

Examination of the Knowledge and Perceptions of Millennials Regarding the Dietary  
Guidelines for Americans and MyPlate

Thesis

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By

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## Abstract

**Background:** Diet quality and nutrition knowledge are major determinants of health. The Dietary Guidelines for Americans (DGA) provide evidence-based recommendations for making healthy dietary choices and preventing chronic disease. Millennials are the largest and most diverse generation in the United States (US). Some research shows that millennials have poor diet quality and there is a dearth of information regarding their adherence to MyPlate recommendations and the factors associated with their self-reported diet quality (SRDQ).

**Objective:** To examine the associations between millennials' SRDQ, adherence to MyPlate recommendations, food security, consumer behavior and mental health outcomes millennials and to explain the knowledge and perceptions of millennials regarding the DGA and MyPlate recommendations.

**Methods:** Millennials (24-38 years of age) residing within the US were recruited via ResearchMatch.org for a cross-sectional survey-based study. Questions derived from validated national surveys measured demographics, SRDQ, consumer behavior, food security, and mental health. A subset of participants participated in focus groups. Descriptive statistics characterized the sample. Pearson's Chi-squared tests explored the relationships among SRDQ and variables of interest.

**Results:** Respondents ( $n = 233$ ) were mostly female (76%), non-Hispanic white (74%), employed (83%), college educated (83%), and one-third of individuals with incomes  $> \$100,000$  (32%). Strong positive relationships were observed between SRDQ and mental health ( $p = 0.019$ ), food security ( $p < 0.001$ ), perceived importance of nutrition

when purchasing food ( $p = 0.019$ ). No association was observed between MyPlate adherence and SRDQ ( $p = 0.610$ ). A total of 3 focus groups were held ( $n = 7$ ) and were about 80 minutes in length. The following three themes emerged from the focus group discussion: MyPlate as being unrealistic, MyPlate can be improved by aligning it more to MyPyramid, and Meal planning and preparation as the best strategy to meet MyPlate recommendations.

**Conclusions:** SRDQ of predominantly non-Hispanic white, high-income millennials was associated with consumer behaviors, mental health outcomes, and food security.

Millennials should be targeted in interventions to improve diet quality of Americans.

Future studies should consider the diverse needs of millennials and target more diverse audiences.

## Dedication

I dedicate this to my wonderful parents for supporting me throughout my journey in graduate school and for the opportunities they have provided for me.

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## Chapter 1. Introduction

The Dietary Guidelines for Americans (DGA) provide evidence-based nutrition information and recommendations to help Americans make healthy food and beverage choices to improve the quality of their diet. Research has increasingly tied health with quality of overall diet, known as diet quality, rather than individual nutrients, known as diet quality.<sup>1</sup> The Healthy Eating Index (HEI) scores a person's diet quality based on how closely it is aligned to the recommendations of the DGA. The recommendations include, focusing on variety, nutrient density, and amount, limiting calories from added sugars and saturated fats and reducing sodium intake, and shifting to healthier beverage choices.<sup>2</sup> There is strong evidence that a healthy eating pattern that follows the recommendations of the DGA is associated with a reduced risk of CVD.

Many Americans have poor diet quality.<sup>3</sup> For example, only 1 in 10 Americans meet the recommendations for fruit and vegetables.<sup>4</sup> About three-quarters of the United States (US) population have dietary patterns low in vegetables, fruit, dairy, and oils.<sup>2</sup> Research shows that the population consumes a diet high in total protein and total grains, but low in whole grains. Additionally, most Americans consume more than the recommended amount of saturated fats, added sugars, and sodium.<sup>2</sup>

More than two-thirds of adults in the US are overweight or obese and about one-half have one or more preventable chronic diseases such as type 2 diabetes, some cancers, poor bone health, cardiovascular disease, and high blood pressure. These diseases are mainly a result of poor diet quality and lack of physical activity. The medical costs associated with obesity in 2008 were estimated at \$147 billion, showing that obesity and

these chronic diseases do not only come with poor health outcomes but also at a great cost.<sup>5</sup>

Research shows that millennials, the largest generational cohort in the US, struggle to meet the recommendations of the DGA, and some research shows that there is increasing obesity and poor diet quality among this group.<sup>6</sup> This may be due to sociodemographic and other factors such as income, shopping habits, mental health, and education levels. If millennials adopt a better understanding and perception of the DGA, it could result in a lower incidence of preventable chronic diseases and obesity.

