: Interprofessional Teams and Food Insecurity

McKenna Christy Voorhees
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/etd
Part of the Nutrition Commons

Recommended Citation
https://digitalcommons.usu.edu/etd/8600
AN EXPLORATION OF SYSTEM LEVEL DIMENSIONS OF NUTRITION IN RELATION TO HEALTH: INTERPROFESSIONAL TEAMS AND FOOD INSECURITY

by

McKenna Christy Voorhees

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Nutrition and Food Sciences

Approved:

Heidi J. Wengreen, Ph.D.  
Major Professor

Gretchen G. Peacock, Ph.D.  
Committee Member

Mateja Savoie-Roskos, Ph.D.  
Committee Member

Maryellen McClain-Verdoes, Ph.D.  
Committee Member

Katie Brown, Ph.D.  
Committee Member

D. Richard Cutler, Ph.D.
Vice Provost for Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

2022
ABSTRACT

An Exploration of System-Level Dimensions of Nutrition in Relation to Health: Interprofessional Teams and Food Insecurity

by

McKenna Christy Voorhees, Doctorate of Nutrition and Food Sciences
Utah State University, 2022

Major Professor: Dr. Heidi Wengreen
Department: Nutrition, Dietetics, and Food Sciences

There are infinite dimensions of, and contributors to health outcomes in vulnerable populations. Two understudied factors include interdisciplinary healthcare teams and food insecurity. Interdisciplinary teams promote optimized patient outcomes and efficiency. Registered Dietitian Nutritionists (RDNs) are well-positioned to contribute meaningfully to interdisciplinary teams; yet, understanding of the RDN in relation to interdisciplinary teams is lacking. Furthermore, approaches to interprofessional-related education (IPE) in dietetic programs to facilitate interdisciplinary skill acquisition is not well understood. The first purpose of this dissertation was to begin addressing these gaps through the examination of RDN and dietetic student attitudes of interdisciplinary teams, and survey IPE efforts within dietetics programs. Findings were significant among RDNs: clinical RDNs, higher perceptions of value from other team members, frequent participation on teams, and identifying as female related to more enthusiastic attitudes of team-based care.
More time with the RDN credential was associated with less enthusiastic attitudes. Findings were not significant among dietetic students. The utilization of multiple IPE approaches in programs may yield more favorable outcomes. Currently, the assessment of IPE competencies in students is not measured uniformly across dietetic programs, which may prohibit the determination of objective IPE effectiveness.

Food insecurity is associated with negative health outcomes and occurs when food quality or adequacy is compromised. Groups who experience food insecurity disproportionately include lower-income individuals and persons with disabilities. Accordingly, the second purpose of this dissertation was to explore food access and food insecurity four to six months following the onset of the COVID-19 pandemic among lower-income Utahns. The interaction between frequent food access challenges and children in the household, job changes, and older age were associated with food insecurity severity.

The third purpose of this dissertation was to investigate the relationship between disability, food insecurity, and self-reported health among individuals with disabilities. The main finding suggested that food insecurity may function as a possible mechanism linking disability and disparities in self-reported health.

In summary, this dissertation filled gaps in the interdisciplinary and food insecurity literature, with downstream implications for health outcomes. RDN and student perceptions of interdisciplinary teams and aspects of IPE curricula in dietetic training programs were examined, as were food insecurity in a lower-income population, and the relationship between disability, food insecurity status, and health.
PUBLIC ABSTRACT

An Exploration of System-Level Dimensions of Nutrition in Relation to Health: Interprofessional Teams and Food Insecurity

McKenna Christy Voorhees

Many factors influence health; two such factors that warrant additional research include interdisciplinary healthcare teams and food insecurity. These factors may be particularly important among vulnerable populations such as individuals with special healthcare needs, lower income populations, and individuals with disabilities.

Interdisciplinary teamwork promotes improved, and more efficient patient care through the collaboration of healthcare providers in various professional disciplines. Registered Dietitian Nutritionists (RDNs) are experts in the science and application of nutrition, which plays an important role in various disease states. Despite the established need for RDNs on interdisciplinary teams, there is limited research in the interdisciplinary scholarship targeting this profession. As a first step in determining the quality of RDN integration in healthcare teams, interdisciplinary attitudes of RDNs and students studying to become RDNs across the United States (U.S.) were analyzed. Results revealed that the specific area of specialty of the RDN (clinical RDNs), feeling more valued by other team members, more frequent participation in teams, and gender (females) were associated with more favorable attitudes of interdisciplinary healthcare teams. More time with the RDN credential was associated with slightly less favorable attitudes.
In 2017, the accreditation parameters for dietetic programs in the U.S. required that all programs include interprofessional-related education (IPE) to support students in their future readiness to participate effectively in interdisciplinary teams. As a step to determining IPE effectiveness in dietetic students, this dissertation explored various aspects of IPE, including specific IPE approaches alongside student and program director perspectives, as well as how directors determine whether students meet the IPE-related learning objectives. Main findings indicated that multiple approaches to meet IPE standards were related to higher student satisfaction of IPE. Additionally, few programs seem to be utilizing validated tools to evaluate whether students are meeting IPE-related learning objectives, which makes the broad assessment of readiness for interdisciplinary teamwork challenging.

Food insecurity occurs when the quality or quantity of available food is insufficient. Lower income individuals and persons who have a disability experience food insecurity at higher rates. This dissertation investigated the impact of the COVID-19 pandemic on food access and food insecurity in lower-income Utahns four to six months following the onset of COVID-19 (March 2020). Frequent difficulties with physical access to food in combination with children in the home were related to food insecurity severity, as were employment changes during the pandemic, and older age. This emphasizes the need for additional support and preventative efforts for lower-income families in reducing food access challenges during times of crisis, such as a pandemic.

This dissertation also examined the relationship between disability and self-reported health status, and whether food insecurity among persons with disabilities contributed to disparities in self-reported health. Results suggested that food insecurity
may play a role in poorer self-reported health in individuals with disabilities compared to individuals without disabilities. This finding is important, as it proposes that reducing food insecurity among persons with disabilities may impact health outcomes.

In conclusion, this dissertation substantially adds to existing work by investigating RDN and dietetic student attitudes of interdisciplinary teams and aspects of IPE in dietetic programs; a profession that is generally understudied in the interdisciplinary healthcare research. Moreover, this research explored food access, food insecurity, and health in vulnerable populations—lower income individuals and persons with disabilities. The exploration of food access/food insecurity among lower-income Utahns may help to reduce health burden in this population. Lastly, reducing food insecurity in persons with disabilities may impact self-reported health. Though the interdisciplinary teams-related research in RDNs and students did not directly correspond to health outcomes in the studies conducted herein, perhaps they set the stage for future research in the area.
ACKNOWLEDGMENTS

I would like to first thank my major professor, Dr. Heidi Wengreen. I am immensely grateful for her enduring patience, support, and encouragement. Without her mentorship and belief in me, I would not have pursued a Ph.D. Dr. Wengreen secured numerous opportunities for me to develop skills and knowledge along my doctoral journey in various capacities, for which I am extremely grateful.

My thanks also to each of my committee members: Drs Gretchen Peacock, Maryellen McClain-Verdoes, Katie Brown, and Mateja Savoie-Roskos, for their invaluable feedback and support throughout this process. It has been a privilege to learn from each of them. Additionally, their open-mindedness for proposed modifications brought on by the COVID-19 pandemic are greatly appreciated.

The Utah Agricultural Experiment Station (UAES) funded the research conducted in individuals with disabilities in the Intermountain West (Chapter 5) through the Seed Grant Program (PI: Guadalupe Marquez-Velarde, PhD). This grant made this, and other related projects possible.

I am grateful for my sister, Kelli, for always listening and lending words of wisdom during challenging times, and my dear parents, Pam and Kim Christy, who taught me throughout my life that I can “do hard things”. The support of my parents and parents-in-law, especially through the many hours of childcare, has meant a great deal.

Lastly, I would like to express my immeasurable gratitude for my husband, Tyler. His encouragement and support, manifested in words and through many sacrifices along the way, empowered me to accomplish my goals. Thank you for being the ultimate partner.
and friend and always being there for me. This dissertation is dedicated to you and our son. Without you, none of this would be possible.

McKenna Christy Voorhees
## CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>PUBLIC ABSTRACT</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xv</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION TO THE PROBLEM AND REVIEW OF THE LITERATURE</td>
<td>1</td>
</tr>
<tr>
<td>Abstract</td>
<td>1</td>
</tr>
<tr>
<td>Problem Statement</td>
<td>2</td>
</tr>
<tr>
<td>Provider Dimension of Health: Interdisciplinary Collaboration</td>
<td>5</td>
</tr>
<tr>
<td>Population Dimension of Health: Food Insecurity</td>
<td>16</td>
</tr>
<tr>
<td>Conclusion</td>
<td>23</td>
</tr>
<tr>
<td>References</td>
<td>25</td>
</tr>
<tr>
<td>2. A COMPREHENSIVE ANALYSIS OF RDN AND DIETETIC STUDENT PERCEPTIONS OF INTERDISCIPLINARY HEALTH CARE TEAMS</td>
<td>37</td>
</tr>
<tr>
<td>Abstract</td>
<td>37</td>
</tr>
<tr>
<td>Introduction</td>
<td>39</td>
</tr>
<tr>
<td>Materials and Methods</td>
<td>43</td>
</tr>
<tr>
<td>Results</td>
<td>51</td>
</tr>
<tr>
<td>Discussion</td>
<td>69</td>
</tr>
<tr>
<td>Conclusion</td>
<td>78</td>
</tr>
<tr>
<td>References</td>
<td>80</td>
</tr>
</tbody>
</table>
Appendix D. RDN and Dietetic student Interdisciplinary Perceptions Survey ....205
Appendix E. Dietetic Program Curriculum (IPE) Survey ..................................228
Appendix F. Food Insecurity During COVID-19 Survey ..................................235
Appendix G. Disability and Health Survey ............................................................299
Appendix H. Approval Protocol #10660 .................................................................315
Appendix I. IRB Approval Protocol #11022 ..........................................................317
Appendix J. Permission to Use Co-author Letters .................................................320

CURRICULUM VITAE .............................................................................................325
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Registered Dietitian Nutritionist (RDN) and Dietetic Student (Dietetic student) Demographic Characteristics (Gender, Location, Years in Practice, Area of Practice or Interest, and Program Type)</td>
</tr>
<tr>
<td>2-2</td>
<td>Differences in Attitudes of Efficiency and Outcomes of Team-based Care among Dietetic Students by Area of Interest, Location, Program Type/level, and Program Year</td>
</tr>
<tr>
<td>2-3</td>
<td>Registered Dietitian Nutritionist (RDN) ‘Efficiency of Team-based Care’ Score Regression Output (three models)</td>
</tr>
<tr>
<td>2-4</td>
<td>Registered Dietitian Nutritionist (RDN) ‘Outcomes of Team-based Care’ Score Regression Output (two models)</td>
</tr>
<tr>
<td>2-5</td>
<td>Mode of Collaborative Practice Endorsed by Registered Dietitian Nutritionists</td>
</tr>
<tr>
<td>3-1</td>
<td>Demographic Characteristics of Dietetic Program Directors (n = 67) and Dietetic Students (n = 137)</td>
</tr>
<tr>
<td>3-2</td>
<td>Program Type by Geographic Region for Program Directors (n = 67)</td>
</tr>
<tr>
<td>3-3</td>
<td>Program Type by Geographic Region for Students (n = 137)</td>
</tr>
<tr>
<td>3-4</td>
<td>Interprofessional Education Approaches According to Program Directors (N = 67) and Students (N = 137)</td>
</tr>
<tr>
<td>3-5</td>
<td>Time of IPE Implementation in Dietetics Programs (Director-reported) by Program Type (n = 67)</td>
</tr>
<tr>
<td>3-6</td>
<td>Time of IPE Implementation in Dietetics Programs (Director-reported) by Program Level (n = 67)</td>
</tr>
<tr>
<td>4-1</td>
<td>Demographic Characteristics of SNAP-Eligible Respondents in Utah (N = 508)</td>
</tr>
<tr>
<td>4-2</td>
<td>Predictors of Food Insecurity Severity (Ordinal Logistic Regression)</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>4-3</td>
<td>SNAP-Eligible Participants’ Level of Agreement Regarding Perceptions and Barriers to SNAP within Four to Six Months of the COVID-19 Outbreak</td>
</tr>
<tr>
<td>4-4</td>
<td>SNAP-Eligible Participants’ Level of Agreement Regarding Perceptions and Barriers to Food Programs within Four to Six Months of the COVID-19 Outbreak</td>
</tr>
<tr>
<td>5-1</td>
<td>Demographics by Disability (N =1610)</td>
</tr>
<tr>
<td>5-2</td>
<td>Average Marginal Effects (AMEs) for Direct and Indirect Effects on Disability and Self-reported Health</td>
</tr>
</tbody>
</table>
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Path Diagram of the Proposed Relationship Between Disability and Health through Food Security Status</td>
<td>5</td>
</tr>
<tr>
<td>3-1</td>
<td>Reported Evaluation Methods of Student Fulfillment of Interprofessional Education-related Learning Objectives</td>
<td>108</td>
</tr>
<tr>
<td>4-1</td>
<td>Interaction of Children in the Household and Frequency of Challenges on Degree on Food Insecurity (Ordinal Logistic Regression)</td>
<td>138</td>
</tr>
<tr>
<td>4-2</td>
<td>Risk of Severity of Food Insecurity Expressed in Odds Ratios (Final Model of Ordinal Logistic Regression)</td>
<td>139</td>
</tr>
<tr>
<td>4-3</td>
<td>Food Assistance Program Use Prior to, and within Four to Six Months of the COVID-19 Outbreak</td>
<td>141</td>
</tr>
<tr>
<td>5-1</td>
<td>Path Diagram Displaying Regression Estimates for those with any Physical Disability</td>
<td>169</td>
</tr>
<tr>
<td>5-2</td>
<td>Path Diagram Displaying Regression Estimates for those with any Non-physical Disability</td>
<td>170</td>
</tr>
<tr>
<td>5-3</td>
<td>Average Marginal Effects (AMEs) for Direct and Indirect Effects on Disability and Self-Reported Health</td>
<td>174</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION TO THE PROBLEM AND REVIEW OF THE LITERATURE

Abstract

There are a number of factors indirectly contributing to health outcomes, including within the realm of nutrition. Two nutrition-related, system-level dimensions require further exploration, one of which is provider-oriented (interdisciplinary healthcare teams) and the other exists at the population level (food insecurity). Interdisciplinary collaboration occurs when providers from various professional disciplines work synergistically to meet patient care goals. This care modality is becoming increasingly more common to facilitate optimized care outcomes. There is a paucity of research examining Registered Dietitian Nutritionists (RDNs or dietitians) in relation to interdisciplinary collaboration, as well as efforts performed at the dietetic student level to foster interdisciplinary skill acquisition despite the established need for the RDN on the team. Objectives outlined to address extant gaps in this area include investigating RDN and dietetic student attitudes of interdisciplinary healthcare teams, and how they may vary with respect to various characteristics. Food insecurity occurs when food intake quality or variety are compromised and may also involve reduced quantities of food intake. It is well understood that food insecurity is related to negative health outcomes, and it affects lower income individuals disproportionately. It is expected that food insecurity and related challenges were compounded during the COVID-19 pandemic, potentially more so among lower income groups. This dissertation aims to investigate food insecurity and food access
among a lower-income population four to six months following the onset of the COVID-19 pandemic (March 2020). Lastly, in addition to the known associations between food insecurity and health disparities, there is extensive evidence supporting the association between disability and food insecurity, as well as disability and health outcomes. An exploration of food insecurity functioning as a mechanism for the known disparities in health outcomes in relation to disability remains necessary

Problem Statement

There are infinite dimensions of, and contributors to health outcomes. Two severely understudied contributors are interdisciplinary, or interprofessional collaboration (heretofore referred to as IPC) in healthcare to optimize patient outcomes, and food insecurity. The former is primarily healthcare-provider-oriented, while the latter is a population-level predictor of health outcomes, though both have health implications, particularly among vulnerable individuals. These individuals include those with chronic, complex or multifaceted health conditions; low-income groups; and persons with disabilities.

RDNs are experts in the science and application of nutrition and are therefore well-suited to meaningfully and uniquely contribute to the interprofessional healthcare team, which is the anticipated modality of future healthcare delivery. IPC promotes the reduction in medical errors, monetary costs, and optimized efficiency in care as well as supporting quality of care and treatment effectiveness. RDNs possess the expertise needed to address aspects of both acute and chronic complex conditions
including, but not limited to gastrointestinal disorders, nutrient deficiencies, diabetes, food allergy, developmental disabilities, and malnutrition.\textsuperscript{10} RDNs are also qualified in navigating the intricacies in the determination of enteral and intravenous nutrition needs of patients.\textsuperscript{10}

Despite these estimable team contributions, representation of the RDN in interdisciplinary research is lacking.\textsuperscript{15,18,23-26} Consequently, the degree to which RDNs are effectively integrated in the healthcare team is not sufficiently understood. Additionally, the level of preparedness and demonstration of requisite interdisciplinary skills among emerging RDNs is not well known. Current and future RDN involvement on interprofessional teams may give rise to repercussions in patient outcomes. One proposed obstacle and, potentially, facilitator to RDN involvement in the team setting is attitudes regarding interdisciplinary care.\textsuperscript{24} Moreover, interdisciplinary attitudes have been associated with interdisciplinary involvement.\textsuperscript{27} Therefore, a comprehensive assessment of RDN and dietetic student attitudes of interdisciplinary healthcare teams is necessary as a foundational first step in deepening the understanding of RDN involvement and preparedness for interdisciplinary healthcare delivery to ultimately maximize the health of all individuals, including those with complex health conditions and needs.

Food insecurity, or the uncertain access to sufficient quantities and variety of food,\textsuperscript{28} is staggeringy common in the United States (U.S.), with national rates surpassing 10\% in 2019.\textsuperscript{29} Food insecurity is associated with various health conditions of concern.\textsuperscript{1} Low-income individuals\textsuperscript{1,4} and persons with one or more disabilities demonstrate higher prevalence of food insecurity\textsuperscript{7} and accordingly, the potential for coinciding health risks.\textsuperscript{1,5}
The COVID-19 pandemic presented copious hardship and devastation globally, including food access challenges.\textsuperscript{31-38} It is feasible to project that lower-income populations were likely inordinately impacted by interruptions to the food sector brought on by the pandemic. Additionally, it is expected that the impact of COVID-19 will persist beyond the near future.\textsuperscript{31,37,39} Food is a basic human right, so an early examination of food insecurity severity and associated pandemic-related factors among this population is needed to assist in the justification of policy adjustments and provisions to better support the current and future needs of these individuals.\textsuperscript{30} Hence, these research efforts, namely, the examination of food access and food insecurity among lower-income individuals, may indirectly facilitate better health outcomes among this population.

Individuals with disabilities comprise a large proportion (31.8\%) of all food insecure individuals in the United States.\textsuperscript{7,40} Considering the established associations between food insecurity and adverse health outcomes, in conjunction with the higher rates of poorer health among those with disabilities when compared to those without a disability, it is plausible to hypothesize that disability may impact health outcomes through the effect of food insecurity. In this manner, the question of a mechanism linking disability and health can be addressed and explored through mediation analysis, or the examination of how a variable may impact another (Figure 1).\textsuperscript{41} Research is needed to substantiate the relationship between disability and health outcomes through food insecurity. These efforts may in turn justify the future execution of research, including longitudinal research, examining the potential for food security to act as a mediator in the relationship between disability and health outcomes.
Figure 1. Path Diagram of the Proposed Relationship Between Disability and Health through Food Security Status

Provider Dimension of Health: Interdisciplinary Collaboration

In 2003 the Institute of Medicine (now called the National Academy of Medicine) recommended competency in five areas to prevent deficiencies in quality of care and support practitioners’ capacity to deliver optimal care. One of these five core competencies was the need for emerging clinicians to demonstrate competency in interdisciplinary teamwork to promote reliability and continuity of care for clients/patients. Interdisciplinary teamwork/IPC is essentially the culmination of separate professions, unified by the same underlying goal, integrating knowledge and expertise specific to their respective healthcare disciplines to more fully meet the individualized, diverse, and often complex needs of patients.
The complexity and individual nature of each patient’s healthcare needs often warrant the involvement of professionals from numerous professional backgrounds to optimize care. Benefits of the implementation of IPC are extensive and may include increased quality and effectiveness of patient care, thereby enhancing healthcare outcomes. Specifically, studies have demonstrated improvements in depression, diabetes, hypertension, and other disease states when employing an interdisciplinary approach. Avoidance of errors in communication is yet another beneficial feature of interdisciplinary care. Economic advantages may include efficiency and concomitant reductions in healthcare costs. Importantly, the interdisciplinary care modality has shown to be impactful in pediatric populations, as well as children and adults with special health care needs or disabilities.

Health professionals may also receive dividends resulting from the implementation of this approach to healthcare in terms of relationships among providers and personal well-being. Research suggests that interdisciplinary practice elicits increased mutual trust and respect among healthcare providers, enhanced understanding of team-member roles, and potentially improved job satisfaction and overall well-being. In all, the outlined advantages justify the promotion of the interdisciplinary modality in healthcare settings to optimize the care and well-being of both patient and provider alike.

**Interdisciplinary Teams and the Registered Dietitian**

Nutrition, as defined by the Academy of Nutrition and Dietetics (AND), is the physiological science of food and its constituents, the process by which it is absorbed and used by the body, and the way it relates to health and disease. On the other hand, dietetics,
as explained by AND, is the “integration, application and communication of practice principles derived from food, nutrition, social, business and basic sciences, to achieve and maintain optimal nutrition status of individuals and groups.” RDNs are professionals who demonstrate proficiency in both areas, having obtained, at minimum, a baccalaureate degree in a program accredited by the Accreditation Council for Education in Nutrition and Dietetics (ACEND). Dietetics programs require both rigorous academic coursework and an extensive internship, followed by the successful completion of the national Registered Dietitian Examination. Approximately 50% of RDNs have obtained advanced degrees at the master and doctoral levels.

Nutrition impacts health; therefore, the majority of RDNs work in the healthcare arena, where opportunities are plentiful for nutrition care and the associated health implications across the lifespan. Of note, clinical RDNs play significant roles in conditions such as anemia, developmental disabilities, diabetes, food intolerances and allergies, eating disorders, general pediatric care, weight management, neurological disorders, malnutrition, and many others.

Medical Nutrition Therapy (MNT) is the primary form of treatment RDNs employ in clinical settings to aid in disease treatment/management, which may range from educating patients regarding small changes in food consumption, to determining tube feeding regimens or intravenous nutrition recommendations for the medical team. MNT should be principally administered by the RDN in tandem with other health interventions. RDNs are also uniquely positioned to foster behavior change related to food and healthy lifestyles in both in-patient and out-patient settings through counseling and wellness coaching to support clients in health-related objectives for risk reduction and
disease prevention.\textsuperscript{10-11,54} In sum, the RD is a valuable and essential contributor to the medical team, the healthcare setting in general, and to the health of the patients/clients served therein.

RDNs have the skills and expertise necessary to contribute meaningfully to the healthcare outcomes of patients with various conditions and disease states, thus interdisciplinary integration/participation of the RDN is imperative.\textsuperscript{10-14} Virtually every recent AND paper, published through the \textit{Journal of the Academy of Nutrition and Dietetics}, describing the scope of practice and professional standards of the RDN emphasizes participation in interdisciplinary/interprofessional teams.\textsuperscript{10,14,55,56} Other professions from a diversity of disciplines could benefit from collaborating with a nutrition expert within an interprofessional healthcare team to foster and reinforce nutrition integration into more patients’/clients’ care throughout the lifespan and thereby, maximize health outcomes.\textsuperscript{10,13,47} Despite the established importance, RDNs are not well represented in the interdisciplinary literature.\textsuperscript{15,18,23-26} Obtaining a baseline understanding of attitudes and level of involvement within these teams on the part of the RDN is critical in determining where adjustments may be necessary to ensure optimal patient outcomes, provider interactions, and overall well-being of the RDN.

The scope and depth of RDN engagement in interdisciplinary healthcare teams is not well understood; however, because attitudes may serve as predictors of behavior, including in relation to interdisciplinary collaboration,\textsuperscript{20,27,44,57,58} there is value in exploring RDNs’ perceptions on this topic. Results may then pinpoint areas in professional practice to foster increased RDN involvement in interdisciplinary teams. Although a recent study
examined RDN interdisciplinary attitudes, it was performed among Canadian dietitians exclusively.\textsuperscript{59}

In the recent Canadian study among dietitians,\textsuperscript{59} interdisciplinary attitudes were significantly more positive among clinical dietitians compared to other nutrition specialty areas. Differences in attitudes were also observed for location; dietitians in Central Canada had significantly lower attitudes in relation to dietitians located near the Canadian West Coast. Another notable finding indicated that merely half of dietitians reported feeling valued by other members of the team.\textsuperscript{59} A reasonable next step may include examining whether the finding of perceived value by other professionals is consistent among RDNs in the U.S., and how this might correspond with attitudes of the interprofessional healthcare team.

Outside the dietetics discipline, gender has been shown to be associated with attitudes of team-based care, in that, females show greater enthusiasm regarding this care modality.\textsuperscript{60} Professional discipline is likely associated with differences in attitudes as well, where individuals from medicine disciplines have shown significantly lower attitudes than others.\textsuperscript{60} One study found that years of practice did not map onto interprofessional attitudes among faculty.\textsuperscript{60} Other research has suggested that individuals who have been fewer years of experience encounter more barriers to interprofessional collaborative practice.\textsuperscript{61} Age has illustrated mixed findings in terms of interprofessional attitudes, where it was not significantly associated with perceptions in one study,\textsuperscript{59} whereas a separate study conducted by Fulmer and colleagues (2005)\textsuperscript{62} revealed amplified changes in attitudes towards healthcare teams in a pre/post study design for older participants among health profession students. An examination of these attributes (area of specialty, location,
perceptions of value by other team members towards the RDN, gender, year of practice, and age) and the way in which they relate to RDNs’ and dietetic students’ attitudes of interprofessional teams would augment former interprofessional work.

Interprofessional Education and Dietetic Students

As exhorted by National Academy of Medicine in 2003, professions from all disciplines in healthcare should have the capacity to “coordinate, collaborate, and communicate with one another in interprofessional teams to make clinical decisions and solve ethical dilemmas”\(^{16,25,42,63}\). Additionally, in 2010, the World Health Organization (WHO) emphasized the need for collaborative-ready professionals in healthcare with a background in interprofessional education (IPE)\(^{17,64,65}\).

Establishing a direct link between interprofessional education and improvements in patient outcomes has proven quite difficult due to the complexity of such an undertaking.\(^{66,67}\) In 2015, the National Academy of Medicine conducted an appraisal of the literature surrounding IPE and associated outcomes, with the conclusion that IPE can impact attitudes, knowledge, and skills, and that there is currently “limited,” though growing indications that support the relationship between IPE and improved patient care.\(^{67}\) Therefore, continued research in this realm, including within specific professional disciplines, is essential in furthering this work as a whole.

It has been suggested that collaborative skills are not innate, or even necessarily learned in the workplace.\(^{68}\) These skills may otherwise be difficult to obtain in siloed curriculum for various healthcare programs. One article asserts that advantages of providing IPE are multi-faceted, involving the acquisition of collaborative skills that may
be applicable in many areas, thereby ensuring that graduates are sufficiently prepared to meet the demand for professionals with proficiency to operate in team settings. This may promote an enhanced understanding of the health care systems in which students will be working.\textsuperscript{25}

**Interprofessional Education and Dietetics Curricula**

Considering its value in terms of both skill acquisition and the growing link between IPE and improvements in patient outcomes, as well as the recommendations instituted by the National Academy of Medicine\textsuperscript{69} and WHO,\textsuperscript{17} it follows that all dietetics programs (Coordinated Programs, Dietetic Internships, and Didactic Programs) are required by ACEND to incorporate interprofessional education into the curriculum.\textsuperscript{69,70} However, the requirements are broad, introducing the potential for varying levels of its implementation, and implementation quality, into dietetics programs.\textsuperscript{69,70} ACEND does not dictate the specific ways in which these programs fulfill these criteria or how, exactly, learning objective evaluations are conducted.\textsuperscript{69,70} Examining how dietetics curricula across the U.S. incorporate interprofessional education in conjunction with interprofessional perceptions of dietetic students may aid in illuminating which methods best enhance interprofessional perceptions, and further indicate where modifications within programs may be beneficial to ensure that students are “collaborative-ready.”\textsuperscript{25}

Regarding examining student attitudes, developing a comprehensive understanding of dietetic students’ interprofessional perceptions may underline whether additional or modified interprofessional education is needed in accredited dietetic programs. In particular, conducting an analysis of previously identified student-oriented factors that
have been investigated in practicing RDNs, such as career interest (rather than area of specialty), location, and program level and year may be instructive. Findings elucidated by Curran and colleagues suggest that duration in the healthcare profession program is associated with more positive perceptions of interprofessional teams, although the disciplines studied did not include dietetics or nutrition. This factor should therefore be explored in the present study.

In addition to the need to investigate career interest, location, and program level/year in this population, it is expected that the type of program may influence attitudes and should therefore be examined. Accredited dietetics programs encompass the Didactic Program (DPD), the Coordinated Program (CP), and the Dietetic Internship (DI), all of which differ with respect to the supervised practice component of dietetic training. The DPD does not include the supervised practice piece, which must eventually be completed prior to eligibility for the licensure exam. The CP integrates the didactic and supervised practice simultaneously, and the DI is for students who previously completed didactic work. Although IPE requirements are incorporated in each of these programs in some respect, the fundamental differences among programs presumably yield different perceptions of team-based care.

Juxtaposing attitudes of credentialed RDNs and dietetic students could highlight disparities between the two groups. Accordingly, potential areas of enhancements in collaborative skills at both levels may be illuminated to assist in bridging any gaps between student and professional readiness for interprofessional collaboration. Surprisingly, some research suggests that alumni or graduates of programs with IPE training may demonstrate less positive regard for interprofessional teamwork compared to
students having received the training more recently; perhaps positive regard for IPC diminishes overtime. This finding has yet to be examined for the dietetics profession.

In terms of the state of the literature on IPE in dietetic programs, much of the extant literature in which dietetic students are involved focus on the effect of IPE approaches on specific disease states such as cancer or dysphagia, and aim to explore the effect of a specific IPE approach or modality. Group composition, and the efficacy of short-term IPE interventions have been investigated as well. Much of the research incorporating dietetic students have small sample sizes and may not adequately represent dietetic students generally.

In 2015, Eliot & Kolas laid foundational work for how this important topic is being included within programs by conducting a literature review, surveying various dietetic practice groups, and interviewing AND staff. Their findings were grim, detailing only eleven programs with substantial methods of IPE inclusion. Methods of IPE inclusion encompassed case studies, workshops, simulations, grand rounds, research projects, and assignments to interview other professionals. Some universities also provided experiences through student-facilitated clinics where experiential, hands-on learning could occur more frequently. This study took place prior to the implementation of the updated requirements.

Another study conducted by Eliot and colleagues, published after ACEND requirements reflected IPE requirements, built upon this work by recruiting over 500 directors of nutrition and dietetics programs, of which, just over 160 participated. Participants were surveyed with the use of a 10-item validated tool (IPE-API), measuring constructs such as courses, clinical rotations, institutional support, and standardized
assessment/evaluation in terms of IPE. Respondents used a Likert scale to rate the level of incorporation/support in each of these constructs. Though important, the authors note that a more comprehensive analysis of how IPE is being integrated into curriculum is needed, which we hope to identify in our research with the use of an exploratory, semi open-ended survey.

Further, we intend to determine when IPE is integrated into program curricula, and the perceived effectiveness of IPE efforts from the director perspective. The information we gather may reveal whether IPE is being taught in an applied, longitudinal manner which demonstrates promise in the literature, and may help to reveal areas of improvement. Additionally, to our knowledge, no study has looked specifically at student satisfaction of interprofessional education efforts in combination with curricula efforts as described by program directors. Both components may provide insight into the effectiveness of current educational approaches on this topic, expounding on the findings from the proposed broad analysis of student attitudes of interprofessional healthcare teams.

In essence, despite the evident value of the incorporation of RDNs in healthcare teams, we believe that there remain gaps for RDN inclusion and participation in some interprofessional settings. AND recommends that RDNs be actively involved in interprofessional teams. To our knowledge, there is limited research of the RDN’s perceptions of interprofessional healthcare collaboration, including among RDNs who currently work in a clinical capacity. A deeper understanding of RDN attitudes will serve as fundamental first step in understanding the extent of actual team engagement, and shed
light on the perceived quality or effectiveness of interprofessional models currently being implemented.

Further, readiness of the dietetic student to enter the field and participate in healthcare teams successfully may be dependent upon the IPE that the student receives. An assessment of attitudes may aid in deducing students’ current understanding of other disciplines and their respective roles. This may assist researchers and program directors alike in understanding where gaps may exist or in determining whether the shaping of attitudes is necessary to ensure that they are in alignment with the trajectory of healthcare prior to the formation of opinions that could detract from effective collaboration.

Collecting information regarding the ways program directors are meeting the broad interprofessional-related accreditation requirements will also contribute to the identification of areas for growth.

**Specific Aims: Provider-Oriented Dimension of Health**

1. (Study 1; Chapter 2) The first objective of this dissertation was to examine characteristics associated with RDN and dietetic student perceptions of interprofessional healthcare teams. RDN-derived attributes of interest in reference to interprofessional attitudes included area of dietetic specialty, time with RDN credential, location of practice, gender, age, frequency of reported interprofessional engagement, and the degree to which the RDN feels valued by other team members. Features of interprofessional work among RDNs were examined. Student characteristics included career interest area, location, program type (DPD, CP, and DI) and level (undergraduate-level or graduate-level), as well as year of study.
2. (Study 1; Chapter 2) The second objective was to assess and compare RDN and dietetic student attitudes of interprofessional team-based care.

3. (Study 2; Chapter 3) The third objective was to comprehensively examine the ways in which accredited dietetics programs are implementing interprofessional-related education requirements in program curricula, and whether confidence and student satisfaction may be influenced by the number of IPE approaches employed. Relatedly, timing and duration of IPE incorporation were investigated, as were the methods utilized by directors in evaluating attainment of student learning objectives.

At the crux of these aims is the intention to further the research in the field to optimize patient/client care, including among vulnerable populations and those with complex health needs.

**Population Dimension of Health: Food Insecurity**

Food insecurity is defined as “limited or uncertain access to adequate food”. Food insecurity may be further stratified into “low food security” and “very low food security”. Low food security occurs when food quality or variety is compromised, whereas very low food security, the most extreme form of food insecurity, includes the former definition as well as the presence of disrupted eating and decreased food intake. Food insecurity is associated with various detrimental health outcomes, both physical and psychological.

It is well understood that obesity is associated with food insecurity, which in itself increases the risk for gallbladder disease, high blood pressure, lipid disorders, and certain
cancers, among many others.\textsuperscript{84-86} One study noted a 13\% higher rate of obesity among those from food insecure households.\textsuperscript{87} However, obesity is not the only negative health outcome associated with food insecurity—prior scholarship has demonstrated a strong link between food insecurity and chronic disease risk, even when controlling for body mass index,\textsuperscript{1} a measure frequently utilized to define obesity.\textsuperscript{88}

In a study comprised of 41,854 lower-income adults (≤ 200\% of the federal poverty line which was $24,600 per year for a 4-person family in 2017)\textsuperscript{89} those with low and very low food insecurity were at greater risk for ten chronic diseases including kidney disease, coronary heart disease, hepatitis, and cancer when compared to high food secure adults. Notably, overall chronic disease risk was up to 200\% higher for those in food insecure households compared to food secure households, and self-assessed health was poorer among food insecure households.\textsuperscript{1} The association between worse self-reported health in food insecure individuals is supported in prior scholarship as well.\textsuperscript{90,91} Proposed mechanisms underlying the relationship between food insecurity and physical health include reduced micronutrient intake,\textsuperscript{90,92-94} reliance on low-cost foods which tend to also be energy dense,\textsuperscript{87,95} patterns of cyclic overeating when food is available,\textsuperscript{87,90,93,96} and stress-induced fat tissue accumulation.\textsuperscript{90,97,98}

A recent review by Myers\textsuperscript{99} confirmed that there is a strong relationship between food insecurity and psychological distress. Depression,\textsuperscript{82} anxiety, and sleep disorders\textsuperscript{83} are strongly related to food insecurity, with the emerging longitudinal evidence suggesting a bidirectional relationship between food insecurity and depression,\textsuperscript{82} such that depression may elicit, or contribute to, food insecurity and vice versa. In summary, food insecurity is associated with numerous detrimental health conditions, both physical and psychological.
Food insecurity prevalence is considerably higher among individuals with annual incomes below the poverty level, which was $24,858 for a household of four individuals in 2017. A commonly-used tool to measure food insecurity is the USDA food security module. This tool is centered around economic access to food; thus, it is intuitive that lower annual income is related to increased risk of economic food insecurity. Various public food assistance programs exist to attenuate food insecurity as defined by the lack of economic access to food, including the Supplemental Nutrition Assistance Program (SNAP).

SNAP is the “cornerstone” food assistance program in the U.S., typically providing support to eligible persons with a monthly income at or beneath 130% of the poverty level. Benefit provision is dependent upon household size and is disbursed in the form of an electronic card monthly which can only be utilized at authorized stores. Historically SNAP has demonstrated arguably substantial reductions in the likelihood of food insecurity; in fact, one study conducted by Ratcliffe & McKernan revealed that the receipt of SNAP benefits decreases the likelihood of food insecurity by approximately 30%. Moreover, SNAP provision may moderate the association between food insecurity and other health conditions, such as depression.

Although there are some restrictions in place for food products that recipients can purchase with SNAP dollars, they are arguably few when compared to the allowable products permitted through benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). As such, SNAP recipients may be inclined to purchase energy dense, perceivably more affordable foods with the intention of extending supplemental food dollars. The distribution of benefits at the beginning of each
month may also unintentionally reinforce cyclical eating patterns as evidenced by the frequent depletion of benefits in the first part of the month.\textsuperscript{107-109} Additionally, some studies indicate persisting food insecurity of the most extreme form among SNAP utilizers\textsuperscript{110} alongside ongoing reliance on taxing coping mechanisms,\textsuperscript{107} despite the aforementioned evidence indicating the program’s capacity to attenuate food insecurity. The purchasing, eating patterns, and coping mechanisms perpetuated by the design of the SNAP program may precipitate downstream health outcomes as described above.