However, limited information exists on the diet quality of millennials and their perceptions of the DGA. It is important to focus on millennials. Pew Research Center showed that the millennial cohort is projected to continue to increase in size until about 2033.<sup>6</sup> This is mainly because of the high number of young immigrants entering the US. Focusing on the knowledge, perceptions, and factors that affect diet quality in this population at this stage of their life is necessary as it can promote better health outcomes and improved quality of life in one of the largest groups in the US.

### *Objectives*

1. To examine self-reported diet quality and its associations with adherence to the DGA, MyPlate recommendations, food security, consumer behavior and mental health outcomes in millennials.
2. To explain the knowledge and perceptions of millennials regarding the DGA and MyPlate recommendations.

## Chapter 2. Literature Review

### **Defining Millennials**

There is no shortage of definitions for the term “millennials” in the literature and millennials have also been described using various birth years and various labels. For example, millennials have also been referred to as “young adults,” “generation Y,” “gen Y,” “Nintendo Generation,” “generation next,” “Generation Me,” and the “Internet generation.”<sup>7,8</sup> The conflict in defining millennials is a result of the many birth spans used to characterize this group. Most of the birth year ranges used to describe the age of millennials in the literature is from the early 1980s to ending as late as the early 2000s.

Millennials are currently the largest adult generation to date. As of 2015, there were more than 83.1 million millennials, and this number is expected to surpass 90 million by the year 2020. These statistics are highly influenced by immigration.<sup>9,10</sup> In addition to their high numbers, millennials are one of the most diverse generations with 44.2% of the generation being part of a minority group as of 2017.<sup>7</sup> This generation is also characterized by technology use, with people from this generation being the first to be born into a world where both the internet and cell phone already existed. Millennials have also been living through some of the greatest technological advancements in history, which has resulted in the generation being accustomed to receiving information instantly.<sup>7,11</sup> Their expectation of receiving information fast, and instantly, has led to millennials being described as lazy, entitled, and narcissistic.<sup>12</sup> This generation is also more connected than previous generations due to the rise of social media, with 75% of the population having a social media page, and 20% having posted videos of themselves online, making them history’s first “always connected generation.”<sup>11,13</sup>

Another defining characteristic of this generation is that they have taken on very different political views and religious views than generations before them. Millennials have been found to have very liberal views on political and social views. Pew Research Center surveys in 2014 also showed that 50% of millennials identify as political independents, and about 29% are not affiliated with any religion.<sup>14</sup> Many millennials also are outspoken activists on matters such as same-sex marriage, LGBTQA+ rights, and marijuana legalization.<sup>14</sup>

## **Dietary Guidelines for Americans**

### *Background*

The Dietary Guidelines for Americans (DGA), “provides evidence-based nutrition information and advice for people ages two and older to help Americans make healthy choices about food and beverages in their daily lives.”<sup>15</sup> The first DGA was released in 1980, and in 1990, Congress passed the National Nutrition Monitoring and Related Research Act, which stated that the US Department of Agriculture (USDA) and the Health and Human Services (HHS) were to work together to review, revise, and update the DGA every 5 years. The most recent DGA was released in 2020, which will be in effect from 2020-2025.<sup>2</sup> One of the main purposes of the DGA is to serve as the basis of federal food and nutrition education, health policies and programs. Since the DGA serves as such important guidelines, they address pressing health concerns of the population at that time period. Historically, the DGA has released recommendations for Americans aged two years and older and have not included infants from birth. In the 2020-2025 edition of the DGA recommendations for infants aged birth to 24 months and specific recommendations for pregnant women and women lactating are included.