Severely compounding the issue of food access in the United States was the onset of the COVID-19 pandemic, with tremendous increases in food insecurity levels noted in some locations.\textsuperscript{31,37,111,112} One Vermont study indicated that over one third of food insecure households represented in the sample were newly food insecure since the onset of COVID-19.\textsuperscript{31} Dubowitz and colleagues\textsuperscript{112} identified a staggering 80% increase in food insecurity prevalence in two food desert neighborhoods in Pennsylvania during this timeframe as well.

Myriad research studies have identified factors associated with food insecurity during the early stages of the COVID-19 pandemic. Among those disproportionately experiencing food insecurity during this time included persons who endured a job loss since the pandemic,\textsuperscript{31,113} and lower income individuals.\textsuperscript{37,111,113} Morales and colleagues\textsuperscript{111} assert that, despite prior understanding regarding lower income corresponding to food insecurity before the COVID-19 pandemic, vulnerable groups, such as lower income individuals, may have been impacted even more severely during this crisis.

Food access challenges brought on at least in part by obstacles affecting the food sector during the pandemic involved widespread consumer stockpiling of supplies in
combination with co-occurring elevated food costs.\textsuperscript{31-38} Presumably, avoidance of public spaces with the potential for exposure to COVID-19 may have intensified food access difficulties in disadvantaged individuals. An examination of the connection between these, and other physical food access challenges transpiring during the COVID-19 and associations with food security would further justify efforts to mitigate current and future food access challenges to ultimately reduce food insecurity.

In a low-income Pennsylvania food desert/low-income neighborhood, researchers identified disparities in changes to food insecurity prevalence and reported SNAP enrollment. Within the first three months of the pandemic (March-May 2020), SNAP enrollment percentages were maintained in this population despite amplified increases in food insecurity.\textsuperscript{112} Although there have been reports of general increased SNAP enrollment as of literature published in October 2020,\textsuperscript{37} an examination of SNAP utilization and use of other food assistance programs among specific demographic groups would enhance existing findings. Moreover, an appraisal of the experienced barriers to accessing SNAP benefits during the COVID-19 pandemic would direct endeavors to maximize SNAP access and benefits among vulnerable populations during crises such as a pandemic.

The dynamic nature of the pandemic and the associated ramifications warrant ongoing research. Where early food insecurity work has been carried out, it remains necessary to examine how individuals are impacted at later time points in reference to COVID-19’s origination.
Specific Aims: Population-Oriented Dimension of Health

4. (Study 3, Chapter 4) The fourth objective of this dissertation was to examine associations between the frequency of encountered food access challenges and severity of food insecurity among SNAP-eligible Utahns four to six months following the onset of COVID-19. Food assistance program use and barriers perceived by SNAP-eligible Utahns four to six months following the onset of COVID-19 were also examined.

Disability, Food Insecurity, and Health

Disability & Food Insecurity

Individuals with disabilities experience food insecurity disproportionately; indeed, persons with a disability represent over one third of all households defined as “food insecure”. The high occurrence of food insecurity in this population is not confined to a single age group or a specific type of disability, and some assert that the two are “intrinsically linked”. Food insecurity is significantly more prevalent among those with physical disabilities, visual disabilities, and mental disabilities. Targeting the attenuation of food insecurity among these individuals will contribute appreciably to the mitigation of overall food insecurity in the U.S.

Factors mediating disability and food insecurity may include poverty, as households with members who have a disability have a higher likelihood of experiencing poverty and are less likely to be employed. Additionally, physical access to food may be another barrier to food security for those with disabilities. Another likely contributor is higher medical costs, which may displace money available for food purchasing. Some research suggests that individuals with disabilities may need a substantially higher
income to prevent food insecurity to offset medical costs associated with a disability. Additionally, individuals with disabilities may have difficulty obtaining adequate access to food assistance program benefits, as increased medical expenditures may not be sufficiently accounted for when program eligibility is determined. The barriers noted here are not exhaustive, although they aid in demonstrating that disability may predispose individuals to food insecurity through various mechanisms.

The relationship between disability and food insecurity has been studied so extensively that some research is utilizing ‘causal’ terminology. Evidence progressively suggests that disability likely gives rise to food insecurity, at least in part. However, additional research is needed to explore this relationship. Furthermore, there is little research extending the nature of the relationship between food insecurity partly resulting from disability, and downstream health outcomes.

**Food Insecurity and Health/Disability and Health**

The relationship between food insecurity and health has been previously discussed in detail. Suffice it to conclude here that the strength of the relationship between these two factors is significant. Rates of obesity and chronic disease are higher among those with disabilities. Moreover, self-reported health is worse among those with disabilities, including among individuals who have a non-physical disability such as an intellectual disability.

In light of the interconnectedness of each of these variables, it stands to reason that, perhaps food insecurity functions as a contributing mechanism, mediating disability and disparities in health (Figure 1). A statistical exploration of the mediating nature of this
relationship would justify the initiation of longitudinal research exploring the same relationship to direct policy efforts.

**Specific Aims: Population-Oriented Dimension of Health**

5. (Study 4, Chapter 5) The fifth objective of this research was to explore whether an indirect effect may exist between disability and self-reported health through the impact of food insecurity, as well as the direct effect of disability on self-reported health.

**Conclusion**

In summary, this dissertation aims to examine aspects of two dimensions of health—interprofessional healthcare and food insecurity—both of which may have a particularly profound impact on vulnerable populations. Considering the RDN’s established importance on the healthcare team and coinciding underrepresentation in the existing literature, further research is needed to explicate RDN involvement in teams as well as dietetic student preparedness for team collaboration. A feasible and instructive first step in ameliorating this research gap is to explore attitudes of interprofessional healthcare teams in these populations. Additionally, determining ways in which IPE is currently delivered in dietetic programs may illuminate areas for program enhancement to maximize the preparedness of emerging RDNs for interprofessional teamwork.

The multitude of health concerns related to food insecurity as well as the disproportionate prevalence of food insecurity among lower-income populations is well established. However, the COVID-19 pandemic induced unparalleled disruption to the food sector, which likely compounded food insecurity among lower-income individuals.
Accordingly, an investigation of the relationship between food access difficulties and food insecurity among lower income populations is vital in determining responses to minimize food insecurity and ultimately, the associated health risks. Lastly, individuals with disabilities experience food insecurity disproportionately, comprising over one third of all individuals with food insecurity. Due to the strong correlations between food insecurity and health outcomes, and associations between disability and health, research is needed to explore whether there is a plausible indirect effect of disability on health outcomes through the mediator food insecurity.
**References**


   https://www.nhlbi.nih.gov/sites/default/files/media/docs/obesity-evidence-review.pdf


   https://www.who.int/health-topics/obesity


CHAPTER 2
A COMPREHENSIVE ANALYSIS OF RDN AND DIETETIC STUDENT
PERCEPTIONS OF INTERPROFESSIONAL HEALTH CARE TEAMS

Abstract

Background: The Registered Dietitian Nutritionist (RDN) is an important member of interprofessional (IP) healthcare teams; yet, there is limited research of RDNs’ and dietetic students’ perspectives of interprofessional teams.

Objective: To examine characteristics associated with IP RDN/dietetic student attitudes. Modes of IP collaboration (IPC) were also explored, as were differences in RDN and student attitudes.

Design: A cross-sectional electronic Qualtrics survey encompassing demographic questions, the Attitudes Toward Interdisciplinary Healthcare Teams scale (ATIHCT), and additional interprofessional-related items was distributed to RDNs (N = 5,018) and students (contacted through N=288 program directors) across the U.S. in January 2020.

Main Outcome Measures: ATIHCT subscale scores: (1) efficiency of team-based care (TBC); (2) outcomes of TBC.

Statistical Analyses Performed: Multiple linear regression modeled RDN characteristics (area of specialty, time with RDN credential, location, gender, frequency of IPC, and perceived team value of the RDN by other professionals) simultaneously in relation to both outcomes. Analysis of variance explored differences in scores by each student characteristic (career area of interest, location, dietetic program type (Coordinated
Program (CP), Didactic Program in Dietetics (DPD), or Dietetic Internship (DI)), level (undergraduate or graduate), and year of study). Modes of collaboration were analyzed descriptively, and an independent samples t test examined differences in subscale scores between RDNs and students.

**Results:** Efficiency of TBC: Food service ($\beta = -1.48, p = 0.004$) and sports nutrition RDNs ($\beta = -2.58, p = 0.014$) had less favorable attitudes compared to clinical RDNs. Higher perceived team value of the RDN was associated with more favorable efficiency attitudes. Outcomes of TBC: more frequent IPC ($\beta = 0.33, p = 0.04$), and higher perceived team value of the RDN ($\beta = 0.74, p < 0.001$) were associated with higher scores.

Identifying as male ($\beta = -2.81, p = 0.009$) and greater time with the RDN credential ($\beta = -0.03, p = 0.048$) were associated with less favorable attitudes of outcomes of team-based care. Findings were interpreted in relation to the inclusion of all other RDN variables of interest in the linear models. No student characteristics yielded significant differences in either subscale. Consultation and formal team meetings were endorsed by RDNs at the highest frequencies.

**Conclusions:** Specialty, frequency of IPC, perceived RDN value, gender, and time with credential are associated with IP attitudes in RDNs. To support more favorable attitudes of IPC to ultimately encourage effective collaboration, RDNs should be involved in team-based care more frequently. Efforts among other disciplines should be honed to foster appreciation and clarity of the RDN’s role.
Introduction

Interprofessional, or interdisciplinary collaboration (IPC), in healthcare involves the coordinated and complementary expertise of multiple healthcare professionals with the same overarching goal to meet the diverse, individual, and often complex needs of patients more comprehensively.¹ The use of this healthcare modality in comparison to a traditional, siloed approach is becoming increasingly recommended.² A catalyst contributing to this paradigm shift in healthcare was the Institute of Medicine’s (IOM, now the National Academy of Medicine) proposition in 2003 to reduce deficits in the healthcare system through overhauls in healthcare education. This was issued in response to noted insufficiencies in health professionals’ ability to deliver ideal care for patients.³ One central aspect of these recommendations emphasized the need for professionals to demonstrate skills in interprofessional teamwork to promote continuity of care.³,⁴

The advantages of implementing IPC in healthcare extend beyond continuity of care, positively impacting the patient, healthcare systems, and benefitting the clinician personally and professionally.²⁵⁻⁹ In terms of patient benefits, quality of care and treatment effectiveness have been described in the literature.²⁵⁻⁷,⁹ IPC has been associated with improvements in conditions such as depression which affected 17.3 million adults in the United States (U.S.) in 2017, diabetes which impacted nearly 100 million individuals in the U.S. (either prediabetes or diabetes) in 2015, and hypertension (prevalence statistics indicating that 29% of adults in the U.S. had hypertension in 2015-2016) among other disease states.⁶,¹⁰⁻¹⁶ IPC is a proposed conduit for minimizing medical errors and fiscal
costs, as well as increasing efficiency.\textsuperscript{2,3,6-7} All of these factors, among others, warrant the continued push for the incorporation of IPC into healthcare settings, as well as provider competency in IPC.

**Registered Dietitians in Interprofessional Teams**

Registered Dietitian Nutritionists (RDNs) are experts in the science and application of nutrition and should be actively involved in interprofessional teams to aid in meeting the nutritional needs of patients with acute and chronic diseases.\textsuperscript{17,18} Moreover, the Academy of Nutrition and Dietetics (AND) highlights in scope of practice, position papers, and professional practice documents the need for involvement of RDNs on interprofessional teams.\textsuperscript{17,19-21} RDN inclusion in healthcare teams may promote opportunities for the nutrition professional to educate other professionals on nutrition-related concepts to ensure consistency and accuracy of food and nutrition messages provided to patients. Further, active participation of the RDN on the care team will aid in designating suitability of direct RDN involvement in the care of a given patient.\textsuperscript{22}

A New Zealand study supports the above assertion in its assessment of the attitudes of 12 dietitians using qualitative methods (in-person semi-structured interviews) regarding what factors supported or inhibited the provision of optimal patient care. Participants indicated that multidisciplinary teams were advantageous to dietitians, other team members, and patients. An observed benefit was the fact that RDNs could, as suggested by Beckingsale and colleagues, educate other team members on nutrition-related matters.\textsuperscript{18} There remains a paucity of other research on RDN involvement on interprofessional healthcare teams.
IPE and Dietetic Students

Interprofessional Education (IPE) is thought to be an important component in acquiring the skills necessary for effective IPC. The direct link between IPE and patient care outcomes has been somewhat difficult to define; yet, a review conducted by the Institute of Medicine/National Academy of Medicine in 2015 surmised that IPE influences attitudes, knowledge, as well as skills, with limited, though increasing evidence of its impact on patient care outcomes. In 2010, the World Health Organization (WHO) recommended that healthcare professionals have a background in IPE to prepare students for IPC. Therefore, it follows that dietetics programs under the Accreditation Council for Education in Nutrition and Dietetics (ACEND) must include education related to interprofessional collaboration into dietetics curricula. However, the way in which this is accomplished in each program is not dictated by ACEND; programs may choose how these competencies are fulfilled and evaluated. Thus, it is likely that quantity and quality of IPE-related efforts, and therefore associated attitudes of IPC, among dietetics programs vary.

Numerous studies have examined IPE, with relatively few assessing IPE in dietetics programs. Some IPE studies have explored effectiveness in terms of the mode of IPE delivery, including interprofessional courses and web-based modules. Much of this research, though important to developing appropriate and effective IPE models, has been confined to individual programs or universities. A broad analysis of the current status of dietetic students across the U.S. is needed to determine where gaps may remain generally in IPE in light of the recent shifts in accreditation of all dietetics programs.
Attitudes of Team-based Care

Prior research has demonstrated that more positive interprofessional attitudes, including among RDNs, enhance collaboration of actual team-based care delivery. Therefore, there is value in utilizing validated tools examining attitudes, including perceptions related to interprofessional healthcare teams. One such measure is the Attitudes Toward Interdisciplinary Healthcare Teams (ATIHCT) scale which measures attitudes regarding efficiency and outcomes of team-based care (McClain, Schwartz, Bakner, Azad & Shahidullah, in review, 2020).

Using a similar tool, prior scholarship has examined and identified relationships regarding attitudes in relation to professional discipline, prior interprofessional experience, and gender. Student interprofessional attitudes have also been investigated albeit with little dietetic student representation. RDNs are profoundly underrepresented in the interprofessional research as a whole. One study which specifically explored RDN attitudes and interprofessional experiences identified location and specific area of specialty as important contributors to these outcomes; however, this study was termed a “Pan-Canadian” study. A comprehensive exploration of RDNs and dietetic students in the U.S. would address a troublesome gap in the literature.

Research Objectives

The purposes of this study were to expound upon existing research of interprofessional healthcare teams and were three-fold. The first objective of this study was to examine associations between the characteristics of dietetic students/practicing RDNs and their perceptions of interprofessional healthcare teams. Student characteristics
examined in relation to attitudes of interprofessional health care included student career interests, location, program type and level (undergraduate versus graduate), and year of study. RDN characteristics included area of specialty, time with credential, location of practice, gender, age, frequency of reported interprofessional engagement/IPC, and how valued the RDN perceived to be by other professionals. The second objective of this research was to explore the nature of interprofessional work among all RDNs by area of practice as well as clinical position type (inpatient versus outpatient), and employment designation (full-time, part-time, or PRN/as-needed). Finally, differences in interprofessional attitudes between RDNs and dietetic students were examined.

**Materials and Methods**

The study objectives were addressed by way of an online cross-sectional, quantitative study design in which data were gathered anonymously through Qualtrics software. The RDN sample was generated from a randomized list of roughly 5,000 RDs from a diversity of practice specialties and locations, obtained through the Commission on Dietetic Registration (CDR). This was combined with student sample data obtained via snow-ball approach through invitation of program directors nation-wide. An updated iteration of the Attitudes Toward Healthcare Teams Scale (ATHCTS), the ATIHCT scale (McClain, Schwartz, Bakner, Azad & Shahidullah, in review, 2020), was selected to measure interprofessional perceptions of students and RDNs alike.
Participants

This study was approved by the Utah State University Institutional Review Board (Protocol #10660). In addition to the acquired list of approximately 5,000 RDNs who were contacted via email, recruitment efforts occurred regionally (also via email) in healthcare facilities in the Utah and Idaho areas to bolster responses and encourage sufficient representation of RDNs working in clinical settings. Two hundred eighty-eight directors of ACEND-accredited coordinated (CP), didactic (DPD), and dietetic internships (DIs) were recruited via email and asked to forward survey information to the students they oversaw. Sixty CP, 116 DPD, and 112 DI directors were ultimately contacted; although, one DPD director’s email was invalid and another was inadvertently duplicated (DI director). Three of each type of program (CP, DPD, and DI) were selected at random from every state in the U.S. In circumstances where fewer than three of any type of program existed in a given state, all programs were invited to participate.46

Program director information was obtained from information publicly available through the AND website.6 Students were eligible to participate if they were part of any dietetics program accredited by ACEND, as well as consenting to participate after reviewing a letter of information. Participants without the RDN credential, RDNs not currently practicing, students not attending an ACEND-accredited program (n = 21), and RDNs or students who did not provide consent and/or were not at least 18 years of age (n = 2) were excluded from this study. The minimum age to participate was 18 years. To incentivize participation, respondents were provided the option to be entered into a drawing for one of eight Amazon gift cards in the amount of $25.
In total, 5,018 emails were deployed to RDNs, eight of which were sent to clinic managers for distribution to RDNs employed within the same healthcare facility. As such, the actual number of received emails is difficult to determine, though likely not substantially more than 5,018. Of the 5,010 emails obtained from CDR, 48 were not received, presumably because of incorrect or nonexistent email information. The same was true for one of the eight emails sent to RDNs in healthcare facilities in Utah and Idaho.

Participants in this study were defined as survey completers if at least 50% of core demographic-related questions were completed in addition to completion of at least 50% of ATIHCT questions. Researchers anticipated a 10% response rate, equating to approximately 500 responses from RDNs and roughly 1000 responses from students. Actual responses exceeded expectations for RDNs in terms of those who met the criteria as survey completers (n = 617; 12.3% of RDNs; 88.5% of RDNs who initiated the survey) but fell well below predicted student responses (n = 137; 87% of students who initiated the survey). A response rate was not computed for students due to the snowball recruitment method used which relied upon directors’ willingness to forward associated information to their students with no way for researchers to track receipt of this information.

Instrumentation

The survey was initially distributed mid-January 2020 and remained accessible for three weeks with two follow up emails. A series of demographic and IPC/IPE-related questions were asked, followed by a modified version of the ATHCTS (the ATIHCT scale; McClain, Schwartz, Bakner, Azad & Shahidullah, in review, 2020) totaling 28-34
questions depending on respondents’ selected answers. More questions were populated if respondents selected their primary area of practice as ‘clinical’.

The ATIHCT scale is a 13-item tool validated by researchers McClain, Shahidullah, Azad, & Schwartz (in review) through Exploratory Factor Analysis (EFA) (McClain, Schwartz, Bakner, Azad & Shahidullah, in review, 2020). The revised version is more condensed than previous versions (referred to as the Attitudes Toward Healthcare Teams Scale (ATHCTS)) and contains language inclusive of health professionals working in a variety of interprofessional settings with the addition of ‘client,’ as well as other terminology, broadening its relevance. Moreover, interdisciplinary-oriented language was included more prevalently throughout to explicitly convey the ultimate purpose of the tool which is to determine interprofessional perceptions.

The ATIHCT is intended to be analyzed in two subscales rather than as a total score. The first subscale is composed of the items centered on the efficiency of team-based care (4 items, Appendix A), and the second encompasses questions relating to outcomes of team-based care for both the provider and client/patient (9 items, Appendix A). Response options are in a Likert-scale format ranging from Strongly Disagree to Strongly Agree (1=strongly disagree; 6=strongly agree), with reverse coding where appropriate such that higher scores portrayed more favorable attitudes regarding efficiency (maximum possible score = 24) or outcomes of team-based care (maximum possible score = 54).

A diversity of disciplines was included in the original EFA validation study performed by McClain and colleagues, although a relatively small number of nutrition professionals comprised the sample (n = 5, 3.8%). Researchers of the present study, therefore, subjected the RDN and student data to a Confirmatory Factor Analysis (CFA)
followed by an EFA to first confirm the validity of the measure in both populations, and subsequently investigate whether a novel factor structure may be more suitable in these populations (Voorhees, Wengreen & Serang, in progress, 2022). Questions remained identical to those validated by McClain and colleagues, aside from a slight modification to the verbiage in two items (Appendix A).

CFA findings for the present sample warranted the utilization of the two-factor model proposed by McClain and colleagues in dietetic students. However, model fit indices were less encouraging for use in RDNs, which was reinforced by the four-factor structure proposed empirically by the EFA. Despite this finding, the scarcity of interprofessional tools that are validated among RDNs, specifically, warrant its utilization, albeit with the cautious interpretation of results.

**Summary of Statistical Methods**

All data were collated and analyzed in IBM’s Statistical Package for Social Sciences (SPSS, version 24) and R Statistical Software. The dependent variables were the ‘efficiency of team-based care’ subscale score (possible range: 4-24) and the ‘outcomes of team-based care’ score (possible range: 9-54) from the ATIHCT. Both subscale scores were examined in relation to the aforementioned characteristics of interest. Items from the ‘efficiency of team-based care’ subscale were reverse-coded where appropriate to equate higher total subscale scores with more positive attitudes regarding efficiency of team-based care (Appendix A). The alpha level for all inferential statistics was set at 0.05.
Student Analysis

Student characteristics included future career area of interest, location of residence, program type (CP, DPD/DI), level (undergraduate or graduate), and program year (first, second, dietetic internship, or other). ‘Career interests’ were collapsed into four categories: clinical nutrition, sports nutrition, community & public health nutrition, and other. ‘Other’ encompassed food service and food service management, research and education/academia, private practice, and other. Location of residence was classified as Midwest, Northeast, Southeast/Puerto Rico, Southwest, and West regions of the U.S.

Linear regression was the anticipated statistical methodology to examine the associations between student characteristics and attitudes regarding 1) ‘efficiency of team-based care’ and 2) ‘outcomes of team-based care’. However, due to the unexpectedly small sample size ($n = 137$) and the number of levels in each categorical predictor, this method was less desirable. Indeed, an initial examination of the output with the inclusion of all independent variables, for both subscales, yielded extremely low adjusted $R^2$ output (-0.024 and -0.048 for efficiency and outcomes of team-based care subscales, respectively). Variance inflation factors (VIF) were explored for the predictors using the ‘Car’ package in R, none of which produced values above 2.03. This suggests that multicollinearity was not likely the problem underlying the observed poor model fit.

Furthermore, log and square root transformations were applied to the outcome variables with no notable improvements in adjusted $R^2$, despite the relatively normal distribution of both subscale scores. Therefore, one-way between-groups analysis of variance (ANOVA) was performed for each characteristic with respect to both subscales in order to detect the presence of an omnibus difference in means within the described factors.
RDN Analysis

RDN categorical predictors of interest included RDN specialty, location of practice, and gender. Classifications of RDN specialty included clinical nutrition, food service or food service management, sports nutrition, research and education/academia, private practice, community and public health nutrition, and other. Location of practice was defined as described previously for student location of residence. Gender was categorized as female or male due to the limited number of individuals indicating a gender identity other than female or male (n = 1; Table 1) for the regression analyses.

Numeric predictor variables included the number of years since attainment of RDN credential (‘time with credential’; range: 0-51 years) and age (range: 22-86 years). Reported frequency of IPC (less than once a year, once a year, a few times a year, monthly, weekly, and daily coded as 1-6, respectively), and how valued the RDN perceived to be by other professions on the team (very undervalued, somewhat undervalued, neither undervalued nor valued, somewhat valued, and highly valued coded as 1-5, respectively).

The larger sample size of RDNs (n = 617) allowed for the utilization of multiple linear regression, wherein all categorical and numeric predictor variables were modeled concomitantly. Two separate models were fit to examine the associations between predictors and both ATIHCT subscales. A stepwise approach in which the data itself directed the inclusion/exclusion of variables was intentionally not conducted, as emerging literature supports theory-driven identification of predictor variables over selecting or retaining variables on the basis of significance levels.50
Missing Data in RDNs

Location of practice data were missing for 170 respondents (28% of RDN participants) due to an error in survey design, which was corrected immediately once identified. Consequently, these data were missing completely at random (MCAR), as missingness was not related to the observed or unobserved data. The remainder of collective missingness in the predictor variables was proportionally insubstantial (<7% of total sample size), and after examination, was assumed to be missing at random (MAR). The nature of the missingness (MCAR and MAR) suggested that multiple imputation was appropriate to attenuate potential concerns regarding bias and reductions in power. The ‘Mice’ package was used to generate 10 complete datasets for the outcome variables (‘efficiency of team-based care’; ‘outcomes of team-based care’). These datasets were pooled to illustrate the final regression models.

Mode of collaborative practice (warm hand-offs, consultations, formal team meetings, informal team meetings, and other) was explored with respect to RDN specialty through frequencies and percentages rather than through a formal chi-square test of independence. ‘Mode of collaborative practice’ was not a mutually exclusive variable; respondents had the ability to select multiple modes of collaborative practice. Form of collaboration was also descriptively cross-tabulated with clinical RDN setting (outpatient or inpatient) and employment designation (full-time, part-time, or PRN/as-needed).
Results

Demographics

The sample of dietetic students, the vast majority of whom identified as female (93%) had a mean age of 25.5 years ($SD = 6.65$) (Table 1). At the time of writing, population-level percentages were similar for sex (89% female) and age (29.1 years) in dietetic students. Geographic areas most frequently selected were the Midwest ($n = 29; 21\%$) and Urbanized areas ($n = 75; 55\%$). Forty percent of student respondents were in their first year of the program study ($n = 55$), 26% ($n = 35$) in their second year, and 15% ($n = 20$) indicated that they were in the DI phase of their program. The DI follows the completion of the accredited program’s didactic work and involves at least 1000 hours of supervised practice. Most student participants were enrolled in undergraduate-level and DPD or DI programs (73% and 65%, respectively).

Population level parameters differed from the sample statistics for both program type in level, as 47% of dietetic programs are undergraduate programs in the U.S. (compared to 73% in the sample), and 89% of all accredited programs are either the dietetic internship or DPD. When both program level and type are accounted for, the distribution of undergraduate and graduate students enrolled in CPs in the sample (undergraduate CPs = 54%) was quite like the population (undergraduate CPs = 47%). Undergraduate DI or DPD students were lower in the sample (69%) when juxtaposed to population parameters (84%). Clinical nutrition was most frequently endorsed by student respondents as the primary career interest area ($n = 66; 48\%$).
The sample was comprised of RDNs identifying as predominantly female (97%) with a mean age of 40.6 years ($SD = 13.18$ years) and 14.5 years in practice on average ($SD = 12.43$ years). The percentage of females in this sample exceeds the proportion of RDN females in the actual population by 4%, as 93% of RDNs in the general population are female.\textsuperscript{54} Average age of the RDN sample approached the average age reported at the population level (45.1 years).\textsuperscript{54} Primary area of specialty for the sample was clinical nutrition ($n = 373; 61\%$), with fewest practicing in sports nutrition ($n = 10; 2\%$).

According to Rogers,\textsuperscript{54} 52\% of all RDNs work in a clinical capacity, which resembles the sample percentage. The geographic locations represented were diverse, with most participants indicating residence in the Midwest ($n = 126; 20\%$) and Urbanized areas ($n = 299; 49\%$). In terms of sample representativeness for location of residence, the proportion of RDNs from the Midwest in the sample resembled the population percentage (24\% of RDNs in the U.S.). The distribution for other locations was reflected available population-level statistics (West = 21\%, Southwest = 11\%, Southeast = 23\%), aside from the Northeastern region of the U.S., which was somewhat lower in the sample compared to the population (21\% and 12\%, respectively).

<table>
<thead>
<tr>
<th>Demographic</th>
<th>RDN</th>
<th>Dietetic students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed Surveys</td>
<td>$n = 617$</td>
<td>$n = 137$</td>
</tr>
<tr>
<td>Age</td>
<td>$n = 607$</td>
<td>$n = 137$</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>40.64 (13.18)</td>
<td>25.51 (6.65)</td>
</tr>
<tr>
<td>Range</td>
<td>$n = 607$</td>
<td>$n = 137$</td>
</tr>
<tr>
<td>Years</td>
<td>22-86</td>
<td>18-56</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>Gender n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>597 (97)</td>
<td>128 (93)</td>
</tr>
<tr>
<td>Male</td>
<td>19 (3)</td>
<td>9 (7)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (0.2)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Location a n (%)</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwest</td>
<td>126 (20)</td>
<td>29 (21)</td>
</tr>
<tr>
<td>Northeast</td>
<td>71 (12)</td>
<td>17 (12)</td>
</tr>
<tr>
<td>Southeast</td>
<td>103 (17)</td>
<td>22 (16)</td>
</tr>
<tr>
<td>Southwest</td>
<td>45 (7)</td>
<td>19 (14)</td>
</tr>
<tr>
<td>West</td>
<td>91 (15)</td>
<td>22 (16)</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>0 (0)</td>
<td>2 (2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Location b n (%)</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbanized Area</td>
<td>299 (49)</td>
<td>75 (55)</td>
</tr>
<tr>
<td>Urban Cluster</td>
<td>94 (15)</td>
<td>30 (22)</td>
</tr>
<tr>
<td>Rural</td>
<td>43 (7)</td>
<td>6 (4)</td>
</tr>
<tr>
<td>Frontier</td>
<td>1 (0.2)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Years in Practice</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>14 (12.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Year of Study n (%)</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>First year</td>
<td>55 (40)</td>
</tr>
<tr>
<td>Second year</td>
<td>35 (26)</td>
</tr>
<tr>
<td>Dietetic Internship (DI)</td>
<td>20 (15)</td>
</tr>
<tr>
<td>Other</td>
<td>27 (20)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Area of Practice or Interest n (%)</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Nutrition</td>
<td>373 (61)</td>
</tr>
<tr>
<td>Food Service/Food Service Management</td>
<td>37 (6)</td>
</tr>
<tr>
<td>Sports Nutrition</td>
<td>10 (2)</td>
</tr>
<tr>
<td>Research and Education/Academia</td>
<td>43 (7)</td>
</tr>
<tr>
<td>Private Practice</td>
<td>32 (5)</td>
</tr>
<tr>
<td>Community and Public Health Nutrition</td>
<td>87 (14)</td>
</tr>
<tr>
<td>Other</td>
<td>35 (6)</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Program level</strong> $n$ (%)</td>
<td>$n = 136$</td>
</tr>
<tr>
<td>Undergraduate level</td>
<td>100 (73)</td>
</tr>
<tr>
<td>Graduate level</td>
<td>36 (26)</td>
</tr>
<tr>
<td><strong>Program type</strong> $n$ (%)</td>
<td>$n = 137$</td>
</tr>
<tr>
<td>Coordinated Program</td>
<td>48 (35)</td>
</tr>
<tr>
<td>Didactic Program or Dietetic Internship</td>
<td>89 (65)</td>
</tr>
</tbody>
</table>

- Two hundred nine surveys were completed without geographic information accessible to respondents due to survey configuration issue
- Urbanized area = 50,000 or more people; Urban cluster = >2500 and <50,000; Frontier = <7 people per square mile; Rural = all else

**Student Characteristics and Interprofessional Attitudes**

Overall, the mean ATIHCT efficiency subscale score was 18.00 ($SD = 2.75$) for dietetic students, or 75% of the maximum possible score, while mean score for the outcomes of team-based care subscale was 45.67 ($SD = 4.52$), or 85% of the maximum possible score. Prior to subjecting the data to ANOVA, the assumption of homogeneity of variance was verified through Levene’s test. As previously described, area of future career interest was collapsed from seven categories into four categories (clinical nutrition, $n = 66$; sports nutrition, $n = 16$; community & public health nutrition, $n = 29$; other, $n = 26$) to reduce the variability in group size. There was no significant difference in attitudes regarding efficiency ($F(3,133) = 0.50, p = 0.68$) or outcomes of team-based care ($F(3,133) = 1.40, p = 0.25$) with respect to students’ career interests (Table 2). Likewise, region of residence was not significantly associated with either subscale score (efficiency: $F(4,106$
= 1.47, \( p = 0.22 \)); outcomes: \( F(4,106) = 0.54, p = 0.54 \). Additionally, neither program type (CP or DPD/DI) nor program level (undergraduate or graduate) suggested significant differences in either subscale score.
Table 2. Differences in Attitudes of Efficiency and Outcomes of Team-based Care among Dietetic Students by Area of Interest, Location, Program Type/level, and Program Year

<table>
<thead>
<tr>
<th>Model Predictors of Efficiency &amp; Outcomes of Team-based Care</th>
<th>ANOVA 1: Career Area of Interest (df = 3, 133)</th>
<th>ANOVA 2: Region (df = 4, 106)</th>
<th>ANOVA 3: Program Type (df = 1, 135)</th>
<th>ANOVA 4: Program Level (df = 1, 134)</th>
<th>ANOVA 5: Program Year (df = 3, 133)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career Area of Interest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency: $F(p$ value)</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Outcomes: $F(p$ value)</td>
<td>0.50 (0.68)</td>
<td>1.40 (0.25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical nutrition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>17.95 (2.80)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>45.89 (4.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports nutrition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>18.56 (2.16)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>43.56 (4.90)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community &amp; public health nutrition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>17.59 (2.78)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>46.28 (4.85)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (food service, research/education, private practice, other)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>18.23 (2.97)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>45.77 (4.79)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency: $F(p$ value)</td>
<td>--</td>
<td>1.47 (0.22)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Outcomes: $F(p$ value)</td>
<td></td>
<td>0.78 (0.54)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td>Efficiency Mean(SD)</td>
<td>Outcomes Mean(SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>--</td>
<td>17.93 (2.19)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.93 (3.79)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>--</td>
<td>17.41 (2.62)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>47.24 (5.11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southeast or Puerto Rico</td>
<td>--</td>
<td>19.00 (3.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.46 (5.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwest</td>
<td>--</td>
<td>18.32 (2.94)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>46.42 (5.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>--</td>
<td>17.27 (2.81)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>44.82 (2.95)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program type</th>
<th>Efficiency: $F(p$ value)</th>
<th>Outcomes: $F(p$ value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinated program</td>
<td>--</td>
<td>0.02 (0.90)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.24 (0.63)</td>
</tr>
<tr>
<td>Didactic program or DI</td>
<td>--</td>
<td>18.04 (2.77)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.94 (4.81)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program level</th>
<th>Efficiency: $F(p$ value)</th>
<th>Outcomes: $F(p$ value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate level</td>
<td>--</td>
<td>17.78 (2.79)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.58 (4.64)</td>
</tr>
<tr>
<td>Graduate level</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficiency Mean(SD)</td>
<td>Outcomes Mean(SD)</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>18.44 (2.44)</td>
<td>45.72 (4.07)</td>
</tr>
<tr>
<td><strong>Program Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency: $F(p$ value)</td>
<td>--</td>
<td>0.51 (0.67)</td>
</tr>
<tr>
<td>Outcomes: $F(p$ value)</td>
<td>--</td>
<td>0.77 (0.51)</td>
</tr>
<tr>
<td><strong>First year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>--</td>
<td>17.80 (2.76)</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>--</td>
<td>45.05 (4.68)</td>
</tr>
<tr>
<td><strong>Second year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>--</td>
<td>17.77 (2.84)</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>--</td>
<td>45.83 (3.43)</td>
</tr>
<tr>
<td><strong>Dietetic Internship</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>--</td>
<td>18.45 (2.74)</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>--</td>
<td>46.75 (4.29)</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency Mean(SD)</td>
<td>--</td>
<td>18.37 (2.71)</td>
</tr>
<tr>
<td>Outcomes Mean(SD)</td>
<td>--</td>
<td>45.97 (5.56)</td>
</tr>
</tbody>
</table>

a. Attitudes of efficiency of team-based care score
b. Attitudes of outcomes of team-based care score
RDN Characteristics and Interprofessional Attitudes

Attitudes regarding efficiency of team-based care were relatively high with a mean score of 18.85 \( (SD = 2.72) \), or 79\% of the maximum possible score. Similarly, the mean outcomes of team-based care subscale score was 45.63 \( (SD = 4.79) \), or 85\% of the possible maximum subscale score.

Efficiency of Team-based Care

All variables of interest were initially included in a linear model, after which linear regression assumptions were examined. No violations of linearity were observed, and a q-q plot demonstrated general normality in the distribution of residuals. Additionally, there were no highly influential points detected, nor were there any obvious patterns suggesting the need for an alternative approach to a linear model. The homoscedasticity assumption was violated, as noted both visually and with the Breusch-Pagan test\(^5^\) in the Lmtest package.\(^6\) A heteroscedasticity-consistent (HC3) standard error estimator approach (sandwich estimator) was therefore employed using the sandwich package\(^5^9,6^0\) to eliminate concerns potentially arising from heteroscedasticity.\(^6^1\)

Collinearity was identified as variance inflation factors (VIF) for age and time with RDN credential exceeded four;\(^4^9\) thus, age was dropped from the model to reduce redundancy and prevent the invalidation of regression estimates. Three models comprising coefficients, \( p \) values and standard errors are conveyed in Table 3 with model one demonstrating the imputed output of the regression including age, model two exhibiting the imputed results with age dropped from the model, and the final model identical to model two, though with sandwich estimators applied.
Model three served as the final, interpreted regression model for predictors of attitudes of efficiency of team-based care. The only change in predictor variable significance when comparing the models was for frequency of IPC. The first model, which included age, attained the significance threshold while the final model (model 3) approached significance. The remainder of model predictors yielded only slight changes in $p$ values, thereby conserving remaining significance conclusions about the predictors of interest. In the initial model (Model 1, Table 3), specialty, time with credential, location of residence, gender, age, frequency of IPC engagement, and perceived team value of the RDN accounted for 14.6% of the variability in attitudes of efficiency of team-based care (adjusted $R^2 = 12.5\%$), while the models lacking the age variable were reduced slightly ($R^2 = 14.3\%$; adjusted $R^2 = 12.3\%$).

In terms of specialty in relation to efficiency of team-based care score (Model 3, Table 3), all specialties exhibited lower, or less favorable attitudes, of efficiency of team-based care when compared to clinical RDNs after accounting for the other mentioned predictor variables, apart from those indicating a specialty designation of ‘other’. The specialties with significantly different average efficiency subscale scores, however, were limited to food service/food service management ($\beta = -1.48, p = 0.004$) and sports nutrition ($\beta = -2.58, p = 0.014$) when compared to clinical RDNs. When holding specialty, time with credential, region, gender, and ‘frequency of IPC engagement’ constant, for every unit increase in perceptions of the degree to which the RDN is valued on the team, ‘efficiency of team-based care’ subscale score increased by 0.66 units ($p < 0.001$). Residual predictor variables (time with RDN credential, gender, frequency of IPC
engagement) were not significantly associated with efficiency of team-based care score. (Model 3, Table 3)

Outcomes of Team-based Care

Linear regression assumptions were investigated for outcomes of team-based care subscale scores with no deviations noted in linearity or homoscedasticity. Furthermore, there were no highly influential data points. A q-q plot suggested possible minor concerns in residual distribution normality; although the slight departure from complete normality of residuals was suspected to be of little import considering the sample size. As detailed previously, ‘age’ was highly correlated with the variable ‘time with RDN credential’. Consequently, two models are reported with the first representing the relationship between all predictor variables including age and the outcome variable, while the second model represents these relationships with age omitted (Table 4). General conclusions for each variable in relation to the outcome persisted after excluding age, aside from time with RDN credential, which demonstrated a significant association with attitudes scores in the final model only (model 2, Table 4).

Persons in the field of research and education/academia approached significantly lower attitudes of outcomes of team-based care compared to clinical RDNs ($\beta = -1.59, p = 0.055$) when time with credential, location, gender, age, frequency of IPC engagement, and perceived value of the RDN by other team members were accounted for. Individuals identifying as male tended to have lower regard for outcomes of team-based than females by 2.81 points ($p = 0.009$) when the other predictor variables were considered. Both increased frequency of IPC engagement ($\beta = 0.35, p = 0.03$) and greater perceived team value of the RDN ($\beta = 0.73, p < 0.001$) were predictive of more favorable attitudes
pertaining to outcomes of team-based care. Increased time with the RDN credential was associated with less enthusiastic attitudes of outcomes of team-based care ($\beta$=-0.03, $p = 0.048$). Approximately 9% of the variability in attitudes of outcomes of team-based care were attributed to the included variables (Table 4; $R^2 = 0.093$; adjusted $R^2 = 0.072$), which was reduced slightly from the $R^2$ illustrated in the former model (Model 1, Table 4).
Table 3. Registered Dietitian Nutritionist (RDN) ‘Efficiency of Team-based Care’ Score Regression Output (three models)

<table>
<thead>
<tr>
<th>Model Predictors</th>
<th>Model 1: Efficiency of team-based care (age included)</th>
<th>Model 2: Efficiency of team-based care (age excluded)</th>
<th>Model 3*: Efficiency of team-based care (age excluded; Sandwich Estimators utilized)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RDN specialty</strong></td>
<td>Beta (p value)</td>
<td>SE&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Beta (p value)</td>
</tr>
<tr>
<td>Reference group = Clinical nutrition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food service or food service management</td>
<td>-1.45 (0.002)</td>
<td>0.47</td>
<td>-1.48 (0.002)</td>
</tr>
<tr>
<td>Sports nutrition</td>
<td>-2.54 (0.002)</td>
<td>0.82</td>
<td>-2.58 (0.002)</td>
</tr>
<tr>
<td>Research and education/academia</td>
<td>-0.32 (0.48)</td>
<td>0.46</td>
<td>-0.33 (0.47)</td>
</tr>
<tr>
<td>Private practice</td>
<td>-0.89 (0.08)</td>
<td>0.50</td>
<td>-0.88 (0.08)</td>
</tr>
<tr>
<td>Community &amp; public health nutrition</td>
<td>-0.60 (0.07)</td>
<td>0.33</td>
<td>-0.57 (0.09)</td>
</tr>
<tr>
<td>Other</td>
<td>0.57 (0.22)</td>
<td>0.47</td>
<td>0.53 (0.26)</td>
</tr>
<tr>
<td>Time with RDN credential</td>
<td>-0.02 (0.33)</td>
<td>0.02</td>
<td>0.004 (0.63)</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference group = Midwest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>-0.51 (0.17)</td>
<td>0.37</td>
<td>-0.54 (0.22)</td>
</tr>
<tr>
<td>Southeast</td>
<td>-0.61 (0.07)</td>
<td>0.34</td>
<td>-0.57 (0.09)</td>
</tr>
<tr>
<td>Southwest</td>
<td>0.25 (0.56)</td>
<td>0.42</td>
<td>0.24 (0.57)</td>
</tr>
<tr>
<td>West</td>
<td>-0.23 (0.51)</td>
<td>0.35</td>
<td>-0.18 (0.63)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference group = Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>-0.51 (0.40)</td>
<td>0.60</td>
<td>-0.46 (0.45)</td>
</tr>
<tr>
<td>Age</td>
<td>0.02 (0.18)</td>
<td>0.02</td>
<td>--</td>
</tr>
<tr>
<td>Frequency of IPC&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.18 (0.04)</td>
<td>0.09</td>
<td>0.17 (0.06)</td>
</tr>
<tr>
<td>Perceived team value of the RDN&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.65 (&lt;.001)</td>
<td>0.12</td>
<td>0.66 (&lt;.001)</td>
</tr>
</tbody>
</table>
Table 4. Registered Dietitian Nutritionist (RDN) ‘outcomes of team-based care’ score regression output (two models)

<table>
<thead>
<tr>
<th>Model Predictors</th>
<th>Model 1: Outcomes of team-based care (including age)</th>
<th>Model 2a: Outcomes of team-based care (excluding age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDN Specialty</td>
<td>Beta (p value)</td>
<td>SE</td>
</tr>
<tr>
<td><strong>Reference group = Clinical nutrition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food service or food service management</td>
<td>-1.29 (0.13)</td>
<td>0.84</td>
</tr>
<tr>
<td>Sports nutrition</td>
<td>-1.67 (0.27)</td>
<td>1.50</td>
</tr>
<tr>
<td>Research and education/academia</td>
<td>-1.60 (0.054)</td>
<td>0.83</td>
</tr>
<tr>
<td>Private practice</td>
<td>-1.92 (0.31)</td>
<td>0.91</td>
</tr>
<tr>
<td>Community &amp; public health nutrition</td>
<td>-0.73 (0.22)</td>
<td>0.59</td>
</tr>
<tr>
<td>Other</td>
<td>0.68 (0.43)</td>
<td>0.85</td>
</tr>
<tr>
<td><strong>Time with RDN credential</strong></td>
<td>0.02 (0.53)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reference group = Midwest</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>0.44 (0.53)</td>
<td>0.69</td>
</tr>
<tr>
<td>Southeast</td>
<td>-0.38 (0.52)</td>
<td>0.59</td>
</tr>
<tr>
<td>Southwest</td>
<td>0.93 (0.22)</td>
<td>0.74</td>
</tr>
<tr>
<td>West</td>
<td>-0.23 (0.68)</td>
<td>0.56</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reference group = Female</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>-2.91 (0.008)</td>
<td>1.10</td>
</tr>
<tr>
<td>Age</td>
<td>-0.05 (0.12)</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Value 1</td>
<td>Value 2</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Frequency of IPC engagement&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.34 (0.04)</td>
<td>0.16</td>
</tr>
<tr>
<td>Perceived team value of the RDN&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.75 (&lt;.001)</td>
<td>0.21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>R&lt;sup&gt;2&lt;/sup&gt;</th>
<th>AdjR&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.095</td>
<td>0.093</td>
</tr>
<tr>
<td></td>
<td>0.072</td>
<td>0.072</td>
</tr>
</tbody>
</table>

<sup>a</sup> Frequency of engagement in interprofessional collaboration
<sup>b</sup> How valued the RDN perceived to be by other professions
<sup>c</sup> Standard error
<sup>d</sup> Final interpreted model
Mode of Collaborative Practice

In reference to each RDN specialty, consultation, formal meetings, and informal meetings were reported highest proportionally (Table 5). Clinical RDNs indicated utilization of formal scheduled meetings most prominently ($n = 286; 77\%$ of clinical RDNs) when compared to other methods of collaborative practice, as well as when compared to the reported proportion of endorsement by other specialties. Seventy-eight percent of outpatient clinical RDNs indicated participation in formal, scheduled team meetings, paralleling the high percentage of inpatient RDNs engaging in IPC in the same manner ($78\%$; Table 5). Clinical RDNs working in inpatient ($79\%$) or PRN positions ($63\%$) reported most frequent involvement in consultations (Table 5).
Table 5. Mode of Collaborative Practice Endorsed by Registered Dietitian Nutritionists

<table>
<thead>
<tr>
<th>Mode of Collaborative Practice</th>
<th>Warm hand-offs among providers n(% of RDNs by specialty)</th>
<th>Consultation n(% of RDN by specialty)</th>
<th>Formal, scheduled team meetings n(% of RDNs by specialty)</th>
<th>Informal, unscheduled team meetings n(% of RDNs by specialty)</th>
<th>Other n(% of RDNs by specialty)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RDN Specialty (N = 617)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical nutrition (n = 373)</td>
<td>168 (45)</td>
<td>286 (77)</td>
<td>288 (77)</td>
<td>233 (62)</td>
<td>28 (8)</td>
</tr>
<tr>
<td>Food service or food service management (n = 37)</td>
<td>7 (19)</td>
<td>14 (38)</td>
<td>19 (51)</td>
<td><strong>23 (62)</strong></td>
<td>5 (14)</td>
</tr>
<tr>
<td>Sports nutrition (n = 10)</td>
<td>4 (40)</td>
<td><strong>7 (70)</strong></td>
<td>6 (60)</td>
<td>7 (70)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Research and education/academia (n = 43)</td>
<td>7 (16)</td>
<td>14 (33)</td>
<td><strong>24 (56)</strong></td>
<td>16 (37)</td>
<td>12 (28)</td>
</tr>
<tr>
<td>Private practice (n = 32)</td>
<td>12 (38)</td>
<td><strong>21 (66)</strong></td>
<td>8 (25)</td>
<td>10 (31)</td>
<td>2 (6)</td>
</tr>
<tr>
<td>Community and public health nutrition (n = 87)</td>
<td>28 (32)</td>
<td><strong>41 (47)</strong></td>
<td><strong>41 (47)</strong></td>
<td>33 (38)</td>
<td>5 (6)</td>
</tr>
<tr>
<td>Other (n = 35)</td>
<td>9 (26)</td>
<td>22 (63)</td>
<td><strong>25 (71)</strong></td>
<td>19 (54)</td>
<td>2 (6)</td>
</tr>
<tr>
<td><strong>Clinical RDNs (n = 373)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Setting</td>
<td>n(% of RDNs by setting)</td>
<td>n(% of RDNs by setting)</td>
<td>n(% of RDNs by setting)</td>
<td>n(% of RDNs by setting)</td>
<td>n(% of RDNs by setting)</td>
</tr>
<tr>
<td>Outpatient Setting (n = 152)</td>
<td>89 (59)</td>
<td>114 (75)</td>
<td><strong>118 (78)</strong></td>
<td>106 (70)</td>
<td>5 (3)</td>
</tr>
<tr>
<td>Inpatient Setting</td>
<td>63 (36)</td>
<td><strong>138 (79)</strong></td>
<td>136 (78)</td>
<td>99 (57)</td>
<td>17 (10)</td>
</tr>
<tr>
<td>Employment designation</td>
<td>n(% of RDNs by employment designation)</td>
<td>n(% of RDNs by employment designation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------</td>
<td>---------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time (n = 267)</td>
<td>123 (46)</td>
<td>210 (79)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>212 (79)</td>
<td>177 (66)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part-time (n = 36)</td>
<td>19 (53)</td>
<td>28 (78)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>29 (81)</td>
<td>24 (67)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRN (as-needed) (n = 24)</td>
<td>10 (42)</td>
<td>15 (63)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 (58)</td>
<td>5 (21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 (13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bolded values denote highest frequencies/percentages in each characteristic
Comparison of RDN and Student Attitudes

An independent samples, two-tailed t test revealed that RDNs had significantly more favorable attitudes relating to efficiency of team-based care (Mean Difference = 0.86, \( t(749) = 3.34, p = 0.001 \)), though the effect size was quite small (\( \eta^2 = 0.015 \)). In contrast, though RDNs had slightly less favorable perceptions of outcomes of team-based care in reference to student perceptions, this difference was not significant (\( t(746) = -0.98, p = 0.92 \)).

Discussion

This study explored RDN and dietetic student attitudes of efficiency and outcomes of interprofessional health care teams. Primary findings included relatively enthusiastic perceptions within both groups, with menial differences in attitudes of efficiency of team-based care between RDNs and dietetic students observed. Among dietetic students, there were no significant differences in attitudes of efficiency or outcomes of team-based care with respect to career interest, location, program type, level, or year. Area of practice appears to predict attitudes of efficiency of team-based care in RDNs. For both attitudes of efficiency and outcomes of team-based care, the degree to which RDNs feel valued by other professionals on interprofessional teams was predictive of more enthusiastic perceptions when other factors were considered. Furthermore, higher frequency of IPC engagement and identifying as female were potentially associated with more favorable impressions of outcomes of team-based care in RDNs, when area of specialty, time with credential, and residence were accounted for. As a consequence of
the unbalanced sample (30 females: 1 other gender), this outcome should be interpreted cautiously. Having the RDN credential for a longer duration was associated with less favorable attitudes of team-based care.

**Student Characteristics and Efficiency/Outcomes of Team-based Care Attitudes**

The fact that there was no difference based on area of career interest in dietetic students was intriguing, as RDN findings in relation to area of specialty were significant for some specific areas and remained so even with the consideration of other potential confounders. This may suggest that experience working in the profession impacts attitudes. Nevertheless, no differences were observed in score for program type, which deviated from preliminary postulations. This observation was unanticipated due to the hands-on experiences fostered only by CPs and DIs and lacking in DPDs—these experiences (supervised practice) mimic real-world RDN work.36

The lack of variability in interprofessional efficiency and outcomes score based on year of study was also contrary to expectations, as one might presume that advancement in the program and/or additional experience would elicit higher scores. This hypothesis was also substantiated by previous interprofessional work conducted in student professionals.34 Of great import is the fact that student characteristics were examined independently, where plausible confounders were not factored into the variability shown in attitude scores. This decision was propelled by limitations in sample size and power, which future research should address. The roles of quantity, quality, and timing if IPE-related practices, which is now a required curriculum component in all accredited dietetics programs nation-wide,28,29 were not examined in the present study.
relative to interprofessional attitudes. IPE is likely an essential constituent of interprofessional perceptions in dietetic students, hence future research should examine the relationship between IPE-related factors and attitudes in dietetic students.

**RDN Objectives and Score**

Among RDNs, interprofessional efficiency attitudes were significantly more favorable in clinical RDNs compared to food service/food service management RDNs and sports nutrition RDNs. Previous findings also demonstrate a greater interprofessional/professional proclivity for dietitians working in a clinical setting in relation to those working in a community nutrition role. This suggests that, perhaps collaborative practice could be enhanced in areas outside of clinical dietetics in particular. However, the underlying rationale for the nuance with respect to which areas of specialty demonstrated attitudes differing from clinical dietitians is an area that requires further study.

Higher perceived value of the RDN by other team members was related to higher affinity for efficiency and outcomes of team-based care when other model predictors were accounted for. This finding is in alignment with some literature which suggests that interprofessional approaches impact professional relationships and thereby influence the care delivered to patients. In this study, however, it is unclear which factor precipitates the other or if the relationship is sequential in nature; that is, whether more positive interprofessional relationships improve attitudes of interprofessional collaboration, or if positive interprofessional attitudes impact professional relationships. It is also plausible that a bi-directional relationship exists in which both factors influence each other.
simultaneously. A recent study identified that merely half of RDNs felt valued by other professionals;\textsuperscript{41} therefore, an increased emphasis on cultivating strong appreciation for and understanding of RDNs among other health professionals is needed.

In light of studies identifying the relationship between increased interprofessional exposure to improved team-based attitudes,\textsuperscript{62,63} the fact that increased frequency of IPC was associated with more favorable outcomes of team-based care attitudes was unsurprising. It lends evidence to previous assertions of a possible association between interprofessional attitudes and IPC.\textsuperscript{44} This study was not able to ascertain the sequence of this relationship--specifically, which precedes the other--although it is intuitive that the two variables, attitudes and actual interprofessional engagement, may interact with one another or function bidirectionally. In contrast, the impact of this variable on attitudes regarding efficiency of team-based care was not significant.

The association between time with RDN credential and attitudes regarding outcomes of team-based care was anticipated, although not in the direction that researchers initially hypothesized. Longer time in practice was thought to correlate with increased interprofessional exposure and thereby, more favorable attitudes. Findings instead indicated that longer time with the RDN credential was associated with slightly less favorable attitudes regarding outcomes of team-based care. It is possible that interactions exist between time with credential, area of specialty, and perhaps a third dimension involving frequency of IPC engagement and interprofessional attitudes. The relationship may be further impacted, and potentially explained, by the amplified focus on interprofessional teams in the profession of dietetics, particularly within the past six years,\textsuperscript{38} in part due to shifts in accreditation requirements involving IPE.\textsuperscript{28,29} This is also
supported by findings identified by Asher and colleagues, where dietitians with fewer years in practice were more positively oriented to IPC. Longitudinal research is needed positioned to clarify these observations.

Gender was a significant predictor of attitudes regarding outcomes of interprofessional team-based care exclusively, with females tending to possess more positive opinions. This gender difference is consistent with previous research utilizing versions of the ATHCTS, indicating that gender, indeed, could play a role in interprofessional attitudes within this discipline as it appears to in others. However, despite prior research findings, this assertion is delivered cautiously, as the proportion of females to males was especially imbalanced in the current study. On the other hand, making any interpretations with regard to gender in the RDN population is inherently quite difficult, due to the fact that persons identifying with a gender other than ‘female’ currently comprise roughly seven percent of those credentialed. It should also be noted that one study did not find statistical differences in terms of gender with the use of a version of the ATHCTS.

Past interprofessional-oriented research among dietitians in Canada identified that location was a factor of significance, which was not found to be the case in the current study which examined RDNs in the U.S. Instrumentation was not identical in these two studies, however—perhaps region does not influence attitudes of interprofessional attitudes among RDNs in the U.S., though relationships between region and other interprofessional/interprofessional features, extending beyond attitudes of healthcare teams, may be significant and meaningful.
**RDN and Dietetic student Score Comparison**

The significant, though small difference in efficiency score for RDNs and dietetic students, in conjunction with nonsignificant differences in perceptions of interprofessional outcomes is informative. Because overall mean scores were quite similar, it indicates that student IPC attitudes are largely aligning with RDNs. The mechanisms underlying the arguably narrow gap between RDN and student perceptions accompanying these findings is not discernable considering the simplicity of the modeled relationship. Indeed, various omitted variables may impact the strength, direction, and potential statistical significance of these findings. Moreover, the ATIHCT may not measure attitudes identically among the two populations, as configural measurement invariance was a potential concern underscored by differing CFA and EFA findings among these two samples (Voorhees, Wengreen, & Serang, in progress, 2022).

**Mode of Collaboration**

Collaboration seems to be most frequently occurring through consultation and formal scheduled team meetings among RDNs of various areas of specialty, though logically, most prominently for clinical RDNs. Among clinical RDNs, proportionally, these modes of collaborative practice were nearly equally common among those working in both outpatient and inpatient settings. Clinical RDNs working in a PRN role reported relatively high endorsement of both of these modes when compared to PRN RDNs’ endorsement of other collaborative methods. Although, in reference to the percentage of collaborative practice in the same forms among full-time or part-time RDNs, the percentage was less extreme (63% and 58% of PRN endorsement compared to 78-81% of
full-time and part-time RDNs). PRN RDNs likely have fewer opportunities to engage collaboratively in general. The nuance and effectiveness of all mediums of collaborative practice were beyond the scope of the present study, but may be investigated effectively through future research, particularly in the form of qualitative studies. Moreover, these relationships could not be verified by formal statistical analyses considering the multiplicity of the modes of collaboration endorsed by participants, which violates the assumption of independence of observations required for many statistical procedures.

**Limitations**

Despite the various strengths of this study, limitations exist which necessitate further discussion. A principal limitation is derived from the discrepancy in the prior validation of the ATIHCT among RDNs and dietetic students, where the two-factor model characterized by the latent variables ‘attitudes regarding efficiency of team-based care’ and attitudes relating to ‘outcomes of team-based care’ (McClain, Schwartz, Bakner, Azad & Shahidullah, in review, 2020) was confirmed in dietetic students but less certain in RDNs (Voorhees, Wengreen, & Serang, in progress, 2022). Accordingly, the conclusions drawn regarding RDNs should be re-evaluated after future modifications are implemented and validity confirmed in the ATIHCT in RDNs. Although this is a notable limitation, it may also be viewed as a strength, as validation measurement of an interprofessional tool among samples of RDNs and dietetic students, particularly of this magnitude, has not formerly been performed to the authors’ knowledge.

Another limitation is the fact that use of this version of the tool made direct comparison of ATHCTS scores from disciplines in some previous research infeasible at
this point; however, the inclusive verbiage and promising initial validation studies of the ATIHCT suggest more prolific utilization in the future. Unfortunately, there was a fairly limited response rate, and the possibility of response bias cannot be ignored. Perhaps those who responded were those most interested in interprofessional teams, thereby inflating interprofessional collaboration scores. Another concern, which has been addressed in great detail above, is the dearth of male participants and respondents identifying as other genders. We also acknowledge the limitation of missing data for geographic region for 209 responses due to an error made in the skip logic of the survey. Omitted variable bias is an enduring issue in research, though even more so when sample size limits the number of variables which may be accounted for in statistical modeling. Finally, it should be noted that this research did not objectively measure actual interprofessional collaboration or the effectiveness of collaboration; future studies should extend this research accordingly.

**Strengths**

This study contributed to a continually growing, and important area of research, and aligns with a rousing call-to-action recently declared in the dietetics profession.\textsuperscript{38} RDNs and dietetic students have historically been profoundly overlooked and underrepresented in the past despite the RDN’s important role on the interprofessional team.\textsuperscript{31,38-40} To our knowledge, this is the only study to date that has measured interprofessional-related perceptions of RDNs in tandem with dietetic students, in addition to performing robust psychometric testing prior to doing so in the same samples investigated. Both samples (RDNs and dietetic students) represented a diversity of
regions, areas of specialty, ages, and program types, among others across the U.S., building on other work performed in Canada. The results in this study may serve as a comprehensive summary of baseline interprofessional attitudes of RDNs and dietetic students to inform where efforts may best be targeted to ultimately improve patient care outcomes.

**Future Research**

In addition to what has been discussed, there are many future research opportunities relating to the findings revealed in the present study. An exploration of how individual team members value one another, rather than interprofessional collaboration alone, would be quite informative and shed light on where role clarity or interprofessional relationships may be improved upon and strengthened to foster improved patient care.

Another aspect of interest would involve exploring the effectiveness of various modes of interprofessional collaboration. Obtaining the patient or family perspective regarding elements of interprofessional collaboration in combination with the professional perspective could evoke a host of meaningful findings as well. Lastly, future research should look at the implementation of professional-level IPE occurring in health care settings among RDNs, and determine the impact on attitudes, efficiency, and outcomes for patients. Efficacy of educational interventions for students should also be examined.
Conclusion

This article elucidated factors that contribute to attitudes regarding efficiency and outcomes of team-based care among RDNs and dietetic students, as well as how RDNs are collaborating. These findings are valuable as more positive attitudes may engender enhanced collaboration.\textsuperscript{62,63} Generally, RDNs and dietetic students appear to positively perceive both aspects of team-care, with slightly more enthusiasm regarding efficiency of teams in RDNs compared to students. Of the primary characteristics studied, statistically significant associations were observed within RDNs for area of specialty, gender, frequency of engaging in interprofessional collaboration, time with credential, and how valued the RDN perceived to be by other professionals. Clinical RDNs, females, higher IPC frequency, and higher perceived value of the RDN predicted more positive attitudes of team-based care once time with RDN credential and location of practice were also accounted for. Greater time with credential was associated with slightly less enthusiastic perceptions of outcomes of team-based care. No differences in either interprofessional efficiency/outcomes attitudes were observed among students with respect to area of career interest, region of residence, program type, program level, or year. Consultation and formal team meetings are often how interprofessional collaboration occurs.

This research provided important baseline information of RDN and dietetic student attitudes and factors related to those perceptions, which is a discipline not extensively studied in the interprofessional literature. The comprehensive analysis of the data obtained from this study serve as a springboard in determining where efforts may be honed or modified to enhance RDN interprofessional attitudes, actual collaborative
engagement, and ultimately, patient care outcomes. Emphasis should be placed on increasing the frequency of RDN interprofessional engagement, which may be attained through a combination of infrastructural support and RDN assertiveness in advocating for involvement within teams. Education of the RDNs role and value should be reinforced to other healthcare professions in their respective healthcare programs, as well as post-graduation. Future research may utilize the version of the tool used in this study in other professional disciplines for comparison of interprofessional perceptions. Research may also explore team members’ perceptions and degree of value of each other’s roles, examine the effectiveness of approaches to interprofessional collaboration (e.g. consultations, formal meetings, warm hand-offs, etc.), and acquire information on patient perspectives.
References


40. Schroeder A, Pole D, Eliot KA, Rahman RS, Toomey E. Perceptions of healthcare professional students on the roles and responsibilities of the Registered


CHAPTER 3
INTERPROFESSIONAL EDUCATION IN DIETETICS PROGRAMS: STUDENT AND DIRECTOR PERSPECTIVES

Abstract

**Background:** Interprofessional Collaborative Practice (IPCP) is an approach that is well-positioned to optimize healthcare delivery and outcomes. Accreditation standards for dietetic programs were recently modified (2017) to require interprofessional-related education (IPE) to foster IPCP readiness among budding RDNs.

**Objective:** To examine how and when IPE is incorporated in dietetics programs across the U.S. Number of IPE approaches in relation to level of student satisfaction with IPE and directors’ degree of confidence in students to effectively engage in IPCP was also explored. The amount of time spent on IPE (in hours), as described by program directors, was investigated, as were evaluation methods employed to determine student attainment of IPE learning objectives.

**Design & Participants/Setting:** This study utilized an online, cross-sectional Qualtrics survey to collect data in program directors ($N = 67$; 23% response rate; $n = 17$ coordinated program (CP), $n = 22$ didactic program (DPD), $n = 28$ dietetic internship (DI)) and dietetic students ($N = 137$). Students were contacted via snowball sampling through directors.

**Main Outcome Measures:** IPE approaches were coded as ‘lectures’, ‘assignments’, ‘direct experience’, and ‘case studies or facilitated multidisciplinary interactions’. Timing
of IPE was defined in terms of program year (‘first’, ‘second’, ‘third’, ‘fourth’, ‘other’). Director level of confidence was measured on a 10-level scale while student IPE level of satisfaction was conveyed through a 7-level scale; higher values reflected higher confidence or satisfaction, respectively.

**Statistical Analyses Performed:** IPE approaches and timing of implementation were summarized informally with counts/percentages. Spearman’s rank-order correlations explored number of IPE approaches (range: 0-4) with respect to director confidence/student satisfaction, as well as time spent on IPE in relation to director confidence. Multiple linear regression analyzed director confidence (outcome variable) regressed on the possible interaction between number of IPE methods utilized and time spent on IPE, accounting for program type (CP, DPD, DI) and level (undergraduate, graduate). Ways in which IPE objectives are being evaluated was an open-response survey item and were coded accordingly.

**Results:** Multiple approaches were endorsed by both samples, though case studies (79%) and direct experience (73%) were reported most frequently among directors and lectures (86%) among students. Implementation of IPE was reported most often in years 1/2 and 3/4 in CP and DPD directors, respectively. Number of IPE approaches was associated with student level of IPE satisfaction ($r(135) = 0.47$, $p < 0.001$), though not with director level of confidence ($p = 0.486$) after accounting for program type/level, and time spent on IPE. Time spent on IPE was significantly associated with director level of confidence when these variables were examined independent from other variables ($r(45) = 0.33, p = 0.025$). Four modes of evaluation were identified, with significant variability in
subclassifications: 1) evaluations involving multiple disciplines, 2) evaluations centered on activities completed independently by students, 3) rotation evaluations, and 4) other.

**Conclusions:** IPE in dietetics programs is multidimensional, involving combinations of approaches. Number of IPE approaches is associated with student level of satisfaction, though not with director level of confidence after accounting for program type/level, and time spent on IPE. Increased time dedicated to IPE is associated with higher level of director confidence. Evaluation methods of student attainment of IPE objectives were diverse and often not easily distinguished from the approach itself. Utilization of validated measures to examine IPE effectiveness/attainment appears to be sparse.

---

**Introduction**

**Interprofessional Collaborative Practice**

Interprofessional collaborative practice (IPCP) engages multiple health care professionals to work in tandem with patients and their families, optimizing health care delivery.\(^1\) IPCP is particularly important for patients experiencing chronic or highly complex conditions requiring the expertise and skillset of providers with various backgrounds.\(^2\) Although the concept of interprofessional teamwork is not novel, interest intensified approximately 20 years ago due to concerns highlighted by the National Academy of Medicine regarding compromised patient safety resulting from medical errors.\(^3\) Lack of effective collaboration in the healthcare setting may underpin these concerns, giving rise to initiatives such as the Quadruple Aim.\(^4,5\) The Quadruple Aim is
focused on health care improvements at the patient level, population/community level, the healthcare system as a whole, and work life enhancement of health care providers.\textsuperscript{4,5}

Although efforts have been made to reduce medical errors in the United States (U.S.), concerning rates persist. Furthermore, the US health care system continues to be one of the costliest in the world, lacking evidence of associated health outcome superiority potentially resulting from insufficient collaboration among healthcare team members.\textsuperscript{1,3,6,7,8,9} The issues identified by the National Academy of Medicine and the staggering prevalence of chronic disease in the United States\textsuperscript{10} warrant a focus on quality training centered on IPCP early in the future health care professional’s education, with consistent reinforcement before the initiation of professional work, and beyond.\textsuperscript{5,11,12,13}

**Interprofessional Education in Dietetics**

Interprofessional education (IPE) fosters enhanced outcomes in healthcare through the interactive teaching and learning from students across at least two disciplines.\textsuperscript{1,14,15} Registered Dietitian Nutritionists (RDNs) are positioned to meaningfully contribute to interprofessional teams\textsuperscript{16,17,18} for a multitude of disease states across the lifespan.\textsuperscript{17} Indeed, RDN scope of practice, outlined by the Academy of Nutrition and Dietetics (AND) emphasizes RDN involvement in interprofessional teams to improve patient outcomes considering the number of disease states for which RDNs play a critical role.\textsuperscript{16} Thus, to encourage readiness for IPCP and ultimately promote optimal patient outcomes,\textsuperscript{19} quality IPE incorporation into dietetics education programs is paramount.

The Accreditation Council for Education in Nutrition and Dietetics (ACEND) oversees the accreditation of dietetics education programs to support student
preparedness and competency for eventual professional practice.\textsuperscript{20} In 2017, ACEND made great progress in supporting IPE in dietetics curricula by amending requirements to include knowledge of interprofessional teams and the roles of other disciplines (KRDN 2.2; KRDN 2.5), and the ability to work within interprofessional teams (CRDN 2.4).\textsuperscript{21} These two ACEND standard revisions were maintained in the 2022 Accreditation Standards.\textsuperscript{22} However, despite these advancements, it is likely that the quantity and quality of IPE varies widely among programs and locations with possible implications regarding IPCP readiness.\textsuperscript{21,22}

IPE literature in the field of dietetics has evaluated specific approaches to IPE and IPE-related work alongside changes in attitudes, knowledge, and various other outcomes.\textsuperscript{2,11,14,23-31} Features of IPE that have been investigated include group composition,\textsuperscript{24} the effectiveness of online or simulation-based interprofessional learning,\textsuperscript{26,27,29,32} and the influence of student adaptability on IPE receptiveness.\textsuperscript{31} Although the terminology used in ACEND requirements does not constrain programs to incorporate true IPE according to the previously described definition,\textsuperscript{1,14,15} the term “IPE” will be used in this paper to represent the interprofessional-related approaches directors described to meet aforementioned CRDN and KRDN standards.\textsuperscript{21} The IPE context, namely, the particular disease state wherein IPE is delivered has included cancer,\textsuperscript{25} dysphagia, and other feeding disorders.\textsuperscript{27,33} To date, most of the dietetics-related IPE research has been conducted in a localized fashion; there is a paucity of research exploring IPE in the field of dietetics from a broader perspective.\textsuperscript{34,35}

Eliot and Kolasa (2015) identified dietetics programs exemplifying IPE, with findings suggesting that IPE implementation in dietetics education was very limited at the
time. In fact, the authors only discussed seven dietetics programs implementing IPE.\textsuperscript{34} This work preceded the addition of interprofessional knowledge and competency requirements in the 2017 ACEND standards.\textsuperscript{21} A broad update of IPE in nutrition and dietetics was released in 2021, outlining relevant changes in accreditation standards, scope of practice, and standards of professional practice documents.\textsuperscript{6} Another study examined institutional IPE readiness of dietetics programs; however, this study was conducted before accrediting changes occurred.\textsuperscript{35} Despite these meaningful contributions, there remains a gap in the literature regarding IPE incorporation in dietetics curricula since accreditation standards have been modified.\textsuperscript{21} Furthermore, due to the flexibility allowed in the fulfillment of ACEND requirements,\textsuperscript{21} it is likely that the breadth, frequency, intensity, and overall approach to IPE differ considerably among programs. Obtaining a snapshot of interprofessional-oriented education efforts employed by dietetics programs will begin to clarify opportunities for growth in the profession. Therefore, the purpose of this research is to comprehensively explore ways in which dietetics programs nation-wide meet accreditation curriculum requirements involving interprofessional education. Other factors to be investigated include: 1) the number of IPE approaches employed in tandem with perceived effectiveness and student satisfaction, 2) when the topic is primarily addressed, as well as 3) the amount of time spent on interprofessional-related education with respect to perceived effectiveness. An examination of the number of IPE methods and associated perceived effectiveness when accounting for time spent on IPE activities and program type was also performed. Lastly, evaluation methods of interprofessional student learning were explored.
Materials and Methods

Participants

This cross-sectional, survey-based study was approved by the Utah State University Institutional Review Board (Protocol #10660). ACEND oversees the accreditation process for coordinated programs in dietetics (CP), didactic programs in dietetics (DPD), and dietetics internship programs (DI). CPs include both didactic work and supervised practice hours required for the RDN credential examination, while DPD and DI programs provide didactic course work and supervised practice hours in isolation. For every state in the U.S., all program types were contacted, except in the case where more than three programs of a given type existed. (CP, DPD, DI). If more than three CP, DPD, or DI programs existed in a state, three were selected at random. At the time of writing, 60 CP, 215 DPD and 260 DI programs were ACEND-accredited, and directors were contacted from information publicly available through ACEND.

Directors were also asked to disseminate information regarding a separate student-centered survey to students enrolled in their programs. Students enrolled in the selected ACEND accredited program aged 18 years or older and provided consent to participate were included. Completion of 80% or more of the director-related survey, and at least 50% completion of demographic and instrument-specific items of the student survey, defined survey completers. The way survey completion was defined in directors and students differed due to fewer survey items in the director survey. Qualtrics software was the selected survey platform.
To encourage participation, individuals were given the option to enter a drawing for one of eight $25 Amazon gift cards. Two hundred eighty-eight directors were contacted (60 CP; 116 DPD; 112 DI); however, one email was invalid and another duplicated (DI and DPD, respectively). Sixty-seven of the 78 indicating program directorship of a dietetics program (86%) completed at least 80% of the program director survey, of which 17 directed CPs (28% of CPs contacted), 22 oversaw DPDs (19% of DPDs contacted), and 28 indicated directorship of DIs (25% of DIs contacted). Overall response rate for program directors was 23%. One hundred thirty-seven students were classified as *questionnaire completers*. Student response rates could not be computed due to the snowball approach employed, wherein survey distribution was dependent on the directors’ willingness to disseminate student information.

**Instrumentation**

Surveys were accessible online for three weeks, beginning in January 2020. Following initial survey dissemination via email, two follow-up email invitations were sent each week following initial recruitment.

**Director Questionnaire**

Qualtrics surveys were devised separately for directors and students. To the authors’ knowledge, a formal, validated tool evaluating ways in which interprofessional education was imbued within dietetics programs did not exist at the time of study. Therefore, the formulation of an exploratory program director questionnaire was necessary. An anonymous 10-item questionnaire was developed, composed of multiple choice, multiple response, and open-ended questions. Survey questions involved
demographic information \((n = 4)\), ways in which ACEND interprofessional standards were being attained \((n = 1)\); multiple-response item), when the topic was addressed, and the amount of time spent on the subject. Evaluation methods for examining student attainment of interprofessional learning objectives was also queried, as well as directors’ degree of confidence in student ability to function within collaborative teams upon program completion. The questionnaire underwent expert review from six nutrition and dietetics professionals; five of the six were employed in academia, and one had experience in the dietetic program accreditation process.

**Student Questionnaire**

The 29-item, anonymous student questionnaire was composed of demographic questions, a slightly modified version of the Attitudes Toward Interdisciplinary Health Care Teams Scale (ATIHCT) (McClain, Schwartz, Bakner, Azad & Shahidullah, in review, 2020), and three questions relating to IPE. The ATIHCT is a measure of perceptions relating to outcomes and efficiency of team-based care, previously validated in a diversity of healthcare professions. IPE items encompassed student perceptions of IPE approaches, the degree of satisfaction associated with IPE, and whether students had received IPE at the time of study. For the purposes of this research, only the demographic and IPE-related data were relevant.

**Statistical Methods**

All statistical analyses were performed with The Statistical Packages for the Social Sciences (SPSS, version 24)\(^{41}\) and R Statistical Software.\(^{42}\) The majority of data analyses were descriptive, considering the exploratory nature of the study, with IPE
approaches summarized in isolation from both the student and director perspective. Spearman’s rank-order correlation was used to explore the relationship number of approaches utilized (possible range: 0-4) and director level of confidence (possible range: 0-10, with higher values suggesting greater confidence) in students’ capacity to work within interprofessional teams or student level of satisfaction (possible range: 0-7, with higher values suggesting greater satisfaction).

To examine when IPE-related ACEND requirements were addressed in programs, cross-tabulation of the year in which IPE was incorporated and program type (CP, DPD or DI) and level (undergraduate; graduate) was demonstrated informally. A formal \( \chi^2 \) Test of Independence was not performed due to the sparsity of cell counts for some variable combinations, in addition to a lack of mutual exclusivity between cells.

A Spearman’s Rank-Order Correlation was employed to assess the amount of time spent, in hours, on IPE and directors’ level of confidence in students’ ability to function in an interprofessional team upon graduation. Data were not normally distributed, with exaggerated right skew noted--reported time spent on IPE varied considerably, with two particularly pronounced outliers (1000 and 1288 hours). Outliers were removed for this analysis.

Multiple linear regression was selected to investigate the potential relationship between the number of IPE methods reported by directors, and level of confidence in student interprofessional performance, accounting for the amount of time spent on IPE in a given program as well as program type/level. It was predicted that the relationship between number of IPE approaches and confidence would depend on time spent on IPE;
thus, an interaction between these number of IPE approaches and time spent on IPE was tested in the model. Alpha levels were set at .05 for all statistical analyses.

Evaluation methods of student attainment of IPE learning objectives, as reported by program directors, were analyzed and coded by two researchers. One researcher (Voorhees, M) coded the evaluation data independently, and an additional researcher (Wengreen, H) subsequently verified the suitability of codes.

Results

Director Demographics

The program most prominently represented was the DI \((n = 28; 42\%)\), which nearly aligns with the percentage of ACEND-accredited DIs in the U.S. with respect to CP and DPD programs (49%). In contrast, CPs composed 25% of the sample compared to 11% of dietetics programs in the U.S. Similarly, DPD programs differed in the proportion represented in the sample in relation to all U.S. accredited dietetics programs, but demonstrated a lower percentage in the sample compared to the U.S. (33% and 40%, respectively) rather than higher as observed with CPs. Thirty-five percent \((n = 6)\) of CPs were at the graduate level, compared to 4.5% of DPDs \((n = 1)\) and 86% of DIs \((n = 24)\). Seven areas of specialty were endorsed with clinical nutrition being the most prominent \((n = 30, 45\%)\). Thirty-three states and one territory (Puerto Rico) were
represented in the sample of dietetics directors. Most programs were located in the Midwest ($n = 22; 33\%$), and Southeast ($n = 18; 27\%$), (Table 1; Table 2). The distribution of programs by geographic location reflects distribution of all ACEND programs generally in terms of percentage of all program types in each region, aside from Midwest and Southwest locations, which comprise 24\% and 12\% of programs, respectively.

Table 1. Demographic Characteristics of Dietetic Program Directors ($n = 67$) and Dietetic Students ($n = 137$)

<table>
<thead>
<tr>
<th>Director Characteristics</th>
<th>$n$</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>17</td>
<td>25%</td>
</tr>
<tr>
<td>DPD</td>
<td>22</td>
<td>33%</td>
</tr>
<tr>
<td>DI</td>
<td>28</td>
<td>42%</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>32</td>
<td>48%</td>
</tr>
<tr>
<td>Graduate</td>
<td>31</td>
<td>46%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>6%</td>
</tr>
<tr>
<td>Director Area of Specialty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical nutrition</td>
<td>30</td>
<td>45%</td>
</tr>
<tr>
<td>Food service or food service management</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>Sports nutrition</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Research and education/academia</td>
<td>9</td>
<td>13%</td>
</tr>
<tr>
<td>Private practice</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>Community and public health nutrition</td>
<td>15</td>
<td>22%</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>9%</td>
</tr>
<tr>
<td>Region of United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>22</td>
<td>33%</td>
</tr>
<tr>
<td>Northeast</td>
<td>12</td>
<td>18%</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>2</td>
<td>3%</td>
</tr>
</tbody>
</table>
Southeast 18 27%
Southwest 5 7.5%
West 8 12%

**Student Characteristics (n = 137)**

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Mean (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 (6.65)</td>
<td></td>
<td>18-56</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program Type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinated Program</td>
<td>48</td>
<td>35%</td>
</tr>
<tr>
<td>Didactic Program</td>
<td>89</td>
<td>65%</td>
</tr>
<tr>
<td>Dietetic Internship</td>
<td>20 (of 89 Didactic students)</td>
<td>22% of 65% Didactic students</td>
</tr>
</tbody>
</table>

| Undergraduate | 100 | 73% |
| Graduate     | 36  | 26% |

<table>
<thead>
<tr>
<th>Year in Program</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>55</td>
<td>40%</td>
</tr>
<tr>
<td>Second</td>
<td>35</td>
<td>26%</td>
</tr>
<tr>
<td>Dietetic Internship for didactic students</td>
<td>20</td>
<td>15%</td>
</tr>
<tr>
<td>Other</td>
<td>27</td>
<td>20%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area of Interest</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical nutrition</td>
<td>66</td>
<td>48%</td>
</tr>
<tr>
<td>Food service or food service management</td>
<td>1</td>
<td>0.7%</td>
</tr>
<tr>
<td>Sports nutrition</td>
<td>16</td>
<td>12%</td>
</tr>
<tr>
<td>Research and education/academia</td>
<td>5</td>
<td>4%</td>
</tr>
<tr>
<td>Private practice</td>
<td>15</td>
<td>11%</td>
</tr>
<tr>
<td>Community and public health nutrition</td>
<td>29</td>
<td>21%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region of United States</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwest</td>
<td>29</td>
<td>20%</td>
</tr>
<tr>
<td>Northeast</td>
<td>18</td>
<td>13%</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Southeast</td>
<td>25</td>
<td>18%</td>
</tr>
</tbody>
</table>
Table 2. Program Type by Geographic Region for Program Directors (n = 67)

<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>Coordinated Program n (% of total)</th>
<th>Didactic Program n (% of total)</th>
<th>Dietetic Internship n (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwest</td>
<td>6 (9%)</td>
<td>8 (12%)</td>
<td>8 (12%)</td>
</tr>
<tr>
<td>Northeast</td>
<td>5 (8%)</td>
<td>1 (2%)</td>
<td>6 (9%)</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Southeast</td>
<td>2 (3%)</td>
<td>8 (12%)</td>
<td>8 (12%)</td>
</tr>
<tr>
<td>Southwest</td>
<td>2 (3%)</td>
<td>1 (2%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>West</td>
<td>2 (3%)</td>
<td>4 (6%)</td>
<td>2 (3%)</td>
</tr>
</tbody>
</table>

a. Includes Dietetic Internship
b. Denotes unanswered response
Student Demographics

One hundred thirty-seven students were classified as questionnaire completers. The mean age of respondents was 25 years ($SD = 6.65$ years). Most were enrolled in a DPD or DI ($n = 89; 65\%$), (Table 1). DPD and DI represent most accredited dietetic programs in the U.S. ($89\%$), thus the proportion of CPs in the sample ($35\%, n = 48$) exceeded that of accredited programs nationally ($11\%$). Undergraduate-level programs comprised $73\%$ of the sample ($n = 100$), as did first-year students ($n = 55; 40\%$). Forty-seven percent of accredited programs in the U.S. are at the undergraduate level, indicating a discrepancy between sample and population characteristics.\textsuperscript{37} The proportion of students in CPs classified as undergraduate or graduate were similar to proportions of programs nationally such that $54\%$ were undergraduate and $45\%$ graduate programs in the sample compared to $47\%$ undergraduate and $53\%$ graduate-level programs in the U.S.\textsuperscript{37} More undergraduate DPD and DI students were represented in the sample, proportionally ($84\%$), compared to national program distributions ($69\%$).\textsuperscript{37} In contrast, fewer graduate-level DPD and DI respondents participated in the present study ($16\%$) than the percentage of existing DPD and DI graduate programs nationally ($31\%$).\textsuperscript{37}

Participants resided in 26 different states, the District of Columbia, and Puerto Rico, with fairly even distribution in terms of U.S. geographic region. Geographic regions represented in the sample were relatively similar to program location distribution in the U.S., with the exception of the Southeast ($18\%$ and $28\%$ for the sample and the U.S., respectively) and Northeast ($13\%$ and $19\%$ for the sample and the U.S., respectively), (Table 3). The survey did not distinguish between areas of residence and program location, which has pertinence for distance-education programs. Areas of
interest with highest frequencies included clinical \((n = 66; 48\%)\) and community/public health nutrition \((n = 29; 21\%)\).

**Table 3.** Program Type by Geographic Region for Students \((n = 137)\)

<table>
<thead>
<tr>
<th>Region</th>
<th>Coordinated Program</th>
<th>Didactic Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n (% \text{ of total}))</td>
<td>(n (% \text{ of total}))</td>
</tr>
<tr>
<td>Midwest</td>
<td>7 (5%)</td>
<td>22 (16%)</td>
</tr>
<tr>
<td>Northeast</td>
<td>5 (4%)</td>
<td>12 (9%)</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>1 (1%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Southeast</td>
<td>3 (2%)</td>
<td>19 (14%)</td>
</tr>
<tr>
<td>Southwest</td>
<td>16 (12%)</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>N/A</td>
<td>7 (5%)</td>
<td>19 (14%)</td>
</tr>
<tr>
<td>West</td>
<td>9 (7%)</td>
<td>13 (10%)</td>
</tr>
</tbody>
</table>

**IPE Approaches**

IPE as reported by directors was administered most prevalently through case studies or facilitated multidisciplinary interactions \((n = 53; 79\%)\) (Table 4), followed by direct experience through supervised practice \((n = 49; 73\%)\). Direct experience was
endorsed by students most infrequently when compared to other IPE approaches \((n = 65; 47\%)\), and well below the proportion of directors selecting this approach to IPE. Eighty-six percent \((n = 118)\) of students indicated that IPE was provided in the form of lectures, compared to 63\% of program directors suggesting utilization of this approach \((n = 42)\), (Table 4).

**Table 4. Interprofessional Education Approaches According to Program Directors \((N = 67)\) and Students \((N = 137)\)**

<table>
<thead>
<tr>
<th></th>
<th>Dietetics Directors (n (% of Total))</th>
<th>Dietetic Students (n (% of Total))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture from professionals within or outside of dietetics program</td>
<td>42 (63%)</td>
<td>118 (86%)</td>
</tr>
<tr>
<td>Assignments (online modules/videos, or reading)</td>
<td>40 (60%)</td>
<td>83 (61%)</td>
</tr>
<tr>
<td>Case studies or facilitated multidisciplinary interactions</td>
<td>53 (79%)</td>
<td>84 (61%)</td>
</tr>
<tr>
<td>Direct experience through supervised practice/internships</td>
<td>49 (73%)</td>
<td>65 (47%)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (4%)</td>
<td>5 (4%)</td>
</tr>
</tbody>
</table>
Number of IPE methods and Level of Confidence (Directors)/Level of Satisfaction (Students)

The relationship between the Number of IPE methods and directors’ level of confidence was also examined with a Spearman’s Rank-Order correlation. Results failed to signify a significant association between the two variables ($r(65) = 0.10, p = 0.406$). In contrast, there was a significant association identified between students’ level of IPE quantity/quality satisfaction and number of IPE methods reportedly implemented ($r(135) = 0.47, p < 0.001$).

Timing of IPE

Directors of CPs most frequently selected IPE implementation during the first ($n = 8; 47\%$ of CPs) and second year ($n = 10; 59\%$ of CPs). Conversely, DPD program directors predominantly selected IPE incorporation during years three and four ($n = 14; 64\%$ of DPD directors) (Table 3). Most DI directors ($n = 17; 61\%$) suggested incorporating IPE during the first year, while some ($n = 4$) respondents indicated that IPE was integrated throughout the DI program. Undergraduate-level programs reported IPE implementation during the third and fourth year of programs ($n = 17$ and $n = 19$, respectively), while many graduate-level program directors suggested IPE inclusion during the first year of the program ($n = 20$), (Table 5, Table 6).
Table 5. Time of IPE Implementation in Dietetics Programs (Director-reported) by Program Type \((n = 67)\)

<table>
<thead>
<tr>
<th></th>
<th>First year (n) (% of total)</th>
<th>Second year</th>
<th>Third year</th>
<th>Fourth year</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinated Program</td>
<td>8 (12%)</td>
<td>10 (15%)</td>
<td>4 (6%)</td>
<td>6 (9%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Didactic Program</td>
<td>7 (10%)</td>
<td>6 (9%)</td>
<td>14 (21%)</td>
<td>14 (21%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Dietetic Internship</td>
<td>17 (25%)</td>
<td>4 (6%)</td>
<td>2 (3%)</td>
<td>3 (4%)</td>
<td>6 (9%)</td>
</tr>
</tbody>
</table>

Table 6. Time of IPE Implementation in Dietetics Programs (Director-reported) by Program Level \((n = 67)\)

<table>
<thead>
<tr>
<th></th>
<th>First year (n) (% of total)</th>
<th>Second year</th>
<th>Third year</th>
<th>Fourth year</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>10 (15%)</td>
<td>10 (15%)</td>
<td>17 (25%)</td>
<td>19 (28%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Graduate</td>
<td>20 (30%)</td>
<td>9 (13%)</td>
<td>2 (3%)</td>
<td>3 (4%)</td>
<td>6 (9%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (3%)</td>
<td>1 (1%)</td>
<td>1 (1%)</td>
<td>1 (1%)</td>
<td>2 (3%)</td>
</tr>
</tbody>
</table>

**Time Spent on IPE and Level of Confidence**

Results suggested a statistically significant positive correlation between time spent on IPE and director level of confidence in students’ ability to engage interprofessionally \(r (45) = 0.33, p = 0.025\). Due to the open-response format of this
survey item, some responses were vague and therefore not quantifiable, or data were missing ($n = 18$).

**Multiple linear regression: number of IPE methods and level of confidence/satisfaction, accounting for time spent and program type/level.**

Multiple linear regression results indicated that the number of IPE methods did not significantly ($p = 0.486$) predict directors’ confidence in student ability to engage effectively in interprofessional teams upon program completion when accounting for program type, and program level, as well as the tested, though nonsignificant interaction between number of IPE approaches and time spent on IPE ($p = 0.373$). For every additional IPE method utilized, director level of confidence increased by 0.18 units. DPD directors had significantly lower confidence in students’ capacity to effectively engage in interprofessional collaboration compared to CP directors ($\beta = -1.46; p = 0.014$). The variability in directors’ confidence accounted for in the model was minimal (Adjusted $R^2 = 0.16$). Violations of the homoscedasticity assumption were observed in the model, in addition to some high leverage data points and deviations from a normal distribution. Accordingly, resultant inferential statistics are questionable.

**Evaluation Methods (Open-Response Coding)**

The first iteration of coding suggested 15 ways that programs are evaluating student attainment of IPE-related objectives. A second researcher (Wengreen) identified 19 codes and six sub-codes, specifying the nature of certain overarching codes. The codes identified were then categorized into one of four overarching classifications: 1)
evaluations involving multiple disciplines, 2) evaluations centered on activities completed independently by students, 3) rotation evaluations, and 4) other (Figure 1). Evaluations involving multiple disciplines (n = 14) included assessment of performance in interprofessional meetings and grand rounds, among others. Some sub-categorizations (e.g. case studies, discussions) were repeated in other overarching themes; however, responses explicitly conveying involvement with other disciplines received the code designation described.

One director reported use of the Individual Teamwork Observation and Feedback Tool (iTOFT). This tool was designed to measure interprofessional performance amid other disciplines. Accordingly, researchers classified this evaluation method as one involving other disciplines.

Assignments (n = 20) and reflections (n = 15) comprised the majority of evaluation methods centered on activities completed by students independently (n = 54). Rotation evaluations, as completed by a dietetic preceptor, were a commonly reported measure of IPE attainment among participants (n = 25). Responses which were not in alignment with the previous themes were coded as ‘other’ (n = 23) and were frequently vague and nonspecific regarding involvement from other disciplines. For example, the details regarding case studies were lacking, and it was unclear whether these were merely written case-studies completed by students individually, or if these occurred alongside students from outside of dietetics.
**Figure 1.** Reported Evaluation Methods of Student Fulfillment of Interprofessional Education-related Learning Objectives

- **Evaluations involving multiple disciplines**
  - Case-studies ($n = 2$)
  - Discussion ($n = 1$)
  - Grand rounds ($n = 5$)
  - Interdisciplinary meeting ($n = 2$)
  - Observation of interactions ($n = 1$)
  - Simulation ($n = 2$)
  - iTOFT evaluation* ($n = 1$)

- **Evaluations centered on independently completed activities**
  - Assignments ($n = 20$)
  - Portfolio ($n = 3$)
  - Pre-post test ($n = 2$)
  - Quiz/exam ($n = 13$)
  - Reflection ($n = 15$)
  - Surveys ($n = 1$)

- **Rotation Evaluation** ($n = 25$)
  - General evaluation (rotation evaluation by preceptor) ($n = 25$)

- **Other** ($n = 23$)
  - Activities ($n = 2$)
  - Case studies ($n = 10$)
  - Discussion ($n = 1$)
  - Observation ($n = 3$)
  - Participation ($n = 1$)
  - Patient interviews ($n = 1$)
  - Presentation ($n = 2$)
  - Role-play ($n = 1$)
  - Simulation ($n = 2$)
Discussion

Approaches to IPE

Overall, approaches to interprofessional-related education from the perspectives of dietetic program directors and student perspectives are multi-faceted, likely incorporating a combination of strategies, which is supported by the literature of IPE in dietetics students. Lectures, assignments, and case studies/multidisciplinary interactions were prominent IPE-related methods as reported by both students and directors. Encouragingly, didactic training, student presentations, and simulation-based training or case studies are notable components of previous IPE research involving dietetic students, which resemble the aforementioned methods endorsed frequently by participants. A unifying feature of much of the promising scholarship in this arena is the involvement of multiple disciplines to enable reciprocal learning among students with varying backgrounds. The degree to which other disciplines were involved in some or all of the activities described by respondents in the current study was generally unclear, which limits the appraisal of the attainment of true IPE provision in dietetics curricula nationally.

Direct experience was commonly reported as a means of meeting IPE-related ACEND requirements as well according to program directors. Previous IPE research among dietetics students supports applied interprofessional experiences in which multiple disciplines synergistically work in tandem with a patient sustaining complex or chronic medical challenges. Whether interprofessional experiences are intentionally
coordinated by directors through supervised practice, or whether these are incidental affiliations with other disciplines is unknown in the present study. It is also unknown whether dietetics students are participating in team care or engaging passively through observation.

Notably there was a discrepancy in the frequency of direct experience as reported by directors when juxtaposed to the lower frequency of student endorsement of direct experience. This may be attributed to a number of factors. One reason may be the different distribution of program type for directors and students. The proportion of students from DPD programs and DI programs were higher and lower, respectively, than the percentage of directors leading DPDs and DIs. The fundamental didactic nature of DPDs and application-driven DIs may account for these differences.

The difference in graduate-level students and undergraduate-level students when contrasted with reported level of the program directors led may similarly have impacted differences in provision and receipt of IPE broadly—perhaps undergraduate students generally receive less direct experience, or it is plausible that the impact of program level on the approach endorsed was dependent on program type (DPD, CP or DI). Furthermore, the collection of IPE methods used did not account for time in the program for students. Students in the earlier stages of their respective program may have experienced less, or potentially different exposure to IPE strategies compared to seasoned students in the same program. More research is needed to examine how programs are incorporating IPE strategies from both the standpoint of directors and students, especially in terms of objective effectiveness and barriers to these and other IPE methods.
Another consideration not accounted for in the present study is the platform of the IPE-related approach, whether online or in-person. This feature is especially relevant in light of potential program transitions resulting from the global COVID-19 pandemic. Favorable research on IPE e-learning in dietetics is emerging, and a comprehensive assessment of specific online approaches currently employed would enhance dietetics education research.

This analysis served as a helpful initial step in examining IPE-related approaches currently being used in dietetic programs according to both directors and students; however, it was difficult to distinguish whether approaches such as case studies were completed individually, or if other disciplines were actively involved in these approaches. Therefore, it was challenging to detect the number, style, and quality of true IPE approaches currently employed, wherein teaching and learning occurs in an interactive fashion between students from various disciplines. Considering the mounting evidence regarding IPE according to this definition, and the potential downstream impact in supporting collaborative practice, thereby supporting patient outcomes, future examination of true IPE in dietetics programs would be valuable. This insight could then further illuminate readiness of interprofessional collaborative practice in emerging dietitians.

The Number of IPE Methods Used

The significant positive association between number of IPE-related methods used and student satisfaction suggests that students may appreciate a variety of IPE approaches. Perhaps different approaches resonate more profoundly with certain students,
or the number of IPE approaches may enhance the quality of IPE-related efforts. Despite this interesting association, stage or year in program potentially confounded the relationship between number of approaches and level of satisfaction. Moreover, this analysis does not directly measure quality, nor does it involve other components relating to IPE approaches which may underlie perceptions. Quantity, and potentially variety of IPE, along with other factors such as the approach itself, who administers the IPE, the amount of time spent on IPE, and whether it involves other disciplines may collectively impact student level of satisfaction. Future studies should examine the influence of these aspects with respect to students’ opinions of IPE in dietetics curricula, preferably with a validated outcome measure.

The lack of a significant association between number of IPE approaches and director confidence in student ability to engage in interprofessional collaboration after program completion, after accounting for program type, level, and time spent on IPE approaches indicated that directors may not perceive a variety of approaches as a determinant of successful future interprofessional collaboration. The reduced confidence of DPD directors in student ability to engage in IPCP when compared to CP directors was intuitive in that, DPD programs do not include supervised practice; conversely, it is incorporated in all CP programs. Perhaps direct experience in interprofessional work obtained through supervised practice, which was reportedly employed by most of the respondents in the sample, is regarded as more preparatory to effective collaboration than other methods.

The findings from the analysis of number of IPE methods and director confidence level should be interpreted with caution considering the small sample size. There were
also violations of homogeneity of variance. Time spent on IPE appeared difficult for directors to quantify, plausibly for those who considered supervised practice as the primary means of IPE. Another possible concern is the interpretation of program level. Many DIs nationally do not end with the bestowal of a degree \((n = 204)\), although they can follow completion of an undergraduate degree; thus, some DI directors may have reported directing a graduate-level program and others an undergraduate-level program.

**Timing of IPE**

When IPE was integrated in dietetics programs was unclear. By virtue of certain program types, this question may have been interpreted by directors in divergent ways, particularly for directors of DIs. Response options included ‘first year’, ‘second year’, ‘third year’, ‘fourth year’, and ‘other’. The discrepancy between the prevalence of IPE in the first or second year as reported by CP directors compared to more frequent reports of the third or fourth year by DPD directors is likely explained by whether directors understood the year of the program to be in reference to the typical completion of an undergraduate degree (4 years in length), or if the director perceived the initiation of the program as separate from the length of the undergraduate degree overall. In the latter case, directors may have selected that IPE was provided in the first year of the program, while this may have also translated for the third year of the student’s overall degree in the case for the undergraduate student. The distribution of program level tabulated with program type does not explain the difference, as undergraduate-level CPs and DPDs in the sample were both represented more than graduate-level programs. However, CPs
were less extreme in this distribution \( (n = 10 \) undergraduate programs and \( n = 6 \) graduate programs).

Timing of IPE-related implementation was investigated in isolation and did not include frequency of IPE incorporation within the time frame selected by the respondent. Perhaps IPE was discussed on multiple occasions within the first or second year, for example. Existing research suggest the importance of introduction to IPE early and repeatedly. A more thorough examination of both timing and frequency of IPE in dietetics programs is warranted.

**Evaluation of IPE-Related Objectives**

There was a considerable degree of overlap between evaluation methods among student attainment of program-specific IPE objectives and the IPE approach itself. For instance, ‘assignments’ was identified as the most common evaluation method within the classification of responses completed by students individually (Figure 1). ‘Assignments’ was a selected IPE approach by 60% of directors as well. Only one respondent specified the use of a validated IPE-related tool (iTOFT). Utilization of validated IPE tools among more dietetics programs nationally could improve the reliability and comparability of findings related to IPE effectiveness, while also encouraging the implementation of robust IPE methods, harnessing true IPE, to yield positive measurable results. There are many established tools that could be administered effectively within the discipline of dietetics, such as the Interprofessional Education Assessment and Planning Instrument for Academic Institutions (IPE-API), the Interdisciplinary Education Perceptions Scale (IEPS), and Student Perceptions of Interprofessional Clinical Education-Revised (SPICE-R). Although, it should be noted
that intentions to implement true IPE\textsuperscript{1,14,15} likely preclude effective employment of these measures. Programs should aim to fulfill IPE-related ACEND requirements by implementing actual IPE.

Due to the high number of responses falling in the ‘other’ category of evaluation methods, future research, particularly qualitative research, may clarify some of the existing ambiguity. An analysis of the types of evaluation methods employed in conjunction with method characteristics would be enlightening.

Study Limitations and Strengths

Although this study possesses a number of strengths, there are limitations that should be acknowledged. A significant drawback to this study is the small director sample size and the difference between population-level demographics and sample demographics for both directors and students in terms of representation of program type, program location, and program level. Additionally, the samples were not identical in the sense that the programs of students who participated were not identical to the programs participating directors led due to the snowball approach used. The outcome measures selected (level of confidence and level of satisfaction) were not validated or reliable, which future research should rectify. Other points of interest not discussed in the present study included the effect of online delivery, whether by an online program or through individual assignments which demonstrates promise in the literature,\textsuperscript{2,14,26,29} and barriers to IPE inclusion.\textsuperscript{51} An assessment of encountered barriers may be timely in light of the upcoming transition to all graduate-level dietitian programs.\textsuperscript{52} Finally, there was an error in the creation of the survey which resulted in the inability for early participants to
answer the question related to geographic region. This issue was immediately addressed as soon as it was detected, but did result in some missing data for this item (Table 1).

Study strengths include the breadth of the analysis, which encompassed how and when, IPE is integrated in programs, and how objectives are evaluated using a mixed methods approach. Furthermore, this study was widely representative in terms of geographic setting and provided perspectives from both directors and students. Ultimately, this study served as a fundamental step to further investigating the state of IPE in dietetic programs in the U.S.

Conclusion

This study adds to the existing literature by identifying how IPE-related accreditation standards are being met in dietetic programs in the U.S., when these objectives are implemented, and how they are measured. Level of student satisfaction and level of director confidence in the context of the quantity of IPE approaches employed was also examined. Salient findings suggest concern regarding inconsistency in evaluation methods, which hinders a thorough and accurate examination of the effectiveness of both the quantity and quality of IPE approaches in dietetics curricula. True IPE in which multiple disciplines are learning from and with one another\textsuperscript{1,14,15} was difficult to detect in the current study. Accreditation standards may be enhanced by encouraging the utilization of consistent tools to measure IPE effectiveness, guidelines or requirements on time spent on IPE, and encouragement of methods which involve true IPE.\textsuperscript{1,14,15} In light of the forthcoming transition of all dietetics programs to the graduate-
level, now is an optimal time to examine the state of IPE in dietetics programs to better prepare future dietetics practitioners to effectively work within interprofessional healthcare teams.
References

   [https://apps.who.int/iris/bitstream/handle/10665/70185/WHO_HRH_HPN_10.3_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/70185/WHO_HRH_HPN_10.3_eng.pdf?sequence=1&isAllowed=y)


CHAPTER 4
FOOD ACCESS AND FOOD SECURITY AMONG SNAP-ELIGIBLE, LOWER-INCOME UTAHNS DURING THE COVID-19 PANDEMIC

Abstract

Objective: To assess factors associated with increased likelihood of food insecurity among SNAP-eligible Utahns after the onset of the COVID-19 pandemic in March of 2020.

Design/Setting: A cross-sectional Qualtrics survey was administered July-September 2020 and included the USDA 6-item module on food access and food insecurity. Participants provided responses in relation to their current situation as well as retrospectively, in the 6 months prior to the onset of the COVID-19 pandemic in March 2020.

Participants: All SNAP applicants deemed eligible for benefits by the Utah Department of Workforce Services (N = 24,763) were invited to participate via email; 508 of 646 responses were analyzed (response rate = 2.1%). The sample was predominantly white (n = 383, 75%) and female (n = 392, 77%).

Main Outcome Measure(s): Degree of food security (food secure, low food secure, and very low food secure) was the dependent variable. Frequency of current food access challenges, age, college degree, job change, children in household were the predictor variables.
**Analysis:** Ordinal logistic regression using a model-building approach was used to assess odds of degree of food security.

**Results:** Job change ($p = .002$), older age ($p < .001$), and the interaction between the frequency of food access challenges and children in household ($p = 0.041$) were associated with higher odds of food insecurity following the onset of the COVID-19. College degree reduced odds ($p = .002$). Predictors in the model accounted for 24% of the variability in food insecurity.

**Conclusions and Implications:** Age, college degree, job change, and the interaction of food access challenges and having children in the household were factors associated with severity of food insecurity during the COVID-19 pandemic. Additional research should examine the need for augmented legislation to reduce food insecurity among this population.

---

1 I thank Mateja R. Savoie-Roskos, Heidi Wengreen, Demi Culianos, Casey Coombs, and Heidi LeBlanc for their roles and contributions as coauthors for this chapter.
Introduction

SARS-CoV-2, or COVID-19 received the “pandemic” designation by the World Health Organization (WHO) in March 2020.\(^1\) Within a year, COVID-19 contributed to the death of over 500,000 deaths in the United States (U.S.) alone.\(^2\) In addition to the health-related impacts, the COVID-19 pandemic resulted in economic challenges for many Americans, with the number of unemployed individuals in the U.S. nearly doubling within the first year of the pandemic.\(^3\)

Further, disruption to the food sector was extensive and included reduced food availability due to food stockpiling, as well as increased food costs resulting from general economic shock.\(^4,11\) The abrupt shift to food consumption occurring primarily in the home due to quarantining as a result of local and state mandates/directives to prevent disease spread, further complicated food access.\(^7,12,13\) Myriad food access obstacles, coupled with economic difficulty brought on by COVID-19 likely impacted food security in the six months that followed the inception of the COVID-19 pandemic.\(^4,8,14-16\)

Food insecurity, defined as compromised access to sufficient and nutritious food,\(^4,17,18\) is associated with various chronic diseases and related risk factors, such as obesity, heart disease, hypertension, diabetes, and suppression of the immune system.\(^19-21\) Evidence from previous literature suggests that food insecurity increased in the early months following the outbreak of COVID-19 (April-June 2020).\(^4,22\) Those commonly impacted by food insecurity include low-income individuals, especially families with children. The COVID-19 pandemic increased vulnerability of many of these individuals due to the impact on food access and economic stability.\(^10,12,13,23,24\)
The Supplemental Nutrition Assistance Program (SNAP), established in 1964 and historically referred to as “food stamps”, was designed to attenuate food insecurity in the U.S.\textsuperscript{(10,25,26)} Eligibility is determined in part by monthly income falling below 130 percent of the federal poverty level\textsuperscript{(27)} and therefore targets individuals at higher risk for food insecurity. Several legislative efforts were instituted in an effort to support those reliant on SNAP during the COVID-19 pandemic. For example, the Families First Coronavirus Act (FFCA) provided pandemic electronic meal-replacement benefits (P-EBT), which provided additional money for households with children eligible for school meal benefits.\textsuperscript{(28,29)} In addition, the Coronavirus Aid, Relief, and Economic Security (CARES) Act allotted $15.8 billion dollars in funding support for the SNAP program.\textsuperscript{21} Through the Consolidated Appropriations Act of 2021 states were also granted permission to increase benefit provision to the maximum amount, and later on, to increase benefit maximum by 15% for nine months.\textsuperscript{30}

Despite the various government-funding efforts, food insecurity remained a significant public health concern during the pandemic.\textsuperscript{10} Accordingly, the literature investigating the state of American food insecurity status with regard to the COVID-19 pandemic is becoming increasingly prolific. Much of the research to date has examined changes in food security among college students,\textsuperscript{31} racial and ethnic minority groups,\textsuperscript{22} and low-income adults <250% below the federal poverty line,\textsuperscript{12} as well as some of the intersectionality present among these populations.\textsuperscript{7,8,10,32} Few\textsuperscript{22,33} studies examining individuals eligible to receive SNAP benefits exist in the literature. An examination of food security among individuals eligible to receive SNAP benefits is imperative due to the number of Americans reliant upon the food benefits supplied therein, both prior to
and in the six months that followed the onset of COVID-19. In addition to the need for further research highlighting SNAP-eligible individuals, existing research would be augmented by the analysis of food insecurity after the emergence of COVID-19.

The detrimental effects of COVID-19 were widespread, but the adverse impact varied among demographic and geographic groups. The National Food Access and COVID Research Team (NFACT) was convened in response to the urgent necessity for streamlined, comparable food security data among various groups in the U.S. in anticipation of these disparities, owing to unified instrumentation. Current NFACT studies have examined representative populations in Vermont, low-income and minority groups in New York, and Michigan residents, with varying foci. Some NFACT-related research has examined aspects contributing to increased odds of food insecurity and food access, as well as fruit and vegetable consumption during the COVID-19 pandemic.

To our knowledge, very little research has examined COVID-19-related food insecurity among SNAP participants in Utah. Therefore, the purpose of this research was to determine if frequency of experienced food access difficulties within the six months that followed the COVID-19 pandemic onset was associated with odds of exacerbated food insecurity among SNAP-eligible Utahns after accounting for changes in employment, college degree, age, and children living in the household. Secondary objectives included describing general food assistance program use and reported perceptions of, and barriers to, food assistance programs before and since the onset of the pandemic. This analysis enabled direct comparability of previous NFACT findings,
informing next steps for both research and interventions aimed at attenuating the food security crisis inflicted by the pandemic.

**Methods**

**Instruments**

This cross-sectional study used an anonymous, 76-item questionnaire administered through Qualtrics. The United States Department of Agriculture’s (USDA) six-item validated food insecurity measure was used to examine food insecurity within the six months following the onset of the COVID-19 pandemic. Although the USDA food security items were asked in reference to both “in the year before the COVID-19 outbreak” and “since the COVID-19 Outbreak (March 11 [2020])”, the primary interest of the present study was food security since the COVID-19 outbreak. Also incorporated within the survey were questions about food access, which included food assistance use and associated perceptions, (18 items); eating and purchasing behaviors (12 items); and awareness and use of the Supplemental Nutrition Assistance Program-Education (SNAP-Ed) (8 items). As described above for the timeframe reference regarding food security, respondents were asked to provide information for many of the aforementioned questions with respect to the year before the COVID-19 pandemic (March 11, 2019-March 10, 2020), as well as from the COVID-19 outbreak in March of 2020 to the date of survey completion in July, August, or September of 2020. Demographic-related questions such as gender, race, age, level of education, and income were also included (14 items). Questions newly developed by NFACT were piloted with acceptable internal consistency.
Prior to data collection, the study was reviewed and approved by the Utah State University Institutional Review Board (Protocol #11339).

**Participants and Recruitment**

All persons in the state of Utah 18 years old or older, having applied, and deemed eligible for SNAP benefits by the Utah Department of Workforce Services within six months prior to data collection were invited to participate in this study via email. A central determinant of SNAP eligibility is monthly income less than 130% of the federal poverty level. Prospective respondents were invited to participate from July to September 2020 via email. Reminder emails were sent two weeks after the initial invitation. Participants consented to participate in the study digitally after viewing a detailed letter of information, prior to completing the study. Participants who completed the survey were given the option to be entered into a drawing to receive one of twenty-five $50 Amazon gift cards.

**Data Analysis**

To ensure validity and consistency, responses with time stamps less than 500 seconds and those exhibiting signs of obvious discrepancies in questions designed to detect internal consistency issues were eliminated, consistent with the data quality checks recommended for use among all NFACT researchers (Acciai F, Ohri-Vachaspati P, unpublished data, 2020). Additionally, cases suggesting excessive repeated responses and random text entries combined with other indicators of invalidity (Acciai F, Ohri-Vachaspati P, unpublished data, 2020) were removed. Individuals who did not
reside in Utah since at least January 1st, 2020 were excluded. Ordinal logistic regression models were fit using the MASS package\textsuperscript{39} to examine predictors of degree of food insecurity, which included food secure, low food secure, and very low food secure, within four to six months following the onset of the COVID-19 pandemic, in the form of odds ratios. Predictor variables of interest were informed by findings in previous NFACT research, which were added to the model one at a time and dropped if they did not significantly contribute to the model. Spearman’s bivariate correlations or Chi-square tests of independence were performed to examine the relationship of predictor variables.

Model fit was measured in terms of Pseudo $R^2$ (Nagelkerke). The main variable of interest (summed frequency of food access challenges within six months of the COVID-19 outbreak) was included exclusively first, and as described above, subsequent cofactors/covariates were added one at a time and retained if the variable significantly contributed to the model at the $p<.05$ level. Similarly, two-way interactions among hypothesized predictive variables were tested for significance ($p < .05$) and incorporated accordingly. All missing data were assumed to have occurred at random, and data were imputed using the Mice package\textsuperscript{40} with 20 datasets to address analytical concerns resulting from any excessive missing data. The assumption of proportional odds for food insecurity status was assessed using the test of parallel lines on the first three imputed datasets with output suggesting that this assumption was also met, $X^2(6) = 9.84, p = .132$; $X^2(6) = 5.47, p = 0.485$; $X^2(6) = 7.30, p = .290$. All statistical analyses were conducted in SPSS version 24 and R Statistical Software.\textsuperscript{41} Alpha levels were set at .05 with 95% confidence levels.
Predictor Variables

The primary predictor variable was frequency of encountering various food access challenges reported by respondents within six months of the COVID-19 outbreak (March 11, 2020). Food access challenges encompassed six separate questions, each with possible responses including ‘never’, ‘sometimes’, ‘usually’, and ‘every time’, and coded as 1, 2, 3, and 4, respectively (Appendix B). Internal consistency was tested for the collection of these questions, yielding an acceptable Cronbach’s alpha (0.79). Responses were summed for all food access questions and treated as a single unit, with higher scores reflecting higher frequency of food access challenges since COVID-19 ($M = 15.11; SD = 3.95; \text{minimum score} = 6; \text{maximum score} = 24$).

Additional variables of interest included age, number of children, attainment of a college degree, and job change (loss, furlough, or income reduction anytime since COVID-19’s onset). Age was treated as a continuous variable, while the remainder were treated as binary variables. College degree was categorized such that participants had or had not attained a college degree. Likewise, job change classified respondents as experiencing a change in employment since COVID-19. The selected variables were guided by findings in NFACT literature, though not all variables with a hypothetical implication were included in the model to prevent excessive decreases in statistical power. Further, some variables commonly accounted for such as race/ethnicity, and gender were excluded due to the nature of the demographics captured in the sample.

Dependent Variable

Food insecurity was stratified into three distinct groups as outlined by the previously validated USDA Food Insecurity Module, with classifications of ‘food secure’, ‘low food
secure’ and ‘very low food secure’ for the ordinal logistic regression analysis coded as 0, 1, and 2, respectively.\textsuperscript{36} These were computed from raw scores of 0-1 (food secure), 2-4 (low food secure), and 5-6 (very low food secure).\textsuperscript{36}

Respondents were asked to recall utilization of food programs such as SNAP, The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), food pantries, and the School Meal Program in the year before the onset of the COVID-19 pandemic (March 11, 2019-March 10, 2020). Indication of program use from the March 11, 2020 to time of survey completion in July, August, or September of 2020 was also requested. Descriptive frequency analyses were employed to explore reported changes in program utilization during these timeframes. Perceptions of food program barriers and utility, and accessibility and utilization of Supplemental Nutrition Assistance Program-Education (SNAP-Ed) courses since the onset of COVID-19 (March 11, 2020) were also summarized with descriptive analyses.

**Results**

**Demographics**

A total of 24,763 SNAP applicants determined eligible for benefits by the Utah Department of Workforce Services were emailed the Qualtrics questionnaire. Three hundred five email addresses were found to be invalid; 646 surveys were collected, 138 of which were discarded due to the previously described validity parameters, yielding a final sample size of 508 (79% of those collected). The majority of the sample were white ($n = 383, 75.4\%$), female ($n = 392, 77.2\%$), between the ages of 18 and 54 years ($M =$
Thirty-three percent of participants obtained a college degree \((n = 166)\) and 43% had children living in the household (Table 1). Two hundred twenty-eight participants (45%) experienced a change in employment, including job loss, reduction in hours, or furlough since the onset of COVID-19. The average score for summed food access challenges was \(15.11 (SD = 3.94; \text{Maximum possible score } = 24)\).

**Table 1.** Demographic Characteristics of SNAP-Eligible Respondents in Utah \((N = 508)\)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>% of Total</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender ((n = 425))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5%</td>
<td>27</td>
</tr>
<tr>
<td>Female</td>
<td>77%</td>
<td>392</td>
</tr>
<tr>
<td>Trans</td>
<td>0.2%</td>
<td>1</td>
</tr>
<tr>
<td>Non-binary</td>
<td>0.4%</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>0.6%</td>
<td>3</td>
</tr>
<tr>
<td>Age ((n = 508))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-34 years old</td>
<td>48%</td>
<td>246</td>
</tr>
<tr>
<td>35-54 years old</td>
<td>49%</td>
<td>250</td>
</tr>
<tr>
<td>55 years and older</td>
<td>2%</td>
<td>12</td>
</tr>
<tr>
<td>Race ((n = 450))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>2%</td>
<td>11</td>
</tr>
<tr>
<td>Black</td>
<td>2%</td>
<td>11</td>
</tr>
<tr>
<td>Native American</td>
<td>3%</td>
<td>16</td>
</tr>
<tr>
<td>White</td>
<td>75%</td>
<td>383</td>
</tr>
<tr>
<td>Other</td>
<td>6%</td>
<td>29</td>
</tr>
<tr>
<td>Ethnicity ((n = 422))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>12%</td>
<td>62</td>
</tr>
<tr>
<td>Not Hispanic or Latino</td>
<td>71%</td>
<td>360</td>
</tr>
<tr>
<td>Children in Household ((n = 508))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>43%</td>
<td>218</td>
</tr>
<tr>
<td>No</td>
<td>57%</td>
<td>290</td>
</tr>
</tbody>
</table>
Education ($n = 422$)

<table>
<thead>
<tr>
<th>Education Category</th>
<th>Percentage</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some high school (no diploma)</td>
<td>6%</td>
<td>28</td>
</tr>
<tr>
<td>High school graduate (including GED)</td>
<td>16%</td>
<td>82</td>
</tr>
<tr>
<td>Some college (no degree)</td>
<td>29%</td>
<td>146</td>
</tr>
<tr>
<td>Associates degree / technical school / apprenticeship</td>
<td>14%</td>
<td>70</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>16%</td>
<td>79</td>
</tr>
<tr>
<td>Postgraduate degree</td>
<td>3%</td>
<td>17</td>
</tr>
</tbody>
</table>

The ordinal logistic regression analysis indicated that each unit of summed score of food access challenges since the COVID-19 outbreak increased the odds of experiencing more severe food insecurity (OR 1.23, $p < .001$) during the same timeframe. The odds of degree of food insecurity assessed within four to six months after the onset of the COVID-19 pandemic associated with summed score of food access remained statistically significant in models that controlled for job change, attainment of college degree, and age (Table 2; Figure 2), which were displayed collectively in Model 2 due to the minimal alterations in odds ratios and significance when each variable was examined individually. The variable children in the household (coded as no children, or some children) was accounted for in the third model although it did not significantly contribute to the model ($p = .063$), and was therefore removed.

Two-way interactions for all possible combinations of described predictor variables, as driven by the fact that all predictor variables theoretically had the potential to influence one another, were individually tested and added to the model if significance was reached. Otherwise, nonsignificant interactions were dropped from the model. There was a significant interaction between frequency of food access challenges and children in the household ($p = .041$) (Figure 1). No other interactions significantly contributed to the
model and were excluded accordingly. The fourth model included this interaction term and previously mentioned variables, which attained a Nagelkerke Pseudo $R^2$ of .242, the highest of all regression models.
<table>
<thead>
<tr>
<th>Model Predictors</th>
<th>Model 1: Food Access</th>
<th>Model 2: Job Change, College Degree, Age</th>
<th>Model 3: Children Challenge</th>
<th>Model 4: Children Challenge (Final Model)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of Food Access Challenges</td>
<td>1.23</td>
<td>1.25</td>
<td>1.25</td>
<td>1.20</td>
</tr>
<tr>
<td>(Summed Score)</td>
<td>&lt;.001***</td>
<td>&lt;.001***</td>
<td>&lt;.001***</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td></td>
<td>0.025</td>
<td>0.026</td>
<td>0.026</td>
<td>0.034</td>
</tr>
<tr>
<td></td>
<td>[1.17-1.29]</td>
<td>[1.19-1.32]</td>
<td>[1.19-1.32]</td>
<td>[1.12-1.30]</td>
</tr>
<tr>
<td>Job Change</td>
<td>-</td>
<td>-</td>
<td>1.77</td>
<td>1.76</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>0.178</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>.002**</td>
<td>.002**</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>[1.24-2.49]</td>
<td>[1.24-2.50]</td>
</tr>
<tr>
<td>College Degree</td>
<td>0.55</td>
<td>0.55</td>
<td>0.53</td>
<td>0.203</td>
</tr>
<tr>
<td></td>
<td>.003**</td>
<td>.003**</td>
<td>.002**</td>
<td>.002**</td>
</tr>
<tr>
<td></td>
<td>[0.37-0.81]</td>
<td>[0.37-0.82]</td>
<td>[0.35-0.79]</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-</td>
<td>-</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>.013</td>
<td>.013</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>[1.02-1.07]</td>
<td>[1.02-1.07]</td>
</tr>
<tr>
<td>Children in Household</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>0.92</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>0.184</td>
<td>0.790</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>0.19</td>
<td>0.790</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>[0.64-1.31]</td>
<td>[0.04-0.90]</td>
</tr>
<tr>
<td>Frequency of Food Access Challenges</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Children in Household</td>
<td>0.041*</td>
<td>1.00-1.23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Nagelkerke Pseudo $R^2$ | .182 | .234 | .235 | .242 |

Abbreviations: OR, Odds Ratio; SE, Standard Error; CI, Confidence Interval; AdjOR, Adjusted Odds Ratio.
*p<.05; **p<.01; ***p<.001.
Bold text: values with maximum odds ratios in each model and highest pseudo $R^2$. 
**Figure 1.** Interaction of Children in the Household and Frequency of Challenges on Degree on Food Insecurity (Ordinal Logistic Regression)
Food Program Use & General Food Insecurity

Utilization of most food assistance programs reportedly decreased from the year prior to COVID-19 (March 11, 2019-March 10, 2020) to four to six months following the outbreak (July-September, 2020). SNAP was the only program with increased participation during this time frame (83% in the year prior to 87% four to six months after the outbreak) (Figure 3). Most respondents \((n = 372, 73.2\%)\) found SNAP benefits easy to use, but some indicated that benefits did not sufficiently meet household needs.
(38% disagreed or strongly disagreed, Table 3). Twenty percent \((n = 102)\) of individuals participated in nutrition education classes through SNAP-Ed \((n = 43 \text{ of } n = 406 \text{ responses})\). Approximately 28% either agreed or strongly agreed that there were “concerns regarding administrative barriers”. Worry pertaining to others finding out about participants’ use of food programs ranged from strongly disagree to strongly agree, although 30% of the sample agreed or strongly agreed that they were “worried people will find out about food program assistance use” (Table 4). Frequency distributions revealed increases in the number of individuals classified as food insecure, which rose drastically from 57% \((n = 285 \text{ of } 501 \text{ responses})\) to over 70% \((n = 350 \text{ of } 499 \text{ responses})\), although the prevalence of food insecurity prior to the COVID-19 pandemic was measured retrospectively.
**Figure 3.** Food Assistance Program Use Prior to, and within Four to Six Months of the COVID-19 Outbreak

Abbreviations: WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; SNAP, Supplemental Nutrition Assistance Program

![Bar chart showing Food Assistance Program Use Pre- and Post-COVID-19](chart.png)
Table 3. SNAP-Eligible Participants’ Level of Agreement Regarding Perceptions and Barriers to SNAP within Four to Six Months of the COVID-19 Outbreak

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, SNAP benefits are easy to use to buy food for our household</td>
<td>38 (7.5)</td>
<td>12 (2.4)</td>
<td>18 (3.5)</td>
<td>136 (26.8)</td>
<td>236 (46.5)</td>
</tr>
<tr>
<td>$n = 440$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNAP benefits are enough to meet our household’s needs</td>
<td>59 (11.6)</td>
<td>133 (26.2)</td>
<td>67 (13.2)</td>
<td>106 (20.9)</td>
<td>73 (14.4)</td>
</tr>
<tr>
<td>$n = 438$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We cannot use SNAP benefits to pay for groceries ordered online</td>
<td>25 (4.9)</td>
<td>71 (14.0)</td>
<td>159 (31.3)</td>
<td>95 (18.7)</td>
<td>89 (17.5)</td>
</tr>
<tr>
<td>$n = 439$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are not able to use our full month’s of SNAP benefits (because, for</td>
<td>121 (23.8)</td>
<td>152 (29.9)</td>
<td>88 (17.3)</td>
<td>56 (11.0)</td>
<td>19 (3.7)</td>
</tr>
<tr>
<td>example, it is hard to go shopping or stores do not have food we need)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n = 436$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bolded text indicates maximum frequency.
Table 4. SNAP-Eligible Participants’ Level of Agreement Regarding Perceptions and Barriers to Food Programs within Four to Six Months of the COVID-19 Outbreak

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree n (%)</th>
<th>Disagree n (%)</th>
<th>Neither Agree nor Disagree n (%)</th>
<th>Agree n (%)</th>
<th>Strongly Agree n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am worried about the paperwork I need to share to enroll in food programs (n = 458)</td>
<td>68 (13.4)</td>
<td>119 (23.4)</td>
<td>131 (25.8)</td>
<td>95 (18.7)</td>
<td>45 (8.9)</td>
</tr>
<tr>
<td>I do not want to rely on food programs because I value personal independence (n = 459)</td>
<td>34 (6.7)</td>
<td>75 (14.8)</td>
<td>152 (29.9)</td>
<td>141 (27.8)</td>
<td>57 (11.2)</td>
</tr>
<tr>
<td>It is difficult for me to travel to the food program offices to apply and recertify (n = 459)</td>
<td>65 (12.8)</td>
<td>122 (24.0)</td>
<td>121 (23.8)</td>
<td>110 (21.7)</td>
<td>41 (8.1)</td>
</tr>
<tr>
<td>I’m worried that I have too many personal assets (savings, house, car) to qualify for a food program (n = 455)</td>
<td>115 (22.6)</td>
<td>155 (30.5)</td>
<td>98 (19.3)</td>
<td>56 (11.0)</td>
<td>31 (6.1)</td>
</tr>
<tr>
<td>I’m worried people will find out I use these programs (n = 458)</td>
<td>98 (19.3)</td>
<td>109 (21.5)</td>
<td>101 (19.9)</td>
<td>108 (21.3)</td>
<td>42 (8.3)</td>
</tr>
</tbody>
</table>

Bolded text indicates maximum frequency.
Discussion

The severity of food insecurity among a vulnerable group during the pandemic may be associated with a number of factors including compromised food access within four to six months following the onset of COVID-19 in combination with children residing in the household, age, attainment of a college degree, and, most prominently, change in employment. These factors accounted for 24.2% of the variability in food insecurity during COVID-19. Among SNAP-eligible Utahns, food program utilization within the four to six months that followed the onset of the COVID-19 pandemic was reduced compared to the reported utilization in the year prior to the pandemic (March 11, 2019-March 10, 2020) for all programs aside from SNAP, though statistical tests were not performed to examine differences due to concerns of violating the independence of observations assumption. However, the total number of food programs used before and within four to six months since the COVID-19 outbreak was subjected to statistical testing, yielding no significant difference.

Previous research in collaboration with the present study examined general risk for food insecurity post COVID-19 in the general populace in a separate state. Findings revealed that job loss, furlough, or lost hours, which were captured in our collapsed binary variable “job change”, significantly predicted food insecurity, as did income. Findings from the current analysis suggest that changes in employment occurring within the four to six months that followed the onset of the COVID-19 pandemic also impacted the level of food insecurity in an already vulnerable sample, such that changes resulted in exacerbated food insecurity. Although odds of food insecurity were quite high and
significant for households with children in the population-level sample, this study’s final model failed to reach statistical significance for the same predictor variable when examining degree of food insecurity among SNAP-eligible participants; however, the predictive effect of food access challenges reported in reference to four to six months since the COVID-19 outbreak was found to depend on whether households included children. Perhaps food access issues were more pronounced among those with children particularly for those already food insecure, potentially as a result of the increased number of mouths to feed or limited ability to leave the home due to school closures during the pandemic. Niles and colleagues (2020) found that attainment of college degree reduced the odds of overall food insecurity in Vermont residents, and our findings were confirmatory of this with regard to severity of food insecurity in the SNAP-eligible Utahns.4

A recent study utilizing a version of the instrument employed in the current study revealed significant predictors of reduced food access to include probable Major Depressive Disorder (MDD), Hispanic ethnicity, and classification as “essential workers.”7 In consideration of these findings, it is not unreasonable to presume that psychological difficulties, including MDD, as well as ethnicity or race, may contribute to worsened food insecurity since COVID-19 in low-income individuals such as the population of interest. Another NFACT-affiliated research study demonstrated significantly lower fruit and vegetable intake among food insecure individuals compared to those classified as food secure.42 Examining this relationship among SNAP utilizers in the context of COVID-19 could also yield informative results to guide future program-related legislation.
Utilization of all food programs individually (food pantries, WIC, School Food Program) was reduced since the onset of COVID-19 aside from SNAP, which increased only slightly. Whether changes in respondent eligibility for various programs (e.g. WIC) contributed to the observed changes in food program use is unknown, as this was not queried in the survey. Previous literature indicated increases in SNAP enrollment since the onset of COVID-19.\textsuperscript{10} Opinions regarding barriers thought to influence food program enrollment during the pandemic, such as stigma, travel, or administrative challenges were quite varied; however, notable observations indicated that most participants found SNAP benefits easy to use, even in the early months of the pandemic. In contrast, roughly one third of the sample suggested concern regarding administrative barriers, difficulty traveling to the food program offices, and worry about others finding out about food program assistance use. Furthermore, almost 38\% indicated that they were inadequate to support household needs, which is supported by other literature.\textsuperscript{10,12}

The impact of COVID-19 on various factors, including food insecurity, was plausibly not static;\textsuperscript{13} perceptions and enrollment in food programs among this population may have changed as proximity to the onset of COVID-19 decreased. Future research may consider inspecting this disparity in heightened food insecurity and reduced food program enrollment, especially with respect to COVID-19, in greater detail.

Although there are many strengths to this study, limitations do exist. First, the data in this study were based on a cross-sectional, convenience sample of SNAP-eligible individuals in Utah. Although the survey was disseminated to all eligible participants in the state of Utah, the response rate was low. It is possible that the target population checks emails less frequently, or that the pandemic influenced participation. Additionally,
self-report survey approaches are inevitably accompanied by response bias, which should
be considered for any generalizations made about the existing study. An important
consideration regarding the primary predictor variable (food access challenges since
COVID-19) is the potential for this variable to function endogenously. It is possible that
some factors, such as children in the household, precipitated food access, in turn
influencing food security status and may confound the associations identified.

Sociodemographic information on all prospective respondents \((N = 24,763)\) was
not obtained, limiting a comparison of sample demographics to population demographics
to determine sample representation. USDA SNAP quality control data indicated that the
percentage of households with children in the state of Utah in fiscal year 2019 was 51%;
similar to the 43% reported in the sample. Other demographic characteristics were not
directly comparable due to differences in how attributes were defined and measured in
the USDA report compared to the present study. A final limitation involves the reliance
on the memory of respondents for retrospective information, as opposed to obtaining
information at different time points in a longitudinal manner.

Study strengths include the use of a tool used among numerous other
collaborators in the U.S.\(^4,7,8,13\) for ease of comparability regarding COVID-19 impact on
food insecurity across a diversity of populations and locations. Other strengths include
the employment of robust statistical methods, and imputation of data to address
missingness and ensure validity of responses, adding to existing literature by identifying
factors impacting food insecurity severity.
Conclusions

The current study adds to the existing literature by exposing factors associated with degree of food insecurity among SNAP-eligible Utahns since the initial COVID-19 outbreak. Despite legislation implemented to support food programs through the COVID-19 crisis, including the FFCA and the CARES Act, expansion and modification of these policies may be beneficial. As evidenced by our findings, food insecurity, including reduced food quantity in an already fragile population, was affecting low-income families by July 2020, and likely even earlier. Beyond this, the increase in SNAP benefits is relatively small at a mere 15% with plans to discontinue the benefit expansion by September 2021. It is possible that many ramifications, including food insecurity, will persist well into the future. Moreover, it is imperative that policies be expanded to ensure that SNAP benefits sufficiently adapt to food price variability, particularly during times of crisis, such as a pandemic. In fact, having such policies in place prior to the economic instability brought on by any major crisis is essential in reducing the gap delay in mobilization of these benefits to, in turn, buffer food insecurity in SNAP participants and their families.
References


doi:10.2105/AJPH.2020.306041

doi:10.1177/00333549211007152


CHAPTER 5
DISABILITY AND HEALTH: THE ROLE OF FOOD SECURITY AS A POTENTIAL MEDIATOR

Abstract

Background: It is well established that there are associations between disability and food insecurity as well as disability and health disparities. Research substantiating the potential for food insecurity to function as a possible mechanism for health disparities among those with disabilities is needed.

Objective: To explore whether there is a significant direct effect between the presence of one or more self-reported disabilities and poorer self-reported health, as well as the indirect effect of disability on self-reported health through food security status.

Methods: This cross-sectional study surveyed individuals (N = 1610) in the Intermountain West region of the United States in July 2020 as part of a larger project examining disability and health. A Qualtrics survey (162 items) was utilized to examine self-reported disability (collapsed into ‘no disability’, n = 955; ‘any physical disability’, n = 294; and ‘any non-physical disability’, n = 361), food security (USDA food security module; coded as food secure/food insecure), self-reported health (range: 1-5 with higher values indicative of more favorable health), and demographic variables, among others. Marginal Mediation Analysis (MMA) explored the direct effect of disability on self-reported health and the indirect effect of disability on self-reported through food security status. The MMA model adjusted for income, employment, food assistance, marital
status, race, education, gender, children in the home, presence of health insurance, age, and the impact of COVID-19. Results are conveyed through Average Marginal Effects (AMEs). 95% Confidence Intervals (CI) were used.

Results: When adjusting for the described variables, there was a significant direct effect of disability on self-reported health, where those with any physical disability (Unstandardized AME = -0.69; CI[-0.82, -0.54]), and those with any non-physical disability (Unstandardized AME = -0.32; CI[-0.45, -0.19]), had lower health scores than those without a disability. Similarly, individuals with any physical disability (Unstandardized AME = -0.02; CI[-0.04, -0.005]) and any non-physical disability (Unstandardized AME = -0.01; CI[-0.03, -0.001]) had significantly lower self-reported health scores through the mechanism of food security status compared to individuals without a disability.

Conclusions: Food insecurity may mediate the relationship between disability and self-reported health. Disparities in health among those with disabilities may be addressed, at least in part, through the attenuation of food insecurity. Reducing food insecurity in individuals with disabilities may not only reduce the overall prevalence of food insecurity but may also influence health outcomes. This research justifies the implementation of longitudinal research to lend further evidence to this finding.
Introduction

Disability and Food Security

Disability is defined by the Americans with Disabilities Act (ADA) as any “physical or mental impairment that substantially limits one or more major life activities.” There is myriad evidence relating disability to food insecurity, which occurs when access to adequate food is insufficient or uncertain. Food security, in contrast, is attained when physical and economic accessibility to safe and nutritious food is ensured, to meet dietary needs and food preferences for a healthy life. Individuals with disabilities comprise an astonishingly high proportion (31.8%) of all food insecure households. Perhaps even more staggering is the degree to which persons with disabilities experience food insecurity. An alarming 38% of all people classified as ‘very low food secure’, are those with disabilities. ‘Very low food security’ is the most extreme form of food insecurity during which persons endure reduced food consumption in combination with disrupted eating patterns. The association between disability and food insecurity has been observed across the lifespan and across types of disability.

Mechanisms potentially contributing to disparities of food insecurity among persons with disabilities include increased rates of poverty and reduced employment among households with disabilities. Furthermore, various expenditures, such as medical equipment, are greater among individuals with disabilities, which may incur a substantial cost burden and impede affordability of other items such as food. Physical access to food may be compromised in this population as well. The abundance of studies, some of which are longitudinal, support the assertion that disability may precipitate and
potentiate food insecurity\textsuperscript{4,11}, extending beyond mere association.\textsuperscript{4} Extensions of these and related preliminary findings necessitate further exploration. Substantiating preliminary findings may contribute to improvements in related policy efforts that are clearly inadequate at best, as evidenced by the striking disparities described above.\textsuperscript{5} In directing efforts to reduce food insecurity among those with disabilities, overall food insecurity in the U.S. will be diminished.\textsuperscript{4,13}

**Food Insecurity and Health**

It is well known that food insecurity may play a role in the development of adverse health outcomes including various chronic illnesses such as hypertension, cancer, diabetes,\textsuperscript{14,15} and obesity.\textsuperscript{16,17,18} Cyclical eating patterns where overeating occurs during times of food availability, which in turn impact metabolism, may be at the crux of many of these health outcomes.\textsuperscript{18,19,20} Other mechanisms include reliance on inexpensive foods which tend to be energy-dense, as well as stress-induced visceral fat accumulation.\textsuperscript{19,21} General malnutrition,\textsuperscript{15,22} specific nutritional deficiencies,\textsuperscript{17} and mental illness\textsuperscript{23,24} are also cited in relation to food insecurity and hunger.\textsuperscript{2,24} Additionally, self-assessed health, which is a simple, yet well-supported indicator of health status,\textsuperscript{25,26} despite its latent nature and variability in the manner in which it may be perceived by respondents\textsuperscript{27} is lower in those with food insecurity.\textsuperscript{14} The preventable nature of food insecurity and its potential health implications warrant acute attention, particularly among groups disproportionately vulnerable to food insecurity such as those with disabilities.\textsuperscript{5}
Disability and Health

Persons with one or more disabilities are at higher risk for obesity\textsuperscript{28,29,30} which is also associated with various debilitating chronic diseases.\textsuperscript{31} Greater obesity or overweight has been identified among adults with intellectual disabilities,\textsuperscript{32} and in children with developmental disabilities.\textsuperscript{33}

However, even when controlling for obesity and several other relevant variables, chronic disease prevalence for at least seven chronic disease states is higher in individuals with disabilities.\textsuperscript{34} Variables capturing aspects of mental (e.g. anxiety, depression) and social health (e.g. isolation) have also been identified, where individuals with disabilities report significantly worse impact than those than those without a disability.\textsuperscript{35} Overall self-perceived health is also poorer among those with a disability, particularly for those with intellectual disabilities.\textsuperscript{34} In summary, it is well established that persons with one or more disabilities are at higher risk of developing generally poorer health outcomes in physically and mentally when compared to individuals without a disability.

Objectives

Considering the various health outcomes associated with food insecurity and the known associations between disability and various health outcomes, this research aimed to determine the direct effect of disability on self-reported health status, as well as the indirect effect of disability on self-reported health as mediated by food insecurity status.
Methods

This study was approved by Utah State University’s Institutional Review Board (Protocol #11022) and served as a component of a multidisciplinary project examining health outcomes associated with food insecurity in the Intermountain West (Utah, Idaho, Colorado, and Wyoming). A cross-sectional survey was administered online through Qualtrics in July 2020. Qualtrics was contracted to recruit similarly sized samples of individuals in the Intermountain Region with, and without a self-reported disability. Disability was defined as having one or more of the following: autism, developmental disability, psychiatric/emotional disability, hard of hearing/deaf, intellectual disability, physical disability requiring a mobility assistive device, chronic illness/long-term illness, learning disability, speech/language disability, traumatic brain injury, or blind/low vision. These were derived from the Disability Education Act. Qualtrics utilized a quota sampling approach to obtain the requested samples, achieved through paid panels as described by Ciciurkaite, Marquez-Velarde, and Brown. The data retrieved, and provided to researchers, was comprised of complete responses only. Complete responses were defined as the provision of a response for all survey items, and information regarding the number of partial survey responses was unavailable.

Participants

Prospective respondents were eligible if they were at least 18 years of age, resided in the Intermountain West region (Utah, Idaho, Colorado, and Wyoming), and consented to participate after reviewing the informed consent statement, which preceded survey
content. In total, 2043 respondents participated, of whom \( n = 1020 \) reported having one or more disabilities (49.9%). Response rates for either sample (those with and without a reported disability) were not disclosed by the contracted survey company.\(^{36}\)

**Instrumentation**

The survey (total items = 162) included questions regarding activities of daily living (14 items), social support (24 items), and food security (18 items\(^ {39}\)). Questions regarding the impact of the COVID-19 pandemic (pandemic-related stressor scale (20 items); alpha = 0.91)\(^ {38}\) were also included. Other topics encompassed in the survey involved physical health (four items), health care (four items), mental health (22 items), mastery and self-esteem (17 items), house modifications (three items), discrimination (22 items), and a series of demographic questions (14 items).

**Disability**

Disability was initially categorized as *physical disability* (hard of hearing/deaf, blindness/low vision, physical disability requiring a mobility device, and chronic/long-term illness), *psychological disability* (psychiatric/emotional disability), and *developmental/intellectual disability* (autism, developmental disability, intellectual disability, learning disability, speech/language disability, traumatic brain injury, and other)\(^ {38}\). This categorization was utilized to align with the work of affiliated scholars involved in the overarching food security and health outcomes project.\(^ {38}\) To account for the lack of mutual exclusivity in disability, as many respondents reported disabilities in multiple categories, disability in the current study was ultimately defined as 1) disabilities
or combinations of disabilities which included at least one physical disability (‘any physical disability’; n = 294) and 2) disabilities or combinations of disabilities which did not include a physical disability (any non-physical disability; n = 361). The remaining category (no disability; n = 955) was defined by the lack of respondent endorsement of any of the disabilities listed.

**Food Security**

Food security status was measured with the 18-item USDA Food Insecurity Module, a validated and widely employed instrument. However, the 6-item food insecurity survey module, a tool embedded within the 18-item module, serves as a validated independent measure of food insecurity as well. The 6-item version was selected due to reduced bias in detecting food insecurity prevalence in relation to the 18-item module. Our interests were less focused on the severity of food insecurity in relation to disability and health; therefore, the binary version was utilized (0 = high/marginal food security, 1 = low/very low food security or food insecurity).

**Self-Reported Health**

Self-reported health was expressed through a 5-item Likert scale (coded as 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent) delineated from the question: “Which of the following best describes your overall health status?” Respondents were given the option to refuse to answer this question or to indicate ‘don’t know’. To maintain the integrity of the numeric quality of the scale, these participants were excluded (n = 27).
Summary of Statistical Methods

Main Model

Marginal Mediation Analysis (MMA) with the MarginalMediation package was the approach utilized to explore the indirect effect of disability (predictor) on self-reported health (outcome) through food security (mediator), and the direct effect of disability on self-reported health. In the present study, the paths examined were limited to ‘path a’, which investigated the relationship between disability and food security and ‘path b’ which explored food security and self-reported health, when controlling for disability (Figures 1 & 2), and ‘path c’, or the direct effect--disability and self-reported health when controlling for food security. The indirect effect is the product of paths ‘a’ and ‘b’. Marginal mediation was selected as opposed to other methodologies, such as a Structural Equation Modeling (SEM) approach, due to the streamlined interpretability of the mediator and outcome variables. Marginal mediation allows for the examination of both continuous and categorical outcomes/mediators, that other mediation approaches cannot handle. In this case, food security (mediator) was a categorical variable, while self-reported health (outcome) was measured numerically.

Pathways require individual model specification prior to mediation analysis. Accordingly, ‘path a’ was defined through a binomial General Linear Model (GLM) with a logit link, otherwise known as logistic regression. This was due to the dichotomous identity of food security (mediator). In contrast, paths ‘b’, and ‘c’ were examined through a gaussian GLM with an identity distribution, which is essentially a traditional linear model. A linear model was deemed to be the suitable methodology for these
regressions in view of the five-level scale defining self-reported health, which also
demonstrated a normal distribution in the sample.

This approach demonstrated statistical outcomes in terms of Average Marginal
Effects (AMEs), which enables relatively simple, interpretable estimations of effect sizes
for both the direct effect and indirect effect in terms of the outcome’s units (self-reported
health). Both unstandardized and standardized AMEs were reported, the latter
conveying the difference in the outcome in terms of standard deviations (SDs). Ninety-
five percent Confidence Intervals (CI) were computed through 500 iterations of
bootstrapping. To demonstrate a more complete picture of the mediation relationship,
regression estimates were also reported for each path.

**Additional Variables**

Variables accounted for in previous work examining relationships between
disability and food security, and food security and health, justified inclusion in the
present model. Variables examined in prior research for ‘path a’ (disability and food
security) included race, gender, education, income, marital status, food assistance
(specifically, The Supplemental Nutrition Assistance Program, “SNAP”), and household
size. In the current study, food assistance was generalized to include food assistance
from any source, including that which was obtained personally (e.g. family or friends), or
through public organizations (e.g. local food pantries or SNAP). Household size was not
captured in the present study.

Variables adjusted for in pertinent previous work along ‘path b’ (food security
and health) encompassed health insurance, employment status, number of children,
household size and composition, race, education, location, age, gender, income, and
veteran status. Of these, we were able to account for health insurance, employment status, whether children lived in the household, race, education, age, gender, and income. In addition to the other described variables, we attempted to control for the impact of COVID-19, as the questionnaire was disseminated to respondents four months after the COVID-19 outbreak received the ‘pandemic’ designation.

Variables were examined for associations statistically with disability, food insecurity, and self-reported health independently; however, due to strong theoretical grounds for incorporating these variables, were retained regardless of whether they were significantly associated with each primary variable of interest (disability, food insecurity, and self-reported health). All available variables supported by previous related research, in addition to the impact of COVID-19, were considered as potential covariates or cofactors in the MMA. In other words, all covariates/cofactors were controlled for in each dimension of the MMA (i.e. ‘path a’, ‘path b’, and ‘path c’) to yield an indirect effect of disability status on self-reported health through food insecurity.

Variance Inflation Factors (VIF) within the Car package tested for multicollinearity and redundancy among the variables adjusted for in the model, none of which were substantially higher than two; thus, all aforementioned variables were adjusted for as anticipated. The model was run both with and without the inclusion of identified potential confounders for comparability.

Exclusions

Notably, there were 83 respondents who indicated ‘don’t know’ or ‘refused’ the item pertaining to income. These respondents were intentionally excluded from the model as well to maintain the numeric quality of ‘income’. As previously described, 27
respondents were excluded for the same reasons for ‘self-reported health’. One participant indicated either of these responses for both income and self-reported health; therefore, 109 responses were excluded. Including participants in the analysis with these responses would have resulted in substantial issues with the statistical analysis.

Additionally, those who self-identified as having a disability defined solely through the presence of a chronic illness and/or psychiatric/emotional diagnosis were eliminated from an iteration of the analysis altogether rather than moved to the group without a self-reported disability. This was not to detract from the degree to which chronic or psychiatric/emotional illness as a disability impacts the sum of health, overall. Rather, these persons were excluded to eliminate the potential for excessive collinearity/conflation between chronic illness or psychiatric/emotional as disabilities and ‘self-reported health’.

The impetus supporting this decision is rooted in literature which examines how self-reported health is interpreted by most individuals. Indeed, historically, most individuals have perceived self-reported health in the context of physical health. It seems intuitive to expect that mental health is now viewed as a key feature of self-reported health as well. Moreover, the purpose of this study was to further explore the potential mediation relationship between disability, food security, and health outcomes; including participants who define disability through a chronic illness or mental illness exclusively may, thereby, invalidate this research question and associated findings. To explore the potential impact of this, the analysis was performed with these individuals excluded ($n = 1610$ when accounting for ‘don’t know’ and ‘refused’ responses) and replicated with all participants ($n = 1910$).
Results

Demographics

Of the 1610 respondents who did not define disability as having a chronic illness or psychiatric/emotional disability exclusively, 59% reported no disability, while 18% reported any physical disability (hard of hearing/deaf, blindness/low vision, physical disability requiring a mobility device, and chronic/long-term illness). The remaining 22% reported having one or more disabilities which were not defined as ‘physical’ in nature (psychiatric/emotional disability, autism, developmental disability, intellectual disability, learning disability, speech/language disability, traumatic brain injury, and other) (Table 1). A comprehensive table with the distribution of specific disability is provided in Appendix C.

Over half of those with a disability of any kind were food insecure, compared to approximately one third of individuals without a self-reported disability. Individuals with a disability more frequently reported income of less than $25,000 annually, and respondents without a disability indicated higher rates of full-time employment (46.7% in relation to 37.4% and 38.2%). In all classifications of disability, the sample was predominantly Non-Hispanic White and identified as female. Few participants (8.9% without a disability, 5.8% with any physical disability, 8% with any non-physical disability) lacked health insurance. The COVID-19 Pandemic Stressor Score, which measured the impact of COVID-19 in various capacities, was most severe for those with any non-physical disability (39.1% compared to 23.6% (no disability) and 36.1% (any physical disability)). Self-reported health score (range: 1-5, where higher scores
suggested better self-reported health) was highest among those without a disability ($M = 3.5; SD = 1.0$), and lowest for those with any physical disability ($M = 2.7; SD = 1.1$).

### Table 1. Demographics by disability ($N = 1610$)

<table>
<thead>
<tr>
<th>Demographic</th>
<th>No Disability</th>
<th>Any Physical Disability</th>
<th>Any Non-Physical Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Security</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not food insecure</td>
<td>651 (68.2%)</td>
<td>137 (46.6%)</td>
<td>171 (47.4%)</td>
</tr>
<tr>
<td>Food insecure</td>
<td>304 (31.8%)</td>
<td>157 (53.4%)</td>
<td>190 (52.6%)</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No income-$24,999</td>
<td>215 (22.5%)</td>
<td>95 (32.3%)</td>
<td>130 (36%)</td>
</tr>
<tr>
<td>$25,000-44,999</td>
<td>193 (20.2%)</td>
<td>70 (23.8%)</td>
<td>88 (24.4%)</td>
</tr>
<tr>
<td>$45,000-64,999</td>
<td>146 (15.3%)</td>
<td>49 (16.7%)</td>
<td>44 (12.2%)</td>
</tr>
<tr>
<td>$65,000-84,999</td>
<td>129 (13.5%)</td>
<td>34 (11.6%)</td>
<td>43 (11.9%)</td>
</tr>
<tr>
<td>$85,000 and above</td>
<td>272 (28.5%)</td>
<td>46 (15.6%)</td>
<td>56 (15.5%)</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed full-time</td>
<td>446 (46.7%)</td>
<td>110 (37.4%)</td>
<td>138 (38.2%)</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>139 (13.6%)</td>
<td>30 (10.2%)</td>
<td>56 (15.5%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>90 (9.4%)</td>
<td>20 (6.8%)</td>
<td>72 (19.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>289 (30.3%)</td>
<td>134 (45.6%)</td>
<td>95 (26.3%)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced, separated, or</td>
<td>177 (18.5%)</td>
<td>55 (18.7%)</td>
<td>66 (18.3%)</td>
</tr>
<tr>
<td>widowed</td>
<td>497 (52%)</td>
<td>143 (48.6%)</td>
<td>139 (38.5%)</td>
</tr>
<tr>
<td>Married</td>
<td>281 (29.4%)</td>
<td>96 (32.7%)</td>
<td>156 (43.2%)</td>
</tr>
<tr>
<td>Never been married</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race &amp; Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>747 (78.2%)</td>
<td>233 (79.3%)</td>
<td>273 (75.6%)</td>
</tr>
<tr>
<td>Other</td>
<td>208 (21.8%)</td>
<td>61 (20.7%)</td>
<td>88 (24.4%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>20 (2.1%)</td>
<td>9 (3.1%)</td>
<td>21 (5.8%)</td>
</tr>
<tr>
<td>High school/GED</td>
<td>208 (21.8%)</td>
<td>53 (18%)</td>
<td>88 (24.4%)</td>
</tr>
<tr>
<td>Education Level</td>
<td>No (32%)</td>
<td>Yes (40.8%)</td>
<td>More than college (Master’s and above)</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>----------</td>
<td>-------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Some college</td>
<td>306 (32%)</td>
<td>120 (40.8%)</td>
<td>151 (41.8%)</td>
</tr>
<tr>
<td>College (Bachelor’s degree)</td>
<td>293 (30.7%)</td>
<td>79 (26.9%)</td>
<td>65 (18%)</td>
</tr>
<tr>
<td>More than college (Master’s and above)</td>
<td>128 (13.4%)</td>
<td>33 (11.2%)</td>
<td>36 (10%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>678 (71%)</td>
<td>184 (62.6%)</td>
<td>253 (70.1%)</td>
</tr>
<tr>
<td>Male</td>
<td>271 (28.4%)</td>
<td>102 (34.7%)</td>
<td>101 (28%)</td>
</tr>
<tr>
<td>Nonbinary or other</td>
<td>6 (0.6%)</td>
<td>8 (2.7%)</td>
<td>7 (1.9%)</td>
</tr>
<tr>
<td>Children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No children</td>
<td>582 (60.9%)</td>
<td>196 (66.7%)</td>
<td>233 (64.5%)</td>
</tr>
<tr>
<td>Yes children</td>
<td>373 (39.1%)</td>
<td>98 (33.3%)</td>
<td>128 (35.5%)</td>
</tr>
<tr>
<td>Health Insurance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health insurance</td>
<td>870 (91.1%)</td>
<td>277 (94.2%)</td>
<td>332 (92%)</td>
</tr>
<tr>
<td>No health insurance of any kind</td>
<td>85 (8.9%)</td>
<td>17 (5.8%)</td>
<td>29 (8%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>42.0 (16.1)</td>
<td>44 (17.3)</td>
<td>34.9 (13.8)</td>
</tr>
<tr>
<td>COVID-19 Pandemic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stressor Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2 (low)</td>
<td>413 (43.2%)</td>
<td>85 (28.9%)</td>
<td>85 (23.5%)</td>
</tr>
<tr>
<td>3-5 (moderate)</td>
<td>183 (19.2%)</td>
<td>56 (19%)</td>
<td>65 (18%)</td>
</tr>
<tr>
<td>6-8 (moderately severe)</td>
<td>134 (14%)</td>
<td>47 (16%)</td>
<td>79 (19.4%)</td>
</tr>
<tr>
<td>9+ (severe)</td>
<td>225 (23.6%)</td>
<td>106 (36.1%)</td>
<td>141 (39.1%)</td>
</tr>
<tr>
<td>Self-Reported Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range: 1-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>3.6 (1.0)</td>
<td>2.7 (1.1)</td>
<td>3.1 (1.1)</td>
</tr>
</tbody>
</table>

a. 109 observations excluded due to responses of ‘don’t know’ or ‘refused’ for self-reported health and/or income

Regression Estimates

Compared to those without a disability, persons with any physical disability demonstrated significantly higher log odds ($\beta = 0.61, p < .001; \text{Figure 1}$) of food insecurity in reference to those without a disability (Odds Ratio = 1.84). Similarly, those
with any non-physical disability had higher log odds of food insecurity than those without a disability \((\beta = 0.36, p = .03; \text{Figure 2; Odds Ratio} = 1.43)\). Food insecurity was significantly predictive of less favorable self-reported health scores \((\beta = -0.22, p<.001; \text{Figures 1 and 2})\). Any physical disability and any non-physical disability were associated with lower self-reported health scores \((\beta = -0.69, p < .001; \beta = -0.32, p < .001 \text{ for physical (Figure 1) and non-physical disabilities (Figure 2), respectively})\). Regression estimates are adjusted for the variables described previously.
**Figure 1.** Path Diagram Displaying Regression Estimates for those with Any Physical Disability

SE = Standard Error

* p<.05  
** p<.01  
*** p<.001
**Figure 2.** Path Diagram Displaying Regression Estimates for those with any Non-physical Disability

![Path Diagram](image)

SE = Standard Error
* p<.05
** p<.01
*** p<.001

**Marginal Mediation: Direct Effects of Disability on Self-Reported Health**

Three models are presented: the first demonstrating the direct and indirect effects of disability on self-reported health with no additional variables adjusted for in the marginal mediation model; the second model conveys the AMEs when adjusting for income, employment, food assistance, marital status, race, education, gender, children in the home, health insurance, age, and the impact of COVID-19; and the third model illustrates the direct and indirect AMEs where respondents with a chronic disease and/or...
psychiatric emotional disability defined disability were included (Table 2). Interpretations are derived from model two.

When adjusting for food insecurity status, income, employment, food assistance, marital status, race, education, gender, children in the home, health insurance, age, and the impact of COVID-19, those with any physical disability had lower self-reported health scores than those without a disability (Unstandardized AME = -0.69; CI[-0.82, -0.54]), as displayed in Table 2 (Model two). Likewise, those with any non-physical disability, when controlling for the same factors, suggested significantly worse self-reported health (Unstandardized AME = -0.32; CI[-0.45, -0.19]) than those without a disability. AMEs for models one and three were less conservative than AMEs in model two.

**Marginal Mediation: Indirect Effects of Disability on Self-Reported Health**

After accounting for the aforementioned variables, there were significant indirect effects of any physical disability or non-physical disability on self-reported health through food security status. Those with a physical disability, through food security status, reported scores which were 0.02 units (Unstandardized AME) lower than those without a disability (CI[-0.04, -0.005]). Respondents with any non-physical disability, through food security status, scored 0.01 units (Unstandardized AME) lower on the self-reported health scale (CI[-0.03, -0.001]) than those without a disability. AMEs were once again more conservative for the indirect effect in model two in relation to models one and three when examining physical disability. For those with any non-physical disability, AMEs were slightly lower in model 3 than model 2 (-0.009 and -0.01, respectively).
Table 2. Average Marginal Effects (AMEs) for Direct and Indirect Effects on Disability and Self-reported Health

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2c</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model excluding covariates/cofactors</td>
<td>Model with covariates/cofactors; disabilities defined exclusively by chronic or psychiatric/emotional disability excluded</td>
<td>Model with covariates/cofactors; disabilities defined exclusively by chronic or psychiatric/emotional disability included</td>
</tr>
<tr>
<td>N</td>
<td>1692[b]</td>
<td>1610[d]</td>
<td>1910[e]</td>
</tr>
<tr>
<td>Direct effect of any physical disability on self-reported health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstandardized AME[a] [95% CI]</td>
<td>-0.81[-0.95, -0.66]</td>
<td>-0.69[-0.82, -0.54]</td>
<td>-0.82[-0.94, -0.70]</td>
</tr>
<tr>
<td>Standardized AME [95% CI]</td>
<td>-0.73[-0.86, -0.60]</td>
<td>-0.62[-0.74, -0.49]</td>
<td>-0.74[-0.85, -0.63]</td>
</tr>
<tr>
<td>Indirect Effect of any physical disability on self-reported health through food insecurity status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstandardized AME [95% CI]</td>
<td>-0.09[-0.13, -0.06]</td>
<td>-0.02[-0.04, -0.005]</td>
<td>-0.02[-0.04, -0.006]</td>
</tr>
<tr>
<td>Standardized AME [95% CI]</td>
<td>-0.08[-0.11, -0.05]</td>
<td>-0.02[-0.03, -0.004]</td>
<td>-0.02[-0.03, -0.005]</td>
</tr>
</tbody>
</table>
### Direct effect of any non-physical disability on self-reported health

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized AME [95% CI]</th>
<th>Standardized AME [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct effect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of any non-physical disability on self-reported health</td>
<td>-0.41 [-0.53, -0.27]</td>
<td>-0.35 [-0.45, -0.24]</td>
</tr>
<tr>
<td>Unstandardized AME [95% CI]</td>
<td>-0.41 [-0.53, -0.27]</td>
<td>-0.35 [-0.45, -0.24]</td>
</tr>
<tr>
<td>Standardized AME [95% CI]</td>
<td>-0.37 [-0.48, -0.25]</td>
<td>-0.32 [-0.41, -0.22]</td>
</tr>
</tbody>
</table>

### Indirect Effect of any non-physical disability on self-reported health through food insecurity status

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized AME [95% CI]</th>
<th>Standardized AME [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indirect Effect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of any non-physical disability on self-reported health through food insecurity status</td>
<td>-0.09 [-0.12, -0.05]</td>
<td>-0.009 [-0.02, -0.0005]</td>
</tr>
<tr>
<td>Unstandardized AME [95% CI]</td>
<td>-0.09 [-0.12, -0.05]</td>
<td>-0.009 [-0.02, -0.0005]</td>
</tr>
<tr>
<td>Standardized AME [95% CI]</td>
<td>-0.08 [-0.11, -0.05]</td>
<td>-0.008 [-0.02, -0.0004]</td>
</tr>
</tbody>
</table>

---
a. Average Marginal Effects in terms of Self-Reported Health  
b. 27 participants excluded due to ‘don’t know’ or ‘refused’ response  
c. Model adjusted for income, employment, food assistance, marital status, race, education, gender, children in the home, health insurance, age, and the impact of COVID-19  
d. 109 cases due to exclusions in income and self-reported health score; 324 respondents excluded due to disability defined solely by chronic illness or psychiatric/emotional illness  
e. 133 cases due to exclusions due to ‘don’t know’ or ‘refused response’ for income and/or self-reported health score
Figure 3. Average Marginal Effects (AMEs) for Direct and Indirect Effects on Disability and Self-reported Health
Discussion

The present study extends previous findings of the established associations between disability, food security, and health by lending evidence to the relationship between disability and health, mediated through food security status. This finding has implications for future longitudinal research and policy decisions. Indeed, the results suggest that attenuating food insecurity among those with disabilities, who comprise nearly one third of all those with food insecurity, will not only reduce the overall prevalence of food insecurity, but may also impact health outcomes at the individual and population levels.

Direct Effect: Disability and Self-Reported Health

Findings relating disability to health outcomes in previous literature were supported in the present study where a significant direct effect was observed, even when removing individuals who exclusively defined disability as a chronic disease or psychiatric/emotional disability. As discussed above, excluding these participants was deemed necessary to prevent conflation of disability and self-reported health, in light of research indicating that respondents have perceived self-reported health to pertain to aspects of physical health in combination with researchers’ conjecture that respondents may integrate psychiatric and emotional health are integrated in the interpretation of ‘self-reported health’.

Reichard and colleagues also determined that those with disabilities, including intellectual disabilities, reported poor self-reported health. Although significant direct
effects were detected among those with any physical disability and those with any non-
physical disability (which includes intellectual disabilities) when compared to those
without a disability, the effect was slightly more pronounced among with any physical
disability, where presence of any physical disability was associated with slightly worse
self-reported health scores. The mechanisms engendering this modest difference are
speculative and may have very little practical relevance. However, it is possible that there
were disparate interpretations of self-reported health among those with any physical
disability and those with any non-physical disability. Alternatively, previous research has
indicated that obesity, which may mediate disability and health, can impact health as well
as impact disability itself, perpetuating what has been termed a vicious cycle. Perhaps
this phenomenon is at play among those with any physical disability and is potentially
perceived as more impactful on health in relation to those with any non-physical
disability. Future research should further investigate disability by type on health,
particularly with the utilization of objective health measures that have reduced risk for
subjective interpretation by study respondents.

**Indirect Effect: Disability and Self-Reported Health through Food Security**

In addition to the relevant information above, perhaps the most profound aspect of
this research was the impact of food security in potentially mediating disability and self-
reported health. This suggests that, among those with disabilities, particularly those with
any physical disability, self-reported health may be attenuated when food insecurity is
modulated. The practical implications of this finding are manifold, especially considering
the variables which were accounted for in the model.
Income, which is strongly associated with food insecurity,\textsuperscript{13,15} was one such variable. Employment was also statistically accounted for, as those with disabilities have a higher prevalence of unemployment.\textsuperscript{9} The significance noted in the indirect effect, despite the adjustments described, suggest that other factors contribute to the disparity. Increased expenditures for medical needs and equipment may contribute to food insecurity and, thereby, worse self-reported health.\textsuperscript{6,10} Future examination of the moderating or interactive effect of disability and income, employment, and expenditures on health in the context of food insecurity could inform public assistance efforts with greater specificity.\textsuperscript{11,45}

Results of the current study indicated a persisting significant relationship between disability and self-perceived health through food security status. Consistent with other literature;\textsuperscript{4,11} it is plausible that food assistance of any type does not sufficiently address food insecurity in this population. This could thereby impact health outcomes. It is imperative that this finding is scrutinized in future research exploring the mediating relationship performed presently, including conducting interaction tests between disability and food assistance of various types. Findings could elucidate the degree to which various forms of food assistance dampen food insecurity and propel specific policy interventions to support these individuals effectively and sufficiently.

**Limitations & Strengths**

Limitations to the current study mainly center around the cross-sectional design and the lack of absolution with which we can ascertain a causal relationship of disability and health through food security. However, due to the high financial and resource costs
of performing longitudinal research, this exploratory cross-sectional work may help to justify and substantiate future longitudinal endeavors to further these initial efforts. Other limitations include the potential for omitted variable bias, which is a ubiquitous concern in social science research. The bias introduced through the availability of completed responses, exclusively, should also be acknowledged, as well as the plausible lack of representation from individuals with severe disabilities. This research was completed by the respondent and did not allow for a caregiver or other helping individual to participate for an individual with a severe disability. Though the sample size was relatively large and was roughly equivalent in regard to those with and without disabilities, an examination of the impact of specific disabilities (e.g. intellectual disability, blindness) was not examined. Additionally, the number, severity, and duration of the disability were not explored in the existing study. Finally, food insecurity as measured in the USDA’s validated food security module is based on financial access to food and does not account for physical access, which may be an especially important consideration among this population. These limitations should be addressed in future research.

Strengths of this study include the methodology allowing for streamlined interpretability, which may be easily implemented in future research. The samples were fairly equal in size, in terms of those with and those without disabilities. This research also accounted for the impact of stressors relating to the COVID-19 pandemic, which has previously been identified to impact individuals with disabilities profoundly. Other variables, as demonstrated in previous literature, were accounted for in the model as well to reduce the potential for confounding. Most important, this study was able to
statistically justify future investigation of food insecurity as a mechanism contributing to health disparities among individuals with disabilities.

**Conclusion**

There is evidence to suggest that the relationship between disability and health is mediated, at least in part, through food insecurity. Individuals with any physical disability, and individuals with any non-physical disability, had worse self-reported health through food security status compared to individuals with no disability in the Intermountain West region of the U.S. These findings should inform future research, including longitudinal research, to substantiate this finding and determine the impact of disability severity, duration, and type on health through the mechanism of food insecurity.
References


CHAPTER 6
SUMMARY & CONCLUSIONS

Summary

There are various individual and system-level contributors to health outcomes among vulnerable individuals. One system-level contributor is delineated from dimensions of the healthcare system (interprofessional healthcare), while others (food insecurity) are derived from dimensions of our social systems at the population level. In terms of the healthcare system in the United States, care provision is increasingly occurring through an interprofessional modality, in which healthcare providers from diverse disciplines work collaboratively to meet the needs of patients or clients more comprehensively.\(^1\) The underlying aim of interprofessional collaboration is to optimize patient health outcomes.\(^1,2-5\)

Registered Dietitian Nutritionists (RDNs) are integral to the success of numerous procedures and disease states with nutrition implications, including those which may affect individuals with disabilities and other complex conditions,\(^6,7\) and therefore are well-suited to make crucial contributions to interprofessional healthcare teams.\(^6,8-11\) Despite the recognized utility of the RDN within interprofessional teams, interprofessional research involving RDNs is scant.\(^5,7,12-15\) Accordingly, little is known about the degree to which RDNs are engaging interprofessionally with other healthcare team members. This dissertation sought to begin rectifying this gap by investigating RDN and dietetic student
perceptions of interprofessional healthcare teams, as attitudes of teams may relate to team engagement (Study 1).

In addition, little is known about the way dietetic training programs are fulfilling accreditation standards, which broadly require the incorporation of interprofessional-related education (IPE) to enable the attainment of interprofessional skills.\textsuperscript{16,17} Beyond a general lack of understanding of the approaches utilized to integrate IPE into dietetic program curricula, the effectiveness of these approaches is not well understood. This dissertation aimed to examine both aspects to aid in the identification of opportunities in dietetics programs to modify, and thereby, potentially maximize IPE efforts to prepare emerging RDNs for effective team engagement (Study 2).

Food insecurity is associated with a multitude of adverse health outcomes.\textsuperscript{18-21} Food insecurity is experienced by individuals from many demographic groups; though especially among lower-income individuals.\textsuperscript{22,23} The COVID-19 pandemic likely compounded challenges this sector of the population encountered in terms of food access,\textsuperscript{24-27} with the associated potential for short and long-term effects on health. This research examined food access, food insecurity, and food program assistance utilization among lower income individuals in Utah four to six months after the onset of the COVID-19 pandemic to pinpoint where supports are needed to ultimately prevent downstream health implications (Study 3).

Individuals with disabilities experience food insecurity at substantially higher rates than others in the United States (U.S.).\textsuperscript{28} Moreover, disability is associated with poorer health, including in the form of chronic disease,\textsuperscript{29} obesity,\textsuperscript{30-32} and low perceptions of self-reported health.\textsuperscript{29} Considering the robust and abundant literature linking disability
to food insecurity, food insecurity to health, and disability to health, this dissertation sought to explore whether food insecurity potentially mediates the relationship between disability and health (Study 4).

**Study 1 (Chapter 2)**

The first study was a cross-sectional, survey-based study in which interprofessional attitudes of RDNs and dietetic students across the U.S. were examined and compared. The Attitudes Toward Interdisciplinary Healthcare Teams Scale (ATIHCT) was employed, which examined attitudes regarding efficiency of team-based care and outcomes of team-based care. Scores were explored in reference to various characteristics of both samples. Results indicated that clinical specialty, higher frequency of engaging in interprofessional teams, and higher perceived value by other members of the team were associated with more positive perceptions. Identifying as male and more years with the RDN credential were associated with less positive attitudes. There were no significant differences in the student characteristics studied.

This study serves as an important contributor to the current scarcity of interprofessional research among RDNs and dietetic students studying to become RDNs in the U.S., specifically by fostering a broad glimpse into the perceptions of outcomes of team-based care and efficiency of team-based care among both RDNs and dietetic students. Findings corroborate the notion that actual engagement in collaborative practice is associated with attitudes regarding team-based care. They also suggest and reaffirm that supporting the RDN’s perceptions of how valued they feel by other team members may impact attitudes, and potentially facilitate the integration of the RDN on the
interprofessional healthcare team. Therefore, this study highlights the need for other professionals to learn about the role and value of the RDN. Future research should build on this work by examining the influence of all team members’ perceptions of one another in relation to team effectiveness, as well as exploring the efficacy of various collaborative approaches in healthcare particularly among teams with RDNs. Future research may also investigate IPE-related approaches with regard to attitudes of team-based care in dietetic students.

**Study 2 (Chapter 3)**

The second study was a mixed-methods, cross-sectional study in which dietetic program directors and students in the U.S. reported how IPE-related ACEND accreditation standards are being fulfilled and evaluated. Student level of satisfaction and director level of confidence in future student interprofessional collaboration were also assessed. Key results indicated that multiple approaches are being utilized, with particularly frequent endorsement of case studies, direct experience, and lectures. More IPE approaches were associated with higher student satisfaction after program type/level, and time spent on IPE were adjusted for, although they were not related to directors’ level of confidence. Directors are evaluating attainment of IPE-related learning objectives with considerable variation, with evidently little utilization of validated tools.

To our knowledge, there is no study that has yet comprehensively examined aspects of the fulfillment of IPE requirements in dietetics programs both quantitatively and qualitatively. Findings illustrated that dietetic programs may be enhanced through the incorporation of multiple IPE approaches into curricula. Furthermore, the diversity of the
evaluation methods used to determine whether students meet IPE-derived learning objectives presents challenges in determining actual IPE effectiveness. Programs may consider employing validated IPE measures to evaluate student learning in this realm to yield valid and psychometrically sound results that may be compared across cohorts and specific IPE models or efforts. This would also encourage the administration of true IPE in which future students can learn from and teach other disciplines. Consequently, perhaps this could strengthen views from other professional disciplines of the value and role of the RDN. Future research should aim to investigate the longitudinal effectiveness of various IPE approaches in dietetic programs with objective measures.

**Study 3 (Chapter 4)**

Study 3 was a cross-sectional study investigating the impact of the COVID-19 on food access and food insecurity in lower-income Utahns four to six months after the World Health Organization designated the outbreak as a pandemic. Frequency of difficulty with food access since the pandemic was tested for associations with food insecurity severity. Additionally, food assistance program utilization before and since the pandemic was evaluated, as were perceptions and barriers to food assistance programs. The interaction of children in the home and frequency of food access challenges were associated with food insecurity severity. Job changes and older age were also associated with more extreme food insecurity. Reported participation in the SNAP program was higher since the pandemic compared to the year prior, with respondents indicating that SNAP benefits were easy to use, though insufficient for household needs. However,
respondents’ use of other food assistance programs decreased during the pandemic. Reported food insecurity increased from 57% to 70% since the onset of COVID-19.

To our knowledge, this is the first research article to date examining food access and food insecurity in lower-income Utahns during the initial phases of the pandemic, in conjunction with food assistance program utilization. Results suggested that low-income Utahns were profoundly affected four to six months after the initiation of the pandemic, and that exacerbated food insecurity severity was pronounced for households already classified as food insecure with children and physical access to food during the pandemic. Accordingly, this study illuminated the need for the implementation of protective and preventative measures to reduce the potential for physical food access, particularly among lower-income families with children, those who experienced a change in employment, and older individuals. The results indicate that supporting these groups may prevent the escalation of food insecurity severity. This study also adds to the extant literature by identifying that SNAP benefits may be enhanced through the expansion of benefits, especially during crises such as a global pandemic. Future research should further explore the disparity in increased SNAP utilization compared to decreased use of other food assistance programs four to six months after the onset of COVID-19 compared to the year preceding the pandemic. Considering the anticipated lasting impact of the COVID-19 pandemic, this population should be examined at subsequent intervals.

**Study 4 (Chapter 5)**

The final study of this dissertation was the first of its kind, to our knowledge, that has explored whether there may be evidence of an indirect effect of disability on self-
reported health through food insecurity. The data demonstrated a significant indirect effect, suggesting that disability may contribute to food insecurity, which in turn, may precipitate poorer health outcomes. The implications of this finding suggest that it is possible that attenuating and preventing food insecurity among those with disabilities may engender better health outcomes. Due to the cross-sectional nature of this research, causality in these findings cannot be ascertained; although, the study serves as a significant first step in justifying further exploration of this relationship. To build on the foundational finding elucidated in this research, future research may consider examining which variables may moderate food insecurity among individuals with specific types of disability, and whether these variables dampen effects on negative health outcomes. Longitudinal research should also be performed to examine the sequential nature of disability, food insecurity, and health outcomes. In particular, the timing and severity of food insecurity onset in relation to specific types of disability, disability severity, and duration should be investigated, in combination with the development of health outcomes which are both subjective and objective.

**Conclusions**

This research identifies and addresses gaps in provider-driven and population-driven aspects of health, with implications for vulnerable groups such as those with complex health conditions, low-income persons, and individuals with disabilities. Of note, a broad assessment of interprofessional attitudes of current RDNs and dietetic students was performed, which, to our knowledge, is the first study of its kind in the U.S.
These findings may prompt related research among RDNs to support their participation in team-based care to ultimately optimize patient outcomes. Similarly, an appraisal of IPE approaches in tandem with director confidence and student satisfaction imparts insights and early recommendations for accredited programs to maximize student preparedness for collaborative practice. The results described in Chapter 4 also illuminate the profound impact of the COVID-19 pandemic on low-income individuals in Utah and advocate for the expansion of SNAP benefits during times of crisis. Moreover, they demonstrate the need to establish robust protective measures on food access amid disaster, particularly for those already experiencing poverty. Lastly, the results described in Chapter 5 augmented previous literature examining the connection between disability and food insecurity, disability and health, and food insecurity and health, through the elucidation of a significant indirect effect of disability on self-reported health through the mechanism of food insecurity.
References


10. DiMaria-Ghalili RA, Mirtallo JM, Tobin BW, Hark L, Van Horn L, Palmer CA. Challenges and opportunities for nutrition education and training in the health


APPENDICES
APPENDIX A. Attitudes Toward Interprofessional Healthcare Teams Scale: as Modified for Chapter 2
**Appendix A.** Attitudes Toward Interdisciplinary Team Care (ATIHCT) items (McClain, Schwartz, Bakner, Azad & Shahidullah, in review, 2020; Voorhees, Wengreen, & Serang, in progress, 2022)

<table>
<thead>
<tr>
<th>ATIHCT Item</th>
<th>Outcomes of team-based care</th>
<th>Efficiency of team-based care</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The interdisciplinary team approach improves the quality of care to patients/clients.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2. Interdisciplinary team meetings foster communication among team members from different disciplines</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3. Patients/clients receiving interdisciplinary team care are more likely than other patients to have their physical, behavioral, developmental, and educational needs met comprehensively</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4. The interdisciplinary team approach permits health/behavioral health providers/clinicians to meet the needs of family caregivers as well as patients/clients.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>MODIFIED IN PRESENT STUDY TO:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The interdisciplinary team approach permits health professionals to meet the needs of family caregivers as well as patients/clients.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The give and take among interdisciplinary team members help them to make better patient/client care decisions</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6. Patients/clients who receive interdisciplinary team care are better prepared for discharge from care than other patients/clients.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7. Working on an interdisciplinary team keeps most health/behavioral health providers/clinicians enthusiastic and interested in their jobs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MODIFIED IN THE PRESENT STUDY TO:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working on an interdisciplinary team keeps most health professionals enthusiastic and interested in their jobs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>8.</strong> Developing a patient/client care plan with other interdisciplinary team members avoids delivering suboptimal care</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>9.</strong> The interdisciplinary team approach makes the delivery of care more efficient</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>10.</strong> Working in interdisciplinary teams unnecessarily complicates things most of the time</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>11.</strong> In most instances, the time required for interdisciplinary team collaborations could be better spent in other ways</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>12.</strong> When developing interdisciplinary patient/client care plans, much time is wasted translating jargon from other discipline</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>13.</strong> Developing an interdisciplinary patient/client care plan is excessively time consuming</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*indicates reverse-coded items
APPENDIX B. Frequency of Food Access Difficulties Questionnaire
Item:

1. Could not find AS MUCH food as I wanted to buy (food not in store)
2. Could not find THE TYPES of food my household prefers to eat
3. Had challenges knowing where to find help for getting food
4. Had to go to more places than usual to find the food my household wanted
5. Had to stand too close to other people, when getting food (less than six feet away)
6. Reduced grocery trips to avoid COVID-19 exposure

Possible Responses:

Never (coded as 1)
Sometimes (coded as 2)
Usually (coded as 3)
Every time (coded as 4)
APPENDIX C. Distribution by Specific Disability ($N = 1020$)
### Appendix C. Distribution by Specific Disability (N = 1020)

<table>
<thead>
<tr>
<th>Disability</th>
<th>n</th>
<th>(% of those with any disability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person who has autism</td>
<td>59</td>
<td>5.8%</td>
</tr>
<tr>
<td>Person who is deaf/hard of hearing</td>
<td>135</td>
<td>13.2%</td>
</tr>
<tr>
<td>Person who has a developmental disability</td>
<td>52</td>
<td>5.1%</td>
</tr>
<tr>
<td>Person who has a psychiatric or emotional disability</td>
<td>454</td>
<td>44.5%</td>
</tr>
<tr>
<td>Person who has an intellectual disability</td>
<td>34</td>
<td>3.3%</td>
</tr>
<tr>
<td>Person who has a physical disability (requires a mobility assisting device)</td>
<td>95</td>
<td>9.3%</td>
</tr>
<tr>
<td>Person who is chronically ill (long term illness)</td>
<td>217</td>
<td>21.3%</td>
</tr>
<tr>
<td>Person who has a specific learning disability (e.g. dyslexia, ADHD)</td>
<td>283</td>
<td>27.7%</td>
</tr>
<tr>
<td>Person who has a speech language disability</td>
<td>39</td>
<td>3.8%</td>
</tr>
<tr>
<td>Person who has a traumatic brain injury</td>
<td>60</td>
<td>5.9%</td>
</tr>
<tr>
<td>Person who is blind or has low vision</td>
<td>81</td>
<td>7.9%</td>
</tr>
<tr>
<td>Other disability</td>
<td>98</td>
<td>9.6%</td>
</tr>
</tbody>
</table>

Mean number of disabilities: 1.58 (SD = 0.962)
Range: 1-8
APPENDIX D. RDN and Dietetic student Interdisciplinary Perceptions Survey
RD & Student Perceptions of Interprofessional Teams

Start of Block: Informed Consent

Q61 Please fully review this Letter of Information document before deciding whether to proceed with this survey. To download a copy of this letter for your records, click here https://protis.usu.edu/media/uploads/7722/10660_Wengreen_LOI_Student_Final.pdf

- Yes I am over the age of 18 and I agree to participate in this study (1)
- No I am not over the age of 18 or I do not agree to participate in this study (2)

End of Block: Informed Consent

Start of Block: Demographics

Q1 Are you a practicing Registered Dietitian (RD) or a student in a dietetics program accredited by the Accreditation Council for Nutrition and Dietetics Education (ACEND)?

- Registered Dietitian (1)
- Dietetics student (2)
- Other (3)

End of Block: Demographics
Q2 What is your current age (in years)?

\[ \n\begin{array}{c}
\text{▼ 18 (2173) ... 100 (2255)} \\
\end{array}
\]

Q3 What is your gender?

- Female (1)
- Male (2)
- Other (1)

Q4 In which state do you currently reside?

\[ \n\begin{array}{c}
\text{▼ N/A (1471) ... Wyoming (1523)} \\
\end{array}
\]

Q5 How would you describe your geographic setting?

- Urbanized area (50,000 or more people) (64)
- Urban cluster (at least 2,500 but fewer than 50,000) (65)
- Rural (population not included in an urbanized or urban area) (66)
- Frontier (fewer than 7 people/square mile) (67)
Q6 Which type of program are you enrolled in?

- Coordinated Program in Dietetics (1)
- Didactic Program in Dietetics (2)

Q7 Are you in a graduate-level or undergraduate-level dietetics program?

- Undergraduate (1)
- Graduate (2)

Q8 Which year are you currently completing in your dietetics program?

- First year in the program (1)
- Second year in the program (2)
- Dietetic internship for didactic students (3)
- Other (please specify) (4)
Q9 Which of the following aligns most closely with your career interests?

- Clinical nutrition (1)
- Food service or food service management (2)
- Sports nutrition (3)
- Research and education/academia (4)
- Private practice (5)
- Community and public health nutrition (6)
- Other (please specify) (7)

Q10 Interprofessional practice and education (IPE) . . . "occurs when individuals 'from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes’” (Core Competencies for Interprofessional Collaborative Practice: Report of an Expert Panel, 2011).

Have you received education or experiences relating to interprofessional healthcare teams in your program?

- Yes (1)
- No (2)
- Unsure (3)
Q11 What ways have you received education on interprofessional healthcare teams within your program (select all that apply)?

- Lecture from dietetics program instructors (1)
- Lecture from professionals or instructors outside your program (2)
- Assigned online modules/videos (3)
- Assigned reading materials (4)
- Facilitated interaction with disciplines from other programs (nursing students, social work students, medical students) through assignments or projects (5)
- Case studies involving multiple professions/disciplines (6)
- Direct experience through supervised practice at sites outside your university setting (7)
- Direct experience through supervised practice at sites located within your university setting (8)
- Other (9) ________________________________________________
Q12 What is your level of satisfaction with the quality and quantity of interprofessional education you have received in your program?

- Extremely satisfied (1)
- Moderately satisfied (2)
- Slightly satisfied (3)
- Neither satisfied nor dissatisfied (4)
- Slightly dissatisfied (5)
- Moderately dissatisfied (6)
- Extremely dissatisfied (7)

Display This Question:
If Are you a practicing Registered Dietitian (RD) or a student in a dietetics program accredited by... = Registered Dietitian

Q12 What year did you obtain your RD credential?

________________________________________________________________

Display This Question:
If Are you a practicing Registered Dietitian (RD) or a student in a dietetics program accredited by... = Registered Dietitian
Q13 What is your primary area of practice?

- Clinical nutrition (including eating disorders) (1)
- Food service or food service management (2)
- Sports nutrition (3)
- Research and education/academia (4)
- Private practice (5)
- Community and public health nutrition (6)
- Other (please specify) (7)

Q14 How many years have you been working in your primary area of practice? (round to nearest year)

- 1 (4) ... 50 (53)

Q15 How many years have you been working in your primary setting? (round to the nearest year)

- 1 (832) ... 50 (881)
Q16 “Interprofessional healthcare collaboration occurs when two or more professions work together to achieve common goals and is often used as a means for solving a variety of problems and complex issues” (Green & Johnson, 2015). In the past year, how often have you typically acted as a member of an interdisciplinary/interprofessional healthcare team?

- Daily (10)
- Weekly (11)
- Monthly (12)
- A few times a year (13)
- Once a year (14)
- Less than once a year (15)
Q17 In what ways do you engage in interprofessional/interdisciplinary teamwork (select all that apply)?

☐ Consultation (1)

☐ Warm hand-offs among providers (2)

☐ Formal, scheduled team meetings (3)

☐ Informal, unscheduled team meetings (4)

☐ Other (please specify) (5)

Q18 Have you ever completed, or been involved in, a formal interprofessional education program such as the Leadership Education in Neurodevelopmental Disabilities (LEND) program?

☐ Yes (1)

☐ No (2)

☐ Unsure (3)
Q19 As a dietitian, how valued do you feel by other professionals within your interprofessional teams?

- Highly valued (1)
- Somewhat valued (2)
- Neither valued nor undervalued (3)
- Somewhat undervalued (4)
- Very undervalued (5)
- Not applicable; I do not work within an interprofessional team (6)

Display This Question:
If What is your primary area of practice? = Clinical nutrition (including eating disorders)

Q20 Do you work at a research or education hospital?

- Yes (1)
- No (2)
- Unsure (3)

Display This Question:
If What is your primary area of practice? = Clinical nutrition (including eating disorders)

Q21 Do you work primarily in pediatrics?

- Yes (1)
- No (2)
- Sometimes (3)
Q22 What is your specific area of clinical practice (select all that apply)?

- Oncology (1)
- Neurology (2)
- ICU (3)
- Weight management (4)
- Diabetes education/management (5)
- Renal dietetics (6)
- Eating disorders (7)
- Feeding (8)
- Other (please specify) (9)
Q23 Do you currently work full-time (30 or more hours/week), part-time (less than 30 hours/week and scheduled for regular hours), or PRN (less than 30 hours/week, and scheduled irregularly)?

- Full-time (1)
- Part-time (2)
- PRN (3)

Display This Question:
If What is your primary area of practice? = Clinical nutrition (including eating disorders)

Q24 Do you spend 70% or more of your time working in an in-patient, or out-patient setting?

- Inpatient (1)
- Outpatient (2)

Display This Question:
If What is your primary area of practice? = Clinical nutrition (including eating disorders)
Q25 Which other professions do you typically work with?

- Physicians or physician residents/interns (1)
- Nurse Practitioners (2)
- Physician Assistants (3)
- Psychologists (4)
- Nurses (5)
- Physical Therapists (6)
- Occupational Therapists (7)
- Psychiatrists (8)
- Pharmacists (9)
- Social Workers (10)
- Genetecists (11)
- Other (please specify) (12)

End of Block: Demographics

Start of Block: Attitudes Towards Health Care Teams Scale - Revised (ATHCTS-R)

Q26 Please read the following questions and rate your agreement for each statement:
Q27 Working in interdisciplinary teams unnecessarily complicates things most of the time.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q28 The interdisciplinary team approach improves the quality of care to patients/clients.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)
Q29 Interdisciplinary team meetings foster communication among team members from different disciplines.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q30 Physicians have the right to alter patient care plans developed by the team.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)
Q31 Patients/clients receiving interdisciplinary team care are more likely than other patients to have their physical, behavioral, developmental and educational needs met comprehensively.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q32 Working on an interdisciplinary team keeps most health professionals enthusiastic and interested in their jobs.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)
Q33 Patients/clients are less satisfied with their care when it is provided by a team.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q34 Developing a patient/client care plan with other interdisciplinary team members avoids delivering suboptimal care.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)
Q35 When developing interdisciplinary patient/client care plans, much time is wasted translating jargon from other disciplines.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q36 Health professionals working on interdisciplinary teams are more responsive than others to personal (eg, financial, billing support, social support) needs of patients.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)
Q37 Developing an interdisciplinary patient/client care plan is excessively time consuming.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q38 The give and take among interdisciplinary team members help them to make better patient/client care decisions.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)
Q39 In most instances, the time required for interdisciplinary team collaborations could be better spent in other ways.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q40 Patients/clients who receive interdisciplinary team care are better prepared for discharge from care than other patients/clients.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)
Q41 The interdisciplinary team approach makes the delivery of care more efficient.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q42 The interdisciplinary team approach permits health professionals to meet the needs of family caregivers as well as patients/clients.

- Strongly disagree (34)
- Disagree (35)
- Slightly disagree (36)
- Slightly agree (38)
- Agree (39)
- Strongly agree (40)

Q43 Are you interested in entering into a drawing for a $25 Amazon gift card? The information you provide will not be associated with your responses.

- Yes (1)
- No (2)

End of Block: Attitudes Towards Health Care Teams Scale - Revised (ATHCTS-R)
APPENDIX E. Dietetic Program Curriculum (IPE) Survey
Program Curriculum and Interprofessional Teams

Start of Block: Default Question Block

Q15 Please fully review this Letter of Information document before deciding whether to proceed with this survey. To download a copy of this letter for your records, click here

○ Yes I am over the age of 18 and agree to participate in this study (1)

○ No I am not over the age of 18 or I do not agree to participate in this study (2)

Skip To: End of Survey If Please fully review this Letter of Information document before deciding whether to proceed with t... = No I am not over the age of 18 or I do not agree to participate in this study
Skip To: End of Survey If Please fully review this Letter of Information document before deciding whether to proceed with t... != Yes I am over the age of 18 and agree to participate in this study

Q1 Are you the director of an ACEND accredited CPD, DPD, or DI dietetics program?

○ Yes (1)

○ No (2)

Skip To: Q16 If Are you the director of an ACEND accredited CPD, DPD, or DI dietetics program? = No

Q2 In which state or territory is your program located?

▼ N/A (1471) … Wyoming (1523)
Q3 Which type of program do you direct?

- Coordinated Program in Dietetics (1)
- Didactic Program in Dietetics (2)
- Dietetic Internship (3)

Q4 Which of the following best represents the dietetics program you direct?

- Undergraduate (1)
- Graduate (2)
- Other (3) ____________________________________________

Q5 Which of the following aligns most closely with your primary area of specialty prior to working in your current position?

- Clinical nutrition (1)
- Food service or food service management (2)
- Sports nutrition (3)
- Research and education/academia (4)
- Private practice (5)
- Community and public health nutrition (6)
- Other (please specify) (7) ____________________________________
Q6

Interprofessional relationships are included in multiple Core Knowledge and Competencies for the Registered Dietitian (KRDNs and CRDNs) as outlined by the Accreditation Council for Education in Nutrition and Dietetics (ACEND):

KRDN 2.2 Describe the governance of nutrition and dietetics practice, such as the Scope of Nutrition and Dietetics Practice and the Code of Ethics for the Profession of Nutrition and Dietetics; and describe interprofessional relationships in various practice settings. KRDN 2.5 Identify and describe the work of interprofessional teams and the roles of others with whom the registered dietitian nutritionist collaborates in the delivery of food and nutrition services. CRDN 2.4 Function as a member of interprofessional teams (CPD and Dietetic Internship only).
How are these required elements met in your program curriculum? (select all that apply)

☐ Lecture from dietetics program instructors (1)
☐ Lecture from professionals or instructors outside your program (2)
☐ Assigned online modules/videos (3)
☐ Assigned reading materials (4)
☐ Case studies involving multiple professions/disciplines (5)
☐ Facilitated interaction with disciplines from other programs (nursing students, social work students, medical students) through assignments or projects (6)
☐ Direct experience through supervised practice/internships at sites outside your university setting (7)
☐ Direct experience through supervised practice/internships at sites located within your university setting (8)
☐ Other (please specify) (9)

Q7
How much time, in hours, do most students spend attaining these requirements through the methods selected in the previous question?

Interprofessional relationships are included in multiple Core Knowledge and Competencies for the Registered Dietitian (KRDNs and CRDNs) as outlined by the Accreditation Council for Education in Nutrition and Dietetics (ACEND):
KRDN 2.2 Describe the governance of nutrition and dietetics practice, such as the
Scope of Nutrition and Dietetics Practice and the Code of Ethics for the Profession of Nutrition and Dietetics; and describe interprofessional relationships in various practice settings. *KRDN 2.5* Identify and describe the work of interprofessional teams and the roles of others with whom the registered dietitian nutritionist collaborates in the delivery of food and nutrition services. *CRDN 2.4* Function as a member of interprofessional teams (CPD and Dietetic Internship only).

Q8 At what point in the program do you address the concept of interprofessional teams in your curriculum (select all that apply)?

☐ First year (1)

☐ Second year (2)

☐ Third year (3)

☐ Fourth year (4)

☐ Other (please specify) (5)

____________________________________

Q9 How do you evaluate students’ attainment of interprofessional-related learning objectives in your program (please be specific)?

____________________________________

____________________________________

____________________________________

____________________________________

____________________________________
Q10 How confident are you in your students’ ability to work within interprofessional teams upon graduation (for CPD and DPD directors) or upon the completion of the Dietetic Internship (for Dietetic Internship directors)?

<table>
<thead>
<tr>
<th>Not at all confident</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
</tbody>
</table>

1 ()

Q14 Are you interested in entering into a drawing to win a $25 Amazon gift card? The information you provide will not be linked to your responses.

- [ ] Yes (1)
- [ ] No (2)

Display This Question:

If Are you the director of an ACEND accredited CPD, DPD, or DI dietetics program? = No
And Are you the director of an ACEND accredited CPD, DPD, or DI dietetics program? != Yes

Q16 If you are not a dietetics program director, but are a Registered Dietitian or dietetics student and have an interest in participating in a separate survey, please click [here](#).

End of Block: Default Question Block
APPENDIX F. Food Insecurity During COVID-19 Survey
Q3 Food Access and Food Security Before and During COVID-19 in Utah (IRB # 11339)
You are invited to participate in a research study by Dr. Mateja R. Savoie Roskos an Assistant Professor in the Department of Nutrition, Dietetics, and Food Sciences at Utah State University. The purpose of this research is to determine how COVID-19 has impacted the ability for Utahn’s to access adequate amounts of safe and affordable food. Specifically, we are interested in learning about changes in your shopping habits, dietary patterns, and use of various assistance programs. You are being asked to participate in this research because you are currently receiving or have previously received Supplemental Nutrition Assistance Program (SNAP) benefits, also known as Food Stamps, in Utah. Your participation in this study is voluntary. You may close your browser at any time to exit the survey. However, since this is an anonymous survey, once you submit the survey, we will not be able to withdraw your answers because we will not know which answers are yours. If you take part in this study, you will be asked to take a survey on Qualtrics, an online survey tool. This survey will take approximately 20-25 minutes of your time and will ask you questions about your general access to food, eating and purchasing behaviors, your perspectives and experiences with COVID-19, and your awareness/use of federal/local food assistance and education programs. The possible risks of participating in this study include loss of confidentiality and potential discomfort that may be associated with thinking about and answer questions from your experiences during what has been a very stressful time for many people. Although you will not directly benefit from this study, it has been designed to learn more about how COVID-19 has impacted food access and food security among individuals across the state of Utah which will be provided to policy makers and legislatures to help them make informed decisions in the future. We will make every effort to ensure that the information you provide remains confidential. We will not reveal your identity in any publications, presentations, or reports resulting from this research study. We will collect your information through Qualtrics, an online survey tool. Online activities always carry a risk of a data breach, but we will use systems and processes that minimize breach opportunities. This data will be securely stored in Box.com, an encrypted, cloud-based storage system. Contact information data that is collected as part of the drawing will be destroyed as soon as all gift cards have been administered. For your participation in this research study you will be eligible to put your name into a drawing for one of 25 $50 Amazon gift cards. All eligible participants
who complete the survey, even if the survey is incomplete, are eligible to be included in the drawing. To be entered into the drawing, participants must provide their contact information at the end of the survey. Participants will be randomly selected after the survey has closed (4 weeks after you received your original email). You can decline to participate in any part of this study for any reason and can end your participation at any time. If you have any questions about this study, you can contact Dr. Mateja R. Savoie Roskos at mateja.savoie@usu.edu or 435-797-5777. Thank you again for your time and consideration. If you have any concerns about this study, please contact Utah State University’s Human Research Protection Office at (435) 797-0567 or irb@usu.edu.

If you agree to participate in this research, please click “yes” below to begin taking the survey. Clicking “yes” on this form means that you have reviewed the information in this form and you agree to join the study.

- Yes (1)
- No (0)

End of Block: Consent and Screener

Start of Block: Consent and Screener US

Qs4
To find out if you are eligible to take this survey, please answer the following questions:

Qs5 Have you lived in the United States since at least January 1st, 2020?

- Yes (1)
- No (0)
Q80 Have you lived in Utah since at least January 1st 2020?

- Yes (1)
- No (0)

End of Block: Consent and Screener US

Start of Block: Consent and Screener Age

Qs6 Please select your age group:

- <18 years old (1)
- 18-34 years old (2)
- 35-54 years old (3)
- 55 years and older (4)

Skip To: End of Survey If Please select your age group: = <18 years old

Page Break
Part 1 General Food Access (part 1 of 5)

Part 1.1 In this survey we will refer to “since the COVID-19 outbreak” in many questions. We are using March 11th as a start date for the COVID-19 outbreak. While it had been building for some time, that was the date the World Health Organization declared that the outbreak was a pandemic. When we ask about “the year before the COVID-19 outbreak,” we mean March 11, 2019 to March 10, 2020.
Q1 Which of the following places did your household use to get food in the year before the COVID-19 outbreak and since the COVID-19 outbreak (March 11th)? Check all that apply.
<table>
<thead>
<tr>
<th>Sources</th>
<th>In the year before the COVID-19 outbreak (1)</th>
<th>Since the COVID-19 outbreak (March 11th) (2)</th>
<th>Did not get food here (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store: Grocery store, supermarket, large bulk stores (source_groc)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Store: Convenience store, corner store (source_conv)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Store: Specialty store (ethnic market, co-op, health food store) (source_spec)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Delivery: Grocery (like Amazon or Instacart) (source_grocdel)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Delivery: Meal-kit (like Blue Apron) (source_mealdel)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Delivery: Meals on Wheels (source_MoW)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Restaurant: To go (delivery, take-out, curbside pickup) (source_restdel)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Restaurant or cafeteria - eat-in (source_restin)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Programs that give food (such as food pantry, school food) (source_prog)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Meals served in group setting like senior center, church, or synagogue (source_group)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Local: Farmers' market (source_farmmkt)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local: Direct from farm: (Community Supported Agriculture (CSA), farm stand pickup / delivery) (source_localfrm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local: Garden, fishing, foraging, hunting, or using my own canned goods (source_grow)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify below if selected) (source_otherbin)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Display This Question:**

*If Which of the following places did your household use to get food in the year before the COVID-19...*

*Or Which of the following places did your household use to get food in the year before the COVID-19 outbreak...*

Enter any additional places you get food:

<table>
<thead>
<tr>
<th>In the year before the COVID-19 outbreak (1)</th>
<th>Since the COVID-19 outbreak (March 11th) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter any additional places you get food:</td>
<td></td>
</tr>
<tr>
<td>(source_othertxt)</td>
<td></td>
</tr>
</tbody>
</table>
Q2 How true are these statements about your household’s food situation in the year before the COVID-19 outbreak and since the COVID-19 outbreak on March 11th?

<table>
<thead>
<tr>
<th>Statement</th>
<th>In the year before the COVID-19 outbreak</th>
<th>Since the COVID-19 outbreak (March 11th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The food that my household bought just didn’t last, and I/we didn’t have money to get more (usda_foodlast)</td>
<td>▼ Often true (1 ... I don’t know (99)</td>
<td>▼ Often true (1 ... I don’t know (0)</td>
</tr>
<tr>
<td>I/we couldn’t afford to eat balanced meals (usda_afford)</td>
<td>▼ Often true (1 ... I don’t know (99)</td>
<td>▼ Often true (1 ... I don’t know (0)</td>
</tr>
</tbody>
</table>
Q2a How true are these statements about your household’s food situation in the year before the COVID-19 outbreak and since the COVID-19 outbreak on March 11th?

<table>
<thead>
<tr>
<th>Statement</th>
<th>In the year before the COVID-19 outbreak</th>
<th>Since the COVID-19 outbreak (March 11th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?</td>
<td>▼ Yes (1 ... I don't know (99))</td>
<td>▼ Yes (1 ... I don't know (99))</td>
</tr>
<tr>
<td>Did you ever eat less than you felt you should because there wasn't enough money for food?</td>
<td>▼ Yes (1 ... I don't know (99))</td>
<td>▼ Yes (1 ... I don't know (99))</td>
</tr>
<tr>
<td>Were you ever hungry but didn't eat because there wasn't enough money for food?</td>
<td>▼ Yes (1 ... I don't know (99))</td>
<td>▼ Yes (1 ... I don't know (99))</td>
</tr>
</tbody>
</table>

Display This Question:

If How true are these statements about your household’s food situation in the year before the COVID-19 outbreak: Did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? [ Yes ]

Or How true are these statements about your household’s food situation in the year before the COVID-19 outbreak: Did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? [ Yes ]

Q2b How often did you cut the size of your meals or skip meals?

<table>
<thead>
<tr>
<th>How often did this happen?</th>
<th>In the year before the COVID-19 outbreak</th>
<th>Since the COVID-19 outbreak (March 11th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(usda_oftencut)</td>
<td>▼ Almost every month (1 ... Only one or two months (1)</td>
<td>▼ Almost every week (1 ... Only one or two weeks (1)</td>
</tr>
</tbody>
</table>
Q3 Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak, if any, and since the COVID-19 outbreak (March 11)? Check all that apply (if none, leave blank).

<table>
<thead>
<tr>
<th>Program Description</th>
<th>Used in the year before the COVID-19 outbreak (1)</th>
<th>Used since the COVID-19 outbreak (March 11th) (2)</th>
<th>Did not use this program (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNAP or Food Stamps (including pandemic-EBT or P-EBT)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(prog_snap)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIC (Women, Infant, and Children’s Program)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(prog_wic)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Meal Program (Lunch, Breakfast, or Summer meals)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(prog_school)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food pantry / Food bank (prog_pantry)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other food assistance program (Commodity Supplemental Food program, Meals on Wheels, or other)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(prog_other)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Display This Question:**

*If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak?*

Or *Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak?*

Enter any additional food assistance programs:

<table>
<thead>
<tr>
<th>Enter any additional food assistance programs:</th>
<th>Used in the year before the COVID-19 outbreak (1)</th>
<th>Used since the COVID-19 outbreak (March 11th) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(prog_othertext)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q3a Please indicate your level of agreement regarding using SNAP (or Food Stamps) food benefits since the COVID-19 outbreak.

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, SNAP benefits are easy to use to buy food for our household (snap_easy)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNAP benefits are enough to meet our household’s needs (snap_enough)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We cannot use SNAP benefits to pay for groceries ordered online (snap_online)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are not able to use our full months’ worth of SNAP benefits (because, for example, it is hard to go shopping or stores do not have food we need) (snap_usefull)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Display This Question:
If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak? = SNAP or Food Stamps (including pandemic-EBT or P-EBT) [Used since the COVID-19 outbreak (March 11th)]

Q3atxt Any other comments about using SNAP during the COVID-19 outbreak?

________________________________________________________________

Page Break

Display This Question:
If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak? = WIC (Women, Infant, and Children’s Program) [Used since the COVID-19 outbreak (March 11th)]
Q3b Please indicate your level of agreement regarding using WIC benefits since the COVID-19 outbreak.

<table>
<thead>
<tr>
<th>Overall, WIC benefits are easy to use to buy food for our household (wic_easy)</th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is a limited selection of food at the stores that we can buy with our WIC benefits (wic_limited)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We cannot use our full months’ worth of WIC benefits (because, for example, it is hard to go shopping or stores are sold out of WIC items) (wic_usefull)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If available, we would be interested in shopping for WIC foods online and using curbside pickup or delivery (wic_online)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Display This Question:**

*If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak (March 11th)?*

<table>
<thead>
<tr>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIC (Women, Infant, and Children’s Program)</td>
</tr>
</tbody>
</table>

Q3btxt Any other comments about using WIC during the COVID-19 outbreak?

________________________________________________________________

Page Break
Display This Question:

If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak (March 11th)?

- School Meal Program (Lunch, Breakfast, or Summer meals) [Used since the COVID-19 outbreak (March 11th)]
Q3c Please indicate your level of agreement regarding School Meals for children in your household since the COVID-19 outbreak. These meals are offered at various school and community pick up locations and in some cases can be home delivered.
<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly agree (5)</th>
<th>Not applicable (88)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The school meals are very helpful for my household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(school_helpful)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School meal sites are not open on a consistent basis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(school_notopen)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We do not have the kitchen equipment to safely store or re-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>heat meals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(school_kitchen)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School meal delivery to our home is not available or is hard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to arrange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(school_hard)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are unable to pick up the meals at the time they are</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>offered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(school_time)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are unable to pick up the meals at the place they are</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>offered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(school_place)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sites provide meals for several days at one time and we run</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>out of meals before the next pick up or delivery day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(school_runout)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The new Pandemic-EBT (P-EBT) card/benefits to pay for children’s meals while school is out have been very helpful (school_PEBT)

Display This Question:

If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak (March 11th) = School Meal Program (Lunch, Breakfast, or Summer meals) [Used since the COVID-19 outbreak (March 11th)]

Q3ctxt Any other comments about using school meals or Pandemic-EBT for school meals during COVID-19 outbreak?

________________________________________________________________
Display This Question:

If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak (March 11th)?

- Food pantry / Food bank [Used since the COVID-19 outbreak (March 11th)]
Q3d Please indicate your level of agreement regarding using a food pantry/food bank during the COVID-19 outbreak?

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food offered at the food pantry/food bank has been very helpful for my household (pantry_helpful)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The food pantry does not have food that my household likes to eat (pantry_foodlike)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The food pantry does not have good quality food (pantry_foodquality)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The food pantry gives me foods I do not know how to prepare (pantry_foodprepare)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The food pantry runs out of food often (pantry_runsout)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food pantry hours are inconvenient or irregular (pantry_hours)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are long lines / long wait times (pantry_lines)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are limits on how often we can visit the food pantry close to our home (pantry_limits)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
If Which of the following food assistance programs did your household use in the year before the COVID-19 outbreak (March 11th)?

- Food pantry / Food bank [Used since the COVID-19 outbreak (March 11th)]

Q3dtxt Any other comments about using food pantries during COVID-19 outbreak?

_________________________________________________________

Page Break
Q3e Please indicate your level of agreement regarding concerns and barriers to using income-based food programs and food pantries since the COVID-19 outbreak (March 11th)?

<table>
<thead>
<tr>
<th>Concern</th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am worried about the paperwork I need to share to enroll in food programs (foodprog_paperwork)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not want to rely on food programs because I value personal independence (foodprog_indep)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is difficult for me to travel to the food program offices to apply and recertify (foodprog_travel)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I’m worried that I have too many personal assets (savings, house, car) to qualify for a food program (foodprog_assets)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I’m worried people will find out I use these programs (foodprog_stigma)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q4 What were the typical types of transportation you used to get food for your household, in the year before the COVID-19 outbreak and since the COVID-19 outbreak? Check all that apply.

<table>
<thead>
<tr>
<th>In the year before the COVID-19 outbreak (1)</th>
<th>Since the COVID-19 outbreak (March 11th) (2)</th>
<th>Did not use this transport (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus or other public transit (trans_bus)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Own vehicle (trans_vehicle)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Ride from friend/family/neighbor (trans_friend)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Ride from taxi or app like Lyft/Uber (trans_taxi)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Someone brings food to me (delivery service or friend/family member) (trans_bringfood)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Walk or bike (trans_walk)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other (please specify below if selected) (trans_otherbin)</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Display This Question:

If What were the typical types of transportation you used to get food for your household, in the year... = Other (please specify below if selected) [ In the year before the COVID-19 outbreak ]

Or What were the typical types of transportation you used to get food for your household, in the... = Other (please specify below if selected) [ Since the COVID-19 outbreak (March 11th) ]
Q4txt Enter any additional types of transportation:

<table>
<thead>
<tr>
<th></th>
<th>In the year before the COVID-19 outbreak (1)</th>
<th>Since the COVID-19 outbreak (March 11th) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter any additional types of transportation: (1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q5 How often did these happen to your household when getting food, since the COVID-19 outbreak (March 11th)?

<table>
<thead>
<tr>
<th>Event</th>
<th>Never (1)</th>
<th>Sometimes (2)</th>
<th>Usually (3)</th>
<th>Every time (4)</th>
<th>Not applicable (88)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Could not find AS MUCH food as I wanted to buy (food not in store)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(challenge_asmuch)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could not find THE TYPES of food my household prefers to eat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(challenge_kinds)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Had challenges knowing where to find help for getting food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(challenge_findhelp)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Had to go to more places than usual to find the food my household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wanted (challenge_moreplaces)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Had to stand too close to other people, when getting food (less than</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>six feet away)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(challenge_close)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced grocery trips to avoid COVID-19 exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(challenge_reducgroc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q5a Please describe the kinds of food you wanted and could not get:

________________________________________________________________

Q5b Please describe the kinds of food you got and did not want:

________________________________________________________________

Q5c If you had to stand too close to other people, what sort of place were you in? (such as store, food pantry, school food program, etc.)?

________________________________________________________________
Q6 Have you or anyone in your household experienced a loss of income or job since the COVID-19 outbreak (March 11th)? Check all that apply.

<table>
<thead>
<tr>
<th></th>
<th>Happened at all since the COVID-19 outbreak (March 11th) (1)</th>
<th>Still happening today (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, lost job (job_loss)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Yes, reduced hours or income at job (job_hours)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Yes, furloughed (job_furlo)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☒ No, have not had any changes in job (job_no)</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Q7 Have you received any money from these sources since the COVID-19 outbreak? Check all that apply.

☐ Federal stimulus check (1)

☐ Friends or family (2)

☐ Unemployment benefits (3)

☒ None of the above (4)

End of Block: General Food Access (part 1 of 5)

Start of Block: Food Access (part 2 of 5)

Part2 Food Access (part 2 of 5)
Q8 What, if anything, would help your household to meet its food needs during the COVID-19 pandemic?

<table>
<thead>
<tr>
<th>Access to public transit or rides (helpful_transit)</th>
<th>Not helpful (0)</th>
<th>Helpful (1)</th>
<th>Not applicable (88)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different hours in meal programs or stores (helpful_mealhours)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Extra money to help pay for food or bills (helpful_extramoney)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Information about food assistance programs (helpful_infprograms)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>More (or different) food in stores (helpful_morefood)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>More trust in the safety of food (helpful_trustfood)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>More trust in safety of food delivery (helpful_trustdeliv)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>More trust in safety of going to stores (helpful_truststores)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Support for the cost of food delivery (hepful_costfood)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Other (please specify below if selected) (helpful_bin)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Display This Question:

*If What, if anything, would help your household to meet its food needs during the COVID-19 pandemic? = Other (please specify below if selected) [ Helpful ]*
Q8txt Enter other things that would make it easier for your household to meet its food needs during the COVID-19 pandemic:

________________________________________________________________

Display This Question:
If What, if anything, would help your household to meet its food needs during the COVID-19 pandemic? = Extra money to help pay for food or bills [Helpful]

Q8a How much extra money per week is needed to meet your household’s food needs? Please provide your best estimate. Only numbers may be entered into this field.

________________________________________________________________

Page Break
Q9 On a scale from 1 (not at all worried) to 6 (extremely worried), what is your level of worry for your household about the following as it relates to COVID-19:

<table>
<thead>
<tr>
<th></th>
<th>1 (not worried at all)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6 (very worried)</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>There will not be enough food in the store (worry_enoughfood)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The country will not have enough food to feed everyone (worry_countryfood)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food will become more expensive for my household (worry_foodexp)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food will become unsafe or contaminated (worry_foodunsafe)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My household will not be able to get or will lose access to programs that provide free food or money for food (worry_programs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My household will lose so much income that we can’t afford enough food (worry_income)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My household won’t have enough food if we have to stay at home and can’t go out at all (due to quarantine or illness) (worry_housefood)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q9txt Please describe any other worries you have about food and COVID-19:

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

Page Break
Q10 Which of the following strategies, if any, are you using now to afford food? If not using them now, how likely are you to use these if your household has challenges affording food in the future during the COVID-19 outbreak?

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Using now</th>
<th>Would use if needed in the future during COVID-19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accept food from friends or family (strat_accept)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Borrow money from friends or family (strat_borrow)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Buy different, cheaper foods (strat_cheap)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Buy food on credit (strat_credit)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Buy foods that don’t go bad quickly (like pasta, beans, rice, canned foods) (strat_gobad)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Get food from a food pantry or soup kitchen (strat_pantry)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Stretch the food that I have by eating less (strat_stretch)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Rely more on hunting/fishing/foraging/growing my own food (strat_grow)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Other (please specify below if selected) (strat_otherbin)</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>
Q10txt Enter other strategies your household is currently using or might use in the future:

<table>
<thead>
<tr>
<th>Currently using: (1)</th>
<th>May use in the future: (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other: (othertxt)</td>
<td></td>
</tr>
</tbody>
</table>

End of Block: Food Access (part 2 of 5)

Start of Block: Eating and Purchasing Behaviors (part 3 of 5)

**Part 3 Eating and Purchasing Behaviors (part 3 of 5)**
Q11 Do you or someone in your household have a special diet?

☐ Food allergy that requires avoiding some foods (such as nut, wheat, dairy allergy) (1)

☐ Food sensitivity that causes problems from eating some foods (such as gluten free or dairy intolerance) (2)

☐ Need to avoid some foods for health condition like diabetes or kidney disease (3)

☐ Religious restriction (such as kosher, halal) (4)

☐ Vegetarian, vegan (5)

☐ Weight loss diet that requires special foods (6)

☐ Other: (7) __________________________________________________________

☐ No one in my family has a special diet (8)
Display This Question:

If Do you or someone in your household have a special diet? = Food allergy that requires avoiding some foods (such as nut, wheat, dairy allergy)

Or Do you or someone in your household have a special diet? = Food sensitivity that causes problems from eating some foods (such as gluten free or dairy intolerance)

Or Do you or someone in your household have a special diet? = Need to avoid some foods for health condition like diabetes or kidney disease

Or Do you or someone in your household have a special diet? = Religious restriction (such as kosher, halal)

Or Do you or someone in your household have a special diet? = Vegetarian, vegan

Or Do you or someone in your household have a special diet? = Weight loss diet that requires special foods

Or Do you or someone in your household have a special diet? = Other:

Or Do you or someone in your household have a special diet? Other: Is Not Empty

Carry Forward Selected Choices from "Do you or someone in your household have a special diet?"

X→
Q11a Have you had challenges finding food that meets these food needs since the COVID-19 outbreak (March 11th)?

<table>
<thead>
<tr>
<th></th>
<th>Yes (1)</th>
<th>No (0)</th>
<th>Not applicable (88)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food allergy that requires avoiding some foods (such as nut, wheat, dairy allergy) (diet_change_allergy)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Food sensitivity that causes problems from eating some foods (such as gluten free or dairy intolerance) (diet_change_sensitive)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Need to avoid some foods for health condition like diabetes or kidney disease (diet_change_health)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Religious restriction (such as kosher, halal) (diet_change_religion)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Vegetarian, vegan (diet_veg)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Weight loss diet that requires special foods (diet_weight)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Other: (diet_other)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>☒ No one in my family has a special diet (Q11a_x8)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q12info The next 4 questions are about how you have been eating in the past month.

Q12.1 About how many cups of fruit (including 100% pure fruit juice) do you eat or drink each day? Examples of 1 cup of fruit include: 1 small apple, 1 large banana, 1 cup (8 oz.) of 100% juice or canned fruit, or ½ cup of dried fruit.

- None (0)
- ½ cup or less (1)
- ½ to 1 cup (2)
- 1 to 2 cups (3)
- 2 to 3 cups (4)
- 3 to 4 cups (5)
- 4 cups or more (6)
Q12.2 About how many cups of vegetables (including 100% vegetable juice) do you eat or drink each day? Examples of 1 cup of vegetables include: 1 cup of cooked leafy greens, 2 cups of lettuce or raw greens, 12 baby carrots, 1 medium potato, or 1 large raw tomato.

- None (0)
- ½ cup or less (1)
- ½ to 1 cup (2)
- 1 to 2 cups (3)
- 2 to 3 cups (4)
- 3 to 4 cups (5)
- 4 cups or more (6)
How often did you eat red meat (such as beef, pork, ham, sausage, veal lamb)? Do not include chicken, turkey or seafood. Include red meat you had in sandwiches, lasagna, stew, and other mixtures.

- Never (0)
- 1 time last month (1)
- 2 to -3 times last month (2)
- 1 time per week (3)
- 2 times per week (4)
- 3 to -4 times per week (5)
- 5 to -6 times per week (6)
- 1 time per day (7)
- 2 or more times per day (8)
Q12.4 How often did you eat any processed meat, such as bacon, lunch meats, or hot dogs? Include processed meats you had in sandwiches, soups, pizza, casseroles, and other mixtures. Processed meats are those preserved by smoking, curing, or salting, or by the addition of preservatives.

- Never (0)
- 1 time last month (1)
- 2 to -3 times last month (2)
- 1 time per week (3)
- 2 times per week (4)
- 3 to -4 times per week (5)
- 5 to -6 times per week (6)
- 1 time per day (7)
- 2 or more times per day (8)
Q12a Compared to before the COVID-19 outbreak, how have you been eating in the past month during the COVID-19 outbreak (since March 11th).

<table>
<thead>
<tr>
<th></th>
<th>More (3)</th>
<th>Less (1)</th>
<th>Same (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have been eating more, less, or about the same amount of fruits and vegetables per day. (eating_comp_fruitveg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have been eating more, less, or about the same amount of processed and red meats. (eating_comp_meats)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have been eating more, less, or about the same amount of fish and seafood. (eating_comp_seafood)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q13 Please indicate your level of agreement with the following statements regarding eating during the COVID-19 outbreak (since March 11th).

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I find myself eating when I’m feeling emotional (such as anxious, depressed, sad), even when I’m not physically hungry. (eathabits_emotional)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I find myself eating when I am lonely, even when I’m not physically hungry. (eathabits Lonely)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I find myself eating when I am stressed out, even when I’m not physically hungry. (eathabits_stress)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I am able to cope with my negative emotions (such as anxiety, sadness) without turning to food for comfort. (eathabits_comfort)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q14 Please indicate whether any of the following are true about your eating and shopping behaviors in the year before the COVID-19 outbreak and since the COVID-19 outbreak (March 11th):

<table>
<thead>
<tr>
<th>Behavior Description</th>
<th>In the year before the COVID-19 outbreak</th>
<th>Since the COVID-19 outbreak (March 11th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I choose local products (behaviors_local)</td>
<td>▼ Often true (1 ... I don't know (99))</td>
<td>▼ Often true (1 ... I don't know (99))</td>
</tr>
<tr>
<td>I buy products with low packaging (behaviors_pack)</td>
<td>▼ Often true (1 ... I don't know (99))</td>
<td>▼ Often true (1 ... I don't know (99))</td>
</tr>
<tr>
<td>I use reusable shopping bags (behaviors_bags)</td>
<td>▼ Often true (1 ... I don't know (99))</td>
<td>▼ Often true (1 ... I don't know (99))</td>
</tr>
<tr>
<td>I choose a vegetarian meal over a meat-based dish (behaviors_veg)</td>
<td>▼ Often true (1 ... I don't know (99))</td>
<td>▼ Often true (1 ... I don't know (99))</td>
</tr>
<tr>
<td>I choose animal products with sustainability labels (such as pasture raised or grass-fed meats, or cage-free eggs) (behaviors_sust)</td>
<td>▼ Often true (1 ... I don't know (99))</td>
<td>▼ Often true (1 ... I don't know (99))</td>
</tr>
</tbody>
</table>
Q15 Has your household done any of the following since the COVID-19 outbreak (March 11th)? Do you believe the average U.S. household has done them, since that time? Check all that apply.
<table>
<thead>
<tr>
<th>My household has done this (1)</th>
<th>I believe the average U.S. household has done this (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy a lot more items in a single trip than before the outbreak (such as 50% more than my household needs) (habits_buymore)</td>
<td></td>
</tr>
<tr>
<td>Deliver food to a friend, neighbor, or family member (habits_deliver)</td>
<td></td>
</tr>
<tr>
<td>Donate to others or share (habits_donate)</td>
<td></td>
</tr>
<tr>
<td>Keep normal shopping habits (habits_normal)</td>
<td></td>
</tr>
<tr>
<td>Maintain a two week supply of food for my household in case we become ill or got quarantined (habits_supply)</td>
<td></td>
</tr>
<tr>
<td>Social distanced by not seeing friends in person (habits_dist)</td>
<td></td>
</tr>
<tr>
<td>Spend more time cooking (habits_cook)</td>
<td></td>
</tr>
<tr>
<td>Throw away less food than normal (habits_throwless)</td>
<td></td>
</tr>
<tr>
<td>Throw away more food than normal because of extra buying (habits_throwmore)</td>
<td></td>
</tr>
<tr>
<td>Volunteer related to the COVID-19 outbreak (habits_volunteer)</td>
<td></td>
</tr>
<tr>
<td>Wore a mask in public (habits_mask)</td>
<td></td>
</tr>
</tbody>
</table>
Part 4 Perspectives and Experience (part 4 of 5)
Q16 On a scale from 1 (strongly disagree) to 6 (strongly agree), how much do you agree with the following statements:
<table>
<thead>
<tr>
<th>Persp/Statement</th>
<th>1 (strongly disagree)</th>
<th>2 (2)</th>
<th>3 (3)</th>
<th>4 (4)</th>
<th>5 (5)</th>
<th>6 (strongly agree)</th>
<th>I don't know (99)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The current COVID-19 outbreak is just like the seasonal flu (persp_flu)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 will affect other states more than mine (persp_VT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 will affect other countries more than the United States (persp_US)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 will affect people like me (persp_me)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The US should prioritize the economy over public health when it comes to COVID-19 (persp_econ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average people should stay at home as much as possible to prevent the spread of COVID-19 (persp_action)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food is not a source of COVID-19 (persp_foodsource)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt prepared for the COVID-19 outbreak (persp_prepared)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Touching food packages can’t transmit COVID-19
(persp_packages)

It is worth the health risk to reopen the economy as soon as possible
(persp_open_econ)

It is worth the health risk to maintain the food supply such as requiring farms and food processing plants to stay open, because we need food
(persp_foodsupply)

If grocery or food delivery workers went on strike, I would take action to support them (like shop elsewhere, sign a petition, contribute money)
(persp_strike)
Q17 Do you know anyone with symptoms of, or diagnosed with, COVID-19? (If so, who? Check all that apply).

☐ Yes, family (1)
☐ Yes, friend(s) (2)
☐ Yes, myself (3)
☐ Yes, other (4)
☐ ☒ No, I don’t know anyone (5)

Q18 Have you had to quarantine in your home due to COVID-19 (for example because of illness, exposure or symptoms)?

☐ Yes (1)
☐ No (0)

End of Block: Perspectives and Experience (part 4 of 5)

Start of Block: SNAP-Ed Questions

Q83 Have you or your child participated in a Create Better Health (SNAP-Ed) nutrition education class?

☐ Yes (1)
☐ No (2)
Display This Question:

If Have you or your child participated in a Create Better Health (SNAP-Ed) nutrition education class? = Yes

Q84
Please select the classes you or your child (if applicable), have participated in. Select all that apply.
Please note that our program was previously known as Food Sense (SNAP-Ed) and is offered through Utah State University Extension.

- Create Better Health (SNAP-Ed) Adult Class (1)
- Create Family Meals (SNAP-Ed) Family Class (2)
- Create Farm Fresh Food (SNAP-Ed) Adult Class (3)
- I have participated in an adult nutrition education class, but I am unsure which one. (4)
- Food Fun & Reading Youth Class (5)
- Create MyPlate Youth Class (6)
- My child participated in a youth education class, but I am unsure which one. (7)

Q85 The next set of questions is about other parts of the Create Better Health (SNAP-Ed) program that you may have noticed in your community.

Q87 Are you familiar with, or have you seen this Thumbs Up for Healthy Choices program? Below is the program's logo.
Q88 Where have you seen the Thumbs Up for Healthy Choices program?

- Yes (1)
- No (2)

Q89 Which Create Better Health (SNAP-Ed) online sources do you follow?

- Facebook (1)
- Instagram (2)
- Pinterest (3)
- Create Better Health Utah blog (4)
- Captain Create YouTube Channel (5)
- Other, please specify (6)

- I do not follow Create Better Health (SNAP-Ed) online (7)
Display This Question:

If Which Create Better Health (SNAP-Ed) online sources do you follow? = Facebook
And Which Create Better Health (SNAP-Ed) online sources do you follow? = Instagram
And Which Create Better Health (SNAP-Ed) online sources do you follow? = Pinterest
And Which Create Better Health (SNAP-Ed) online sources do you follow? = Create Better Health Utah blog
And Which Create Better Health (SNAP-Ed) online sources do you follow? = Captain Create YouTube Channel
And Which Create Better Health (SNAP-Ed) online sources do you follow? = Other, please specify

Q90 How often do you visit Create Better Health social media sites?

○ More than once a day (1)
○ Once a day (2)
○ Once a week (3)
○ Once a month (4)
○ Less than once a month (5)
Q91 Which of the following advertisements have you seen? Select all that apply.

- Image:Advertisement 1 (1)
- Image:Advertisement 2 (2)
- Image:Advertisement 3 (3)
- Image:Advertisement 4 (4)
- Image:Advertisement 5 (5)
- Image:Advertisement 6 (6)
- Image:Advertisement 7 (7)
- Image:Advertisement 8 (8)

End of Block: SNAP-Ed Questions

Start of Block: Demographics (part 5 of 5)

Part5 Demographics (part 5 of 5)

Qs8 Are you of Hispanic, Latino, or Spanish origin?

- Yes (1)
- No (0)
Qs9 What is your race? Check all that apply:

- [ ] Asian (1)
- [ ] Black or African American (2)
- [ ] Native American (3)
- [ ] White (4)
- [ ] Other: (5) ________________________________________________

Qs7 Which of the following best describes your gender identity? Check all that apply:

- [ ] Male (1)
- [ ] Female (2)
- [ ] Transgender (3)
- [ ] Non-binary (4)
- [ ] Prefer to self-describe (5) ________________________________________________
Qs10 What is the highest level of education you have completed?

- Some high school (no diploma) (1)
- High school graduate (including GED) (2)
- Some college (no degree) (3)
- Associates degree / technical school / apprenticeship (4)
- Bachelor’s degree (5)
- Postgraduate (e.g., Master’s, PhD) / professional degree (e.g., JD) (6)

Q19 How many people in the following age groups currently live in your household (including you)? Household includes people currently living within your home, including family and non-family members.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children under 5: (num_people_under5)</td>
<td>▼ 0 (1) ... 7+ (8)</td>
</tr>
<tr>
<td>Children 5-17: (num_people_5-17)</td>
<td>▼ 0 (1) ... 7+ (8)</td>
</tr>
<tr>
<td>Adults 18-65: (num_people_18-65)</td>
<td>▼ 0 (1) ... 7+ (8)</td>
</tr>
<tr>
<td>Adults over 65: (num_people_65up)</td>
<td>▼ 0 (1) ... 7+ (8)</td>
</tr>
</tbody>
</table>
Q20 Which of the following best describes your current occupation?

- Not currently employed (1) ...
- Other (please describe below if selected) (36)

Display This Question:
If Which of the following best describes your current occupation? = Other (please describe below if selected)

Q20txt Other occupation:

________________________________________________________________

Page Break
Q21b What is your ZIP Code?

Page Break
Q22 In what year were you born? 

________________________________________________________________

Q27 Which of the following best describes your household income range in 2019 before taxes?

- Less than $10,000 (1)
- $10,000 to $14,999 (2)
- $15,000 to $24,999 (3)
- $25,000 to $34,999 (4)
- $35,000 to $49,999 (5)
- $50,000 to $74,999 (6)
- $75,000 to $99,999 (7)
- $100,000 to $149,999 (8)
- $150,000 to $199,999 (9)
- $200,000 or more (10)
Q29 Do you have any additional comments or experiences related to the issue of food during the COVID-19 outbreak that you would like to share? Please use this space:

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

Q92
Thank you for your time. Please click the arrow in the right bottom corner to be redirected to a form where you can fill out your contact information to be entered into a drawing for one of 25 $50 Amazon gift cards.

End of Block: Demographics (part 5 of 5)
APPENDIX G. Disability and Health Survey
Food Insecurity & Disability Survey

Filtering question

Which of the following apply to you? Select all that apply. (Categories adapted from the Disability Education Act).

- Person who has autism
- Person who is deaf
- Person who has a developmental disability
- Person who has a psychiatric or emotional disability
- Person who is hard of hearing / deaf
- Person who has an intellectual disability
- Person who has a physical disability (requires a mobility assisting device)
- Person who is chronically ill (long term illness)
- Person who has a specific learning disability (e.g. dyslexia, ADHD)
- Person who has a speech language disability
- Person who has a traumatic brain injury
- Person who is blind or has low vision
- Other disability, please specify ____________________________
- None of the above

3. ADLs and IADLs

1. The next few questions ask about some activities you may or may not have difficulty doing. For each activity, please answer using the option that best describes how easily you are able to do that activity.

   1. Easily  2. With some difficulty  3. With much difficulty  4. Unable to do

   3.1 Reach up and get a 5 pound object (such as a bag of sugar) from just above your head.
   b. Bend down to pick up an object (like a piece of clothing) from the floor?
   c. Turn faucets on and off?
   d. Walk a quarter of a mile?
   e. Stoop or crouch down?
   f. Lift 10 pounds?
   g. Sit for more than two hours?

2. The next few questions ask about the activities of daily living, things that we all need to do as a part of our daily lives. We would like to know if you can do these activities without any help at all, or if you need some help to do them, or if you can’t do them at all.

4.0
1 - Easily 2 - With Difficulty But Without Help 3 - With Special Equipment But No Help
4 - With Help From Someone 5 - Completely Unable to Do This

4.1 Can you prepare your own meals?
a. Can you do your housework?
b. Can you dress and undress yourself?
c. Can you get in and out of bed?
d. Can you take a bath or shower?
e. Can you get to the bathroom on time?
f. Can you climb up stairs?

IF YES TO ANY ANSWERS FOR SECTION 2, THEN:

3. When you need help with any activity limitation, who is it that most often provides this assistance?
a. immediate family member
b. other relative
c. close friend
d. neighbor (not a close friend)
e. employee of a caretaker service
f. other _________________ (specify)

4. Social Support Questions

Family

1. The next few questions ask about your present relationship with your family (other than your partner/boyfriend/girlfriend). For each of the statements, please use the scale shown to tell the number of the category that best describes how true it is for you. In answering these questions, think of those family members that you see or talk to most often.

1 - Not true at all 2 - somewhat true 3 - Moderately true 4 - Very true

a. You feel very close to your family.
b. You have family who would always take the time to talk over your problems, should you want to.
c. Your family often lets you know that they think you are a worthwhile person.
d. You often feel that your family makes too many demands on you.
e. Your family is always pointing out mistakes you have made.
f. Your family is always telling you what to do and how to act.
g. When you are with your family, you feel completely able to relax and be yourself.
h. No matter what happens you know that your family will always be there for you should you need them.
i. You know that your family has confidence in you.
j. Your family is often critical of you.
k. You feel that your family really cares about you.
l. Sometimes you are not sure if you can completely rely on your family.
m. You often feel really appreciated by your family.
n. You sometimes feel that your family expects more from you than they are willing to give.
o. Your family often treats you like a child.
p. Your family often underestimates your abilities.

Friends

2. The next few questions ask about your relationship with your friends. For each of the statements, please use that scale to tell the number of the category that best describes you:

   1 - Not true at all  2 - somewhat true  3 - Moderately true  4 - Very true

a. You feel very close to your friends.
b. You have friends who would always take the time to talk over your problems, should you want to.
c. Your friends often let you know that they think you are a worthwhile person.
d. When you are with your friends you feel completely able to relax and be yourself.
e. No matter what happens you know that your friends will always be there for you should you need them.
f. You know that your friends have confidence in you.
g. You feel that your friends really care about you.
h. You often feel really appreciated by your friends.

5. Food Insecurity

Now I am going to read you several statements that people have made about their food situation. For these statements, please tell me how true they are for {you/your household} in the last 12 months.

1. (I/We) worry whether (my/our) food would run out before (I/we) got money to buy more. 3- often true, 2- sometimes true, or 1- never true
2. The food that (I/we) bought just did not last, and (I/we) did not have money to get more. often true, sometimes true, or never true
3. (I/we) could not afford to eat balanced meals. often true, sometimes true, or never true
4. (I/we) relied on only a few kinds of low-cost food to feed my family because (I was/we were) running out of money to buy food. **often true, sometimes true, never true, or not applicable**
5. (I/we) could not feed my family a balanced meal, because (I/we) could not afford that. **often true, sometimes true, never true, or not applicable**
6. My family has not eaten enough because (I/we) just could not afford enough food. **often true, sometimes true, never true, or not applicable**
7. In the last 12 months, did {you/you or other adults in your household} ever cut the size of your meals or skip meals because there was not enough money for food? **often true, sometimes true, or never true**
8. How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months? **(Almost every month; Some months but not every month; Only 1 or 2 months)**
9. In the last 12 months, did you ever eat less than you felt you should because there was not enough money for food? **(Yes/No)**
10. In the last 12 months, were you ever hungry but did not eat because there was not enough money for food? **(Yes/No)**
11. In the last 12 months, did you lose weight because there was not enough money for food? **(Yes/No)**
12. [In the last 12 months], did {you/you or other adults in your household} ever not eat for a whole day because there was not enough money for food? **(Yes/No)**
13. How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months? **(Almost every month; Some months but not every month; Only 1 or 2 months)**
14. In the last 12 months, did you ever cut the size of {any of the children's} meals because there was not enough money for food? **(Yes/No/Not applicable)**
15. In the last 12 months, did {any of the children} ever skip meals because there was not enough money for food? **(Yes/No/Not applicable)**
16. How often did this happen—**almost every month, some months but not every month, or in only 1 or 2 months**?
17. In the last 12 months, (was your child/were the children) ever hungry but you just could not afford more food? **(Yes/No/Not applicable)**
18. In the last 12 months, did (your child(any of the children) ever not eat for a whole day because there was not enough money for food? **(Yes/No/Not applicable)**

The current pandemic has affected many people in different ways and to different degrees. Please indicate whether you experienced any of the following in the last two months:

**YES/NO (for all)**

1. Problems paying rent or mortgage
2. Problems paying gas, electricity, or heat
3. Furlough days  
4. Salary/pay cut, or hours cut or job demotion  
5. Lack of raises or bonuses  
6. Not knowing if your employment situation will continue  
7. Increased job responsibilities linked with cuts in the workforce  
8. Loss of job/unemployment  
9. Problems with your own business or self-employment  
10. Delays/difficulties when applying for government financial assistance programs  
11. Inadequate amount of food consumption due to lack of financial resources  
12. Inadequate amount of food consumption due to restricted access to regular food sources (grocery stores, food banks)  
13. Ended marital/significant other relationship due to quarantine/"shelter-in place” orders  
14. Staying in an unwanted relationship due to quarantine/”shelter-in place” order  
15. Increased social isolation due to quarantine/”shelter-in place” order  
16. Decreased ability to maintain the same lifestyle as before due to financial constraints  
17. Decreased work/life balance due to work and home-schooling responsibilities  
18. Having to work despite poor health since family depends on your salary  
19. Having to work despite being afraid of getting sick at the workplace  
20. Having to work because of the risk of losing your job permanently

**6. Physical health**

**Self-rated health:**

1. Which of the following best describes your overall health status?  
   1) Excellent  
   2) Very good  
   3) Good  
   4) Fair  
   5) Poor  
   8) Refused  
   9) Don't know

2. What is your weight? (in pounds): ____________________

3. What is your height? (in feet and inches) _______________

**Chronic illnesses**

1. Have you ever been told by a doctor or other health professional that you had… (mark all that apply)  
   1) Heart disease (coronary heart disease, congestive heart failure, a heart attack)  
   2) Arthritis, or any health issue involving bones, joints, and/or muscles  
   3) Cancer (any type)
4) Chronic lower respiratory diseases, such as chronic bronchitis or emphysema
5) Asthma
6) Chronic fatigue syndrome
7) Depression, anxiety, or any other mental health issue
8) Diabetes (type I or II)
9) Chronic kidney disease
10) Chronic liver condition
11) Chronic pain
12) Stroke
13) Any other conditions not mentioned here, explain ______________

Health care

1. Is there a place that you USUALLY go to when you are sick or need advice about your health?
   1) Yes
   2) There is NO place
   3) There is MORE THAN ONE place
   4) Refused
   5) Don't know

2. What kind of place is it? / What kind of place do you go most often - a clinic, doctor's office, emergency room, or some other place?
   1) Clinic or health center
   2) Doctor's office or HMO
   3) Hospital emergency room
   4) Hospital outpatient department
   5) Some other place
   6) Doesn't go to one place most often
   8) Refused
   9) Don't know

3. Is that the same place you USUALLY go when you need routine or preventive care, such as a physical examination or check up?
   1) Yes
   2) No
   3) Refused
   4) Don't know

4. What kind of health insurance or health care coverage do you have? * Mark all that apply
   - Private health insurance (0-no; 1-yes)
   - Medicare
7. Mental health

1. Over the last 2 weeks, how often have you been bothered by any of the following problems? (*Please mark your answer*)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Little interest or pleasure in doing things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Feeling down, depressed, or hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Trouble falling or staying asleep, or sleeping too much</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Feeling tired or having little energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Poor appetite or overeating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Feeling bad about yourself — or that you are a failure or have let</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>yourself or your family down</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Trouble concentrating on things, such as reading the newspaper or</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>watching television</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Moving or speaking so slowly that other people could have noticed?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Or the opposite — being so fidgety or restless</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>that you have been moving around a lot more than usual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Thoughts that you would be better off dead or of hurting yourself</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>in some way</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all     Somewhat difficult     Very difficult     Extremely difficult

Anxiety scale

Please tell me how true each of the following statements has been for you over the past month.

1 - Not at all     2 - Somewhat     3 - Moderately     4 - Very much

a) I felt worried over possible misfortunes.
b) I felt over-excited.
c) I felt tense.
d) I felt anxious.
e) I felt nervous.

Chronic stressors

The following section describes some situations that sometimes come up in people’s lives. As you read each item, please indicate whether these things are not true, somewhat true, or very true for you at this time.

1 - Not true     2 - Somewhat true     3 - Very true

GENERAL
a) You are trying to take on too many things at once.
b) There is too much pressure put on you to be like other people.
c) Too much is expected of you by others.
d) People expect you to do things faster than you are able.
e) There is seldom enough time to complete the things you need to do.

HEALTH CONCERNS
a) Someone in your family or a close friend has a long-term illness or handicap.
b) You have a parent, a child or a spouse or partner who is in very bad health and may die.
c) You take care of an aging or ill family member or friend

Mastery & Self-Esteem

Mastery
People sometimes use the following statements to describe themselves. Indicate the response that best describes how strongly you agree or disagree with each statement.

1- Strongly agree    2 - Mildly agree    3 - Neither agree nor disagree    4 - Mildly disagree    5 - Strongly disagree

a) You have little control over the things that happen to you.
b) There is really no way you can solve some of the problems you have.
c) There is little you can do to change many of the important things in your life.
d) You often feel helpless in dealing with problems of life.
e) Sometimes you feel that you are being pushed around in life.
f) What happens to you in the future mostly depends on you.
g) You can do just about anything you really set your mind to.

Self-esteem
Below is a list of statements dealing with your general feelings about yourself. Please indicate how strongly you agree or disagree with each statement.


a) Overall, I am satisfied with myself.
b) At times, I think I am no good at all.
c) I feel that I have a number of good qualities.
d) I am able to do things as well as most other people.
e) I feel I do not have much to be proud of.
f) I certainly feel useless at times.
g) I feel that I am a person of worth, at least on an equal plane with others.
h) I wish I could have more respect for myself.
i) Overall, I am inclined to feel that I am a failure.
j) I take a positive attitude toward myself.

8. House modifications

1. Have any changes been made to your house (or apartment) because of your health problems or disability?
   1) Yes
   2) No

If YES,

2. What changes have you made to your residence? Mark all that apply
   1) Ramps
   2) Extra wide doors or passages
3) Elevators or stair-lifts (do not include public elevators in apartment buildings)
4) Handrails or grab bars other than normal handrails on staircases
5) Raised toilet
6) Levers, push bars, or special knobs on doors
7) Lowered counters
8) Special slip-resistant floors
9) Any other special features designed for disabled persons
10) No changes

3. Do you use any special equipment or assistive devices to aid you in your usual activities?
   1) Yes
   2) No
   8) Refused
   9) Don't know

9. Discrimination

1. In your day-to-day life, how often do any of the following things happen to you?
   Recommended response categories for all items:

   1- Almost everyday  2- At least once a week  3- A few times a month
   4- A few times a year  5- Less than once a year  6-Never

   a) You are treated with less courtesy than other people are.
   b) You are treated with less respect than other people are.
   c) You receive poorer service than other people at restaurants or stores.
   d) People act as if they think you are not smart.
   e) People act as if they are afraid of you.
   f) People act as if they think you are dishonest.
   g) People act as if they are better than you are.
   h) You are called names or insulted.
   i) You are threatened or harassed.
   j) You are followed around in stores.

2. What do you think is the main reason for these experiences? (Check all that apply)
   1) Your Ancestry or National Origins
   2) Your Gender
   3) Your Race
   4) Your Age
   5) Your Religion
   6) Your Height
7) Your Weight
8) Some other Aspect of Your Physical Appearance
9) Your Sexual Orientation or Gender Identity
10) Your Education or Income Level
11) A Physical Disability or Chronic Illness
12) Your shade of Skin Color
13) I have not had those experiences

3. In the following questions, we are interested in the way other people have treated you or your beliefs about how other people have treated you. Can you tell me if any of the following has ever happened to you:

1- Yes 2- No

a) At any time in your life, have you ever been unfairly fired?
b) For unfair reasons, have you ever not been hired for a job?
c) Have you ever been unfairly denied a promotion?
d) Have you ever been unfairly stopped, searched, questioned, physically threatened or abused by the police?
e) Have you ever been unfairly discouraged by a teacher or advisor from continuing your education?
f) Have you ever been unfairly prevented from moving into a neighborhood because the landlord or a realtor refused to sell or rent you a house or apartment?
g) Have you ever moved into a neighborhood where neighbors made life difficult for you or your family?
h) Have you ever been unfairly denied a bank loan?
i) Have you ever received service from someone such as a plumber or car mechanic that was worse than what other people get?

4. What do you think is the main reason for these experiences? (Check all that apply)
   1) Your Ancestry or National Origins
   2) Your Gender
   3) Your Race
   4) Your Age
   5) Your Religion
   6) Your Height
   7) Your Weight
   8) Some other Aspect of Your Physical Appearance
   9) Your Sexual Orientation or Gender Identity
   10) Your Education or Income Level
   11) A Physical Disability or Chronic Illness
12) Your shade of Skin Color
13) I have not had those experiences

5. When was the last time this happened?
   1) Past week
   2) Past month
   3) Past year
   4) More than a year ago
   5) Never

10. Socio Demographic Questions
    Socioeconomic Status (income, occupation, education, employment status)

    1. Indicate your gender
       1) Male
       2) Female
       3) Non-binary
       4) Other ______

    2. How old are you?

    3. Which of the listed groups do you most closely identify with?
       1) Non-Hispanic White
       2) Non-Hispanic Black
       3) Mexican American
       4) Other Hispanic
       5) Non-Hispanic Asian
       6) Native American
       7) Other-Multiracial
       8) Other __________

    4. What is the highest level of education you successfully completed?
       1) Less than high school
       2) High school/GED
       3) Some college
       4) College (Bachelor’s degree)
       5) More than College (Master’s and above)

    5. What is your current employment status?
       1) Employed full-time
       2) Employed part-time
       3) Unemployed (includes full time students and those physically unable to work)
4) Retired  
5) Homemaker  
6) Sick Leave / Maternity Leave  
7) Other (Specify)

6. Would you please indicate the category that gives the best estimate of your household annual income before taxes.  
   1) no personal income  
   2) under $5,000  
   3) $5,000-$14,999  
   4) $15,000-$24,999  
   5) $25,000-$44,999  
   6) $45,000-$64,999  
   7) $65,000-$84,999  
   8) $85,000-$114,999  
   9) $115,000-$134,999  
  10) $135,000 and above  
  11) 98. Don’t know  
  12) 99. Refused

7. Do you own a home?  
   1) Yes  
   2) No

8. Are you currently receiving income from sources other than employment?  
   1) Yes  
   2) No

   IF YES:

9. What are the sources of this income?  
   1. _____ any form of government assistance  
   2. _____ Pensions  
   3. _____ Stipends  
   4. _____ Investments  
   5. _____ Other (Explain)  
   98. _____ don’t know  
   99. _____ Refused

10. Did you receive any of the following forms of assistance in the last 12 months (Select all that apply):
1) Social Security (SSA or SS) 
2) Social Security Disability (SSDI or SSD) 
3) Supplemental Security Income (SSI) 
4) General Assistance (GA) 
5) Temporary Assistance for Needy Families (TANF) 
6) Aid to Families with Dependent Children (AFDC) 
7) Free or Reduced Lunches (for the minors in the household) 
8) Housing Assistance 
9) Other, please specify ____________________________

11. At any time during the last 12 months, did you receive food/nutrition assistance from any of the following sources (mark all that apply) 

1) Assistance from family or friends 
2) Women, Infants, and Children program (WIC) 
3) Supplemental Nutrition Assistance Program (SNAP) (also known as food stamps) 
4) Local Food Pantries 
5) Religious Organizations 
6) Other, please specify ____________________________

12. Did you receive any of the forms of public assistance mentioned above because you have a disability? 
1) Yes 
2) No 
8) Refused 
9) Don't know

13. What is your current marital status? 
1) Married/living together 
2) Separated 
3) Divorced 
4) Widowed 
5) Never been married.

14. Do any children under the age of 18 live in your household? 
1) Yes 
2) No 

If participating in this study has caused you distress, please refer to the following resources: 

- SAMHSA’s National Helpline – 1-800-662-HELP (4357).
• SAMHSA Treatment Locator provides referrals to low-cost/sliding scale mental health care, substance abuse and dual diagnosis treatment (800-662-4357).
• Anxiety and Depression Association of America (ADAA) provides information on prevention, treatment and symptoms of anxiety, depression and related conditions (240-485-1001).
• Depression and Bipolar Support Alliance (DBSA) provides information on bipolar disorder and depression, offers in-person and online support groups and forums (800-826-3632).
• HelpWhenYouNeedIt.Org over 350,000 listing for social services, mental health, substance use, legal and financial assistance.
• Psychology Today offers a national directory of therapists, psychiatrists, therapy groups and treatment facility options.
APPENDIX H. IRB Approval Protocol #10660
Certificate of Exemption

From: Melanie Domenech Rodriguez, IRB Chair
Nicole Vouvalis, IRB Director
To: Heidi Wengreen
Date: December 12, 2019
Protocol #: 10660
Title: An Exploration of Registered Dietitian and Dietetic Student Perceptions of Interprofessional Healthcare Teams

The Institutional Review Board has determined that the above-referenced study is exempt from review under federal guidelines 45 CFR Part 46.104(d) category #2:

Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: (i) The information obtained is recorded in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subject; (ii) Any disclosure of the responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, educational advancement, or reputation, or (iii) the information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and the IRB conducts a limited IRB review to make required determinations.

This exemption is valid for three years from the date of this correspondence, after which the study will be closed. If the research will extend beyond three years, it is your responsibility as the Principal Investigator to notify the IRB before the study’s expiration date and submit a new application to continue the research. Research activities that continue beyond the expiration date without new certification of exempt status will be in violation of those federal guidelines which permit the exempt status.

As part of the IRB’s quality assurance procedures, this research may be randomly selected for audit during the three-year period of exemption. If so, you will receive a request for completion of an Audit Report form during the month of the anniversary date of this certification.

In all cases, it is your responsibility to notify the IRB prior to making any changes to the study by submitting an Amendment request. This will document whether or not the study still meets the requirements for exempt status under federal regulations.

Upon receipt of this memo, you may begin your research. If you have questions, please call the IRB office at (435) 797-1821 or email to irb@usu.edu.

The IRB wishes you success with your research.
APPENDIX I. IRB Approval Protocol #11022
Certificate of Exemption

From: Melanie Domenech Rodríguez, IRB Chair
     Nicole Vouvalis, IRB Director
To: Guadalupe Marquez-Velarde
Date: March 23, 2020
Protocol #: 11022
Title: Health Outcomes Associated with Food Insecurity in the Intermountain West

The Institutional Review Board has determined that the above-referenced study is exempt from review under federal guidelines 45 CFR Part 46.104(d) category #2:

Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: (i) The information obtained is recorded in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subject; (ii) Any disclosure of the responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, educational advancement, or reputation, or (iii) the information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and the IRB conducts a limited IRB review to make required determinations.

This study is subject to ongoing COVID-19 related restrictions. As of March 15, 2020, the IRB has temporarily paused all in person research activities, including but not limited to recruitment, informed consent, data collection and data analysis that involves personal interaction (such as member checking.
and meaning-making). If research cannot be paused, please file an amendment to your protocol modifying procedures that are conducted in person. The IRB will notify you when in person research activities are once again permitted.

This exemption is valid for five years from the date of this correspondence, after which the study will be closed. If the research will extend beyond five years, it is your responsibility as the Principal Investigator to notify the IRB before the study’s expiration date and submit a new application to continue the research. Research activities that continue beyond the expiration date without new certification of exempt status will be in violation of those federal guidelines which permit the exempt status.

As part of the IRB’s quality assurance procedures, this research may be randomly selected for audit during the five-year period of exemption. If so, you will receive a request for completion of an Audit Report form during the month of the anniversary date of this certification.

In all cases, it is your responsibility to notify the IRB prior to making any changes to the study by submitting an Amendment request. This will document whether or not the study still meets the requirements for exempt status under federal regulations.

Upon receipt of this memo, you may begin your research. If you have questions, please call the IRB office at (435) 797-1821 or email to irb@usu.edu.

The IRB wishes you success with your research.
APPENDIX J. Permission to Use Co-author Letters
August 8, 2022

McKenna Voorhees
mckennavoorhees@gmail.com

Dear Heidi,

I am preparing my final dissertation for submission to the Department of Nutrition, Dietetics, and Food Sciences at Utah State University. I will complete my program in August 2022.

I am requesting your permission to include the attached document as shown in your role as coauthor. Your contribution will be displayed and acknowledged as shown. Please advise any changes you require. Otherwise, you may indicate your approval of this request by signing and dating in the designated area below.

My best regards,

McKenna Voorhees

I hereby give permission to McKenna Voorhees to include
FOOD ACCESS AND FOOD SECURITY AMONG SNAP-ELIGIBLE, LOWER-INCOME UTAHNS DURING THE COVID-19 PANDEMIC and the following material in her dissertation.

____________________

1 I thank Mateja R. Savoie-Roskos, Heidi Wengreen, Demi Culianos, Casey Coombs, and Heidi LeBlanc for their roles and contributions as coauthors for this chapter.

Date: Aug 9, 2022

Signed: Heidi LeBlanc
August 8, 2022

McKenna Voorhees
mckennavoorhees@gmail.com

Dear Casey,

I am preparing my final dissertation for submission to the Department of Nutrition, Dietetics, and Food Sciences at Utah State University. I will complete my program in August 2022.

I am requesting your permission to include the attached document as shown in your role as coauthor. Your contribution will be displayed and acknowledged as shown. Please advise any changes you require. Otherwise, you may indicate your approval of this request by signing and dating in the designated area below.

My best regards,

McKenna Voorhees

I hereby give permission to McKenna Voorhees to include FOOD ACCESS AND FOOD SECURITY AMONG SNAP-ELIGIBLE, LOWER-INCOME UTAHNS DURING THE COVID-19 PANDEMIC and the following material in her dissertation.

_________________________

1 I thank Mateja R. Savoie-Roskos, Heidi Wengreen, Demi Culianos, Casey Coombs, and Heidi LeBlanc for their roles and contributions as coauthors for this chapter.

Date: 8/9/2022

Signed: [Signature]

DocuSigned by:
[Signature]

[Signature]
August 8, 2022

McKenna Voorhees
mckennavorhees@gmail.com

Dear Demi,

I am preparing my final dissertation for submission to the Department of Nutrition, Dietetics, and Food Sciences at Utah State University. I will complete my program in August 2022.

I am requesting your permission to include the attached document as shown in your role as coauthor. Your contribution will be displayed and acknowledged as shown. Please advise any changes you require. Otherwise, you may indicate your approval of this request by signing and dating in the designated area below.

My best regards,

McKenna Voorhees

I hereby give permission to McKenna Voorhees to include FOOD ACCESS AND FOOD SECURITY AMONG SNAP-ELIGIBLE, LOWER-INCOME UTAHNS DURING THE COVID-19 PANDEMIC and the following material in her dissertation.

____________________________

1 I thank Mateja R. Savole-Roskos, Heidi Wengreen, Demi Culianos, Casey Coombs, and Heidi LeBlanc for their roles and contributions as coauthors for this chapter.

Date: 8/9/2022

Signed: Demi Culianos
McKenna Christy Voorhees, RD, CD
Curriculum Vitae

Email: mckennavoorhees@gmail.com
Phone: 801.927.7688

EDUCATION

Aug 2019-Aug 2022 Doctor of Philosophy, Nutrition Sciences
Utah State University, Logan, UT
- Cumulative GPA: 4.00
- Major Professor: Heidi J. Wengreen, PhD, RD
- Dissertation: An Exploration of System-Level Dimensions of Nutrition in Relation to Health—Interprofessional Teams and Food Insecurity

Aug 2013-May 2019 Bachelor of Science, Nutrition, Dietetics, & Food Sciences
Utah State University, Logan, UT
- Dietetics emphasis, Psychology minor
- Cumulative GPA: 3.95/4.00; Summa cum laude
- Dean’s list 2014, 2017, 2018

PROFESSIONAL EXPERIENCE

Aug 2020-Present Dietitian, Up to 3 Early Intervention
Utah State University, Logan, UT
- Perform virtual and in-home nutrition assessments/interventions to support the growth and development of children ages 0-3 years who demonstrate a developmental delay and/or disability in three Utah counties (cumulative number of children served = 130)
- Collaborate interprofessionally to support transitions to healthful and developmentally appropriate eating and feeding
- Co-developed a parent-child, 5-session course on selective eating in toddlers

Nov 2021-Feb 2022 Online Instructor, The Science and Application of Nutrition
(n = 110 students; 3 credit course)
Utah State University, Logan UT
Concurrent Enrollment
• Delivered and created weekly online lecture presentations in fast-paced, comprehensive introductory nutrition course
• Course content encompassed macronutrient composition, digestion, and metabolism; micronutrient functions and recommendations to prevent deficiency/toxicity; and nutrition and chronic disease with equal emphasis on content and application
• Fostered student application of course content through feedback on personal diet analyses and assignments emphasizing food choice, eating behaviors, and the student’s relationship with food

Oct 2021-Dec 2021
Dietetic Preceptor, Up to 3 Early Intervention
Utah State University, Logan, UT
• Mentored a graduate-level dietetic student from the University of Alabama at Birmingham (84 cumulative hours)
• Tailored required student learning objectives to include advanced case studies, a parent group presentation, parent coaching/motivational interviewing, and written education materials for Up to 3 families

Sep 2019-Feb 2021
Professional Mentee/Intern
Sorenson Center for Clinical Excellence
Utah State University, Logan, UT
• Received extensive training at interdisciplinary feeding clinic for children with complex feeding difficulties
• Assessed growth trends, mealtime environment, food and nutrient adequacy, and tube-feed regimens
• Assisted in the provision of recommendations for improved food acceptance and growth alongside feeding therapists (RD, SLP)

Aug 2020-May 2021
Graduate Researcher
National Food Access and COVID Research Team (NFACT)
Utah State University, Logan, UT
Supervisor: Dr. Mateja Savoie-Rokos
• Conducted analyses on the early impact of COVID-19 on food insecurity among ~600 SNAP-eligible Utahns
Aug 2020-May 2021  **Dietetic Preceptor, Coordinated Program in Dietetics**  
Utah State University, Logan, UT  
- Assisted in development of clinical curriculum for 12 students  
- Educated students on various disease states and associated nutrition care  
- Guided students in the utilization of the Nutrition Care Process in a hospital setting

Aug 2020-Dec 2020  **Graduate Teaching Assistant**  
Utah State University, Logan, UT  
Supervisor: Dr. Mateja Savoie-Roskos  
- Assisted with grading and student feedback for upper division community nutrition course (n = 41 students)

Jan 2020-March 2020  **Dietetic Preceptor, Coordinated Program in Dietetics**  
Sorenson Center for Clinical Excellence  
Utah State University, Logan, UT  
- Coordinated interprofessional education experiences for 12 students during which students observed and interviewed professions from diverse professional disciplines (psychiatry, autism support services, speech language pathology)  
- Facilitated student tour of clinic ‘Smart Apartment’ demonstrating assistive technology which can be integrated into homes of community members with disabilities  
- Guided student creation of educational handouts designed for parents of children with feeding difficulties

Aug 2019-May 2020  **LEND Trainee**  
Utah Leadership Education in Neurodevelopmental Disabilities  
Salt Lake City, UT/Logan, UT  
- Received interdisciplinary education to improve the medical care for children with disabilities through the acquisition of 300 hours of clinical, didactic, and research/leadership training related to interprofessional teams  
- Co-authored research study of interdisciplinary attitudes of past LEND trainees (first author; in progress)*

- First author of accompanying manuscript (in progress)*
• Co-presented two virtual nutrition presentations to trainees/faculty in ND, ID, MT, WY, and UT*

Sep 2017-May 2019  
**Clinical Dietetic Intern (625 hours)**  
Logan, UT/Ogden, UT/Greater Salt Lake Area, UT  
• **Facilities:** Logan Regional Hospital, Sunshine Terrace, McKay-Dee Hospital, Primary Children’s Medical Center (Children’s Medical Unit, Outpatient Gastroenterology, Outpatient Cystic Fibrosis), University of Utah Hospital (Medical Intensive Care Unit, Transplant Center, Huntsman Cancer Institute), Fresenius Medical Care, Center for Change Eating Disorders Clinic, South Davis Community Hospital

Sep 2017-May 2019  
**Community Nutrition Intern (420 hours)**  
Logan, UT/Ogden, UT  
• **Facilities:** Utah State University Fueling Station, WIC, Dolores Dore Eccles Center for Early Childhood Education, Utah State University Soup Connection/Community Supported Agriculture, Cache High School, FIT Games Research Study: child anthropometric/carotenoid assessment

Sep 2017-April 2018  
**Food Service/Food Service Management Intern (155 hours)**  
Logan, UT  
• **Facilities:** Utah State University Dining Services, Pioneer Valley Lodge, Logan Regional Hospital Food & Nutrition Services, Edith Bowen Elementary, Meals on Wheels program, Sunshine Terrace

**Sports Nutrition/Tactical Performance Intern**  
US Army Special Forces (SWCS)  
Fort Bragg, NC  
• Intermittently assisted tactical performance dietitians in Dining Facility (DFAC) study to transform eating establishments ‘on post’ for Special Forces soldiers

**HONORS & AWARDS**

Feb 2018  
**Scholar of the Year**  
Department of Nutrition, Dietetics, & Food Sciences
Feb 2018  
**Nominee, Scholar of the Year**  
College of Agriculture & Applied Sciences  
Utah State University, Logan, UT

Apr 2018  
**“A” Pin Award Recipient**  
Utah State University, Logan, UT

Apr 2018  
**Susie Sanford Cook Scholarship Recipient**  
Utah State University, Logan, UT

Apr 2017  
**Bonita W. Wyse Scholarship Recipient**  
Utah State University, Logan, UT

Sep 2017  
**National Military Family Association Scholarship Recipient**

Feb 2014  
**Alumni Council Scholarship Recipient**  
College of Agriculture & Applied Sciences  
Utah State University, Logan, UT

---

**PROFESSIONAL MEMBERSHIPS AND CREDENTIALS**

July 2019-Present  
**Registered Dietitian Nutritionist (RDN/RD)**  
Commission on Dietetic Registration

Sep 2019-Present  
**Certified Dietitian (CD)**  
Utah Division of Occupational & Professional Licensing (DOPL)

Dec 2020-Present  
**Early Intervention Specialist: Professional Authorization**  
Utah Baby Watch Early Intervention Programs

Feb 2022-Present  
**Member, Society for Nutrition Education and Behavior (SNEB)**  
Professional Member

Feb 2022-Present  
**Member, American Society for Nutrition (ASN)**  
Student Graduate Member

Sep 2017-Present  
**Member, The Academy of Nutrition & Dietetics (AND)**  
Student Member: 2017-2019  
Professional Member: 2020-2021; Feb 2022-Present
SCHOLARSHIP & CREATIVE WORK

Journal Articles


Voorhees M, Wengreen H. A Comprehensive analysis of RDN and Dietetic student perceptions of interdisciplinary healthcare teams. Anticipated article submission for publication to JAND. In progress.

Voorhees M, Wengreen H. Interprofessional education in dietetic programs: Student and director perspectives. Anticipated article submission for publication to JAND. In progress.

Voorhees M, Wengreen H, Serang S. The Attitudes Toward Interdisciplinary Health Care Teams Scale (ATIHCT): Factor analysis in Registered Dietitians and dietetic students. Anticipated article submission for publication to JAND. In progress.

Voorhees M, Wengreen H, Savoie-Roskos M, Culianos D. Disability and health: The role of food security as a potential mediator. Anticipated article submission for publication to Disability and Health. In progress.


Refereed Presentations

Voorhees M, Wengreen H. Implementation of Interprofessional Education in Dietetics Curricula. Poster accepted to the Food and Nutrition Conference & Expo (FNCE). October 8-11, 2022. Orlando, FL.


Invited Presentations

Voorhees, M. Feeding Anxious Eaters. Lecture presented at: Utah State University Nutrition through the Lifecycle Course; April 6, 2022; Logan, UT
  • One of three professionals to present to ~60 undergraduate students on promoting happy mealtimes and supporting parent-child mealtime relationships

Voorhees, M. Pediatric Feeding Difficulties. Lecture presented at: Utah State University Maternal & Child Nutrition Lab; April 5, 2021; Logan, UT
  • Delivered pre-recorded presentation to 12 undergraduate dietetic students on differentiating typical toddler eating behavior and potential pediatric feeding disorders (~1 hour)

  • Presented to six doctoral- and postdoctoral-level LEND trainees in the Autism Enhanced training track

Voorhees M. Feeding Difficulties in Children with Autism. Lecture presented at: Utah State University Sorenson Center for Clinical Excellence Integrated Assessment Clinic Seminar; January 17, 2020; Logan, UT.
  • Delivered oral presentation to graduate students and professionals from psychology, social work, and speech language pathology disciplines
Pond D, Voorhees M, Donham A, Trusty N. Case Study Presentation of Interprofessional Team-based Care in Co-located Clinics. Lecture presented at: Utah State University Sorenson Center for Clinical Excellence Grand Rounds; March, 2020; Logan, UT
- Detailed the exemplary provision of coordinated care among a feeding clinic, social work services, and a speech and language clinic to support a young client with special healthcare needs
- Attendees included graduate students from psychology, speech language pathology, marriage and family therapy, audiology, and nursing disciplines

- Presented to all LEND trainees in various professions to promote the timely and appropriate identification of nutrition risk for referral to an RD
- Presentation was broadcast to trainees located in ND, ID, MT, WY, and UT

CONFERENCE ATTENDANCE & TRAININGS

Oct 2022  Attendee: Food and Nutrition Conference & Expo (FNCE)
Orlando, FL

Sep 2021  Attendee: Pediatric Feeding Symposium
Sandy, UT

Aug 2021  Poster Presenter: Society for Nutrition Education & Behavior
Virtual conference

Sep 2019  Attendee: Pediatric Feeding Symposium
Sandy, UT

Apr 2019  Attendee: Utah Academy of Nutrition and Dietetics
Salt Lake City, UT

SOFTWARE EXPERIENCE

Beginning 2019  Statistical Software for the Social Sciences (SPSS)

Beginning 2020  R/RStudio

Beginning 2021  Covidence Systematic Review software