Each of the DGA that have been released has had their own theme or take-home message. The table below provides an abridged version of the DGA:

Edition	Approach for Reviewing the Evidence	Advisory Committee Scientific Report	Focus of Guidance	Number of Guidelines and/or Key Recommendations
1980	Current science was reviewed by select scientists from the USDA and HHS	N/A	Healthy Americans (age not specified for recommendations)	7 Guidelines
1985	The Dietary Guidelines Advisory Committee was created and searched/reviewed the scientific literature	Technical Report (19 pages)	Healthy Americans (age not specified for recommendations)	7 Guidelines
1990	Advisory Committee searched and reviewed the scientific literature	Technical Report (48 pages)	Healthy Americans aged 2 and older	7 Guidelines
1995	Advisory Committee searched and reviewed the scientific literature	Technical Report (52 Pages)	Healthy Americans aged 2 and older to promote health and disease prevention	7 Guidelines
2000	Advisory Committee searched and reviewed the scientific literature	Technical Report (87 pages)	Healthy Americans aged 2 and older to promote health and decrease risk of certain diseases	10 Guidelines Grouped into 3 Main Messages
2005	Advisory Committee searched and reviewed the current scientific literature, conducted data analyses, food pattern modeling analyses, and other scientific reports	Technical Report (364 pages) and appendices (124 pages)	Americans, aged 2 and older, including those at risk for chronic disease, to promote health and decrease risk of major chronic diseases	41 Key Recommendations (23 for general population, 18 for specified populations)
2010	Advisory Committee conducted a systematic review using USDA's Nutrition Evidence Library (NEL), data analyses, food pattern modeling analyses, and other scientific reports	Technical Report (453 pages), appendices (266 pages), and supplementary material online	Americans, aged 2 and older, including those at risk for chronic disease, to promote health and decrease risk of major chronic diseases	29 Key Recommendations (23 for general population, 6 for specific population)
2015	Advisory Committee conducted a systematic review using the NEL, data analyses, food pattern modeling analyses, and existing systematic reviews, meta-analyses, and evidence-based reports	Technical Report (567 pages), appendices (600 pages), and supplementary material online	Americans, aged 2 and older, including those at risk for chronic disease, to promote health and decrease risk of major chronic diseases	5 Key Guidelines, with 13 recommendations

Table 1: Evolution of the Dietary Guidelines for Americans: Process and Products



Along with each DGA having their own theme, they also have a USDA food guide that accompanies the recommendations.

### *MyPlate*

Since 1916, the USDA has been developing food guides to help guide the way Americans eat. There have been eight food guides released by the USDA. MyPlate has been the USDA's food guidance symbol since 2011 and was released with the 2010-2015 DGA as a replacement for the MyPyramid Food Guidance System.<sup>16</sup> Table 2 describes the seven food guides that have been released by the USDA before MyPlate:

Name of Guide:	Years in Effect:	Main Points:
“Food for Young Children” and “How to Select Food”	1916-1930s	Focused on “protective food.” Established guidelines based on food groups, and household measures.
A Guide to Good Eating (Basic Seven)	1940s	Included recommendations for daily servings of seven food groups, however, did not mention specific serving sizes.
Food for Fitness, A Daily Food Guide (Basic Four)	1956-1970s	Used a foundation diet approach. Basic Four: milk group, meat group, vegetable/fruit group, bread cereal group Included specific serving sizes.
Hassle-Free Daily Food Guide	1979	Based on Basic Four, while also created a fifth group to give recommendations on fat, sweets, and alcohol intake.
Food Wheel: A Pattern for Daily Food Choices	1984	A total diet approach that included both nutrient adequacy and moderation. Used a pie chart format to demonstrate the proportion of
Food Guide Pyramid	1992	Used a total diet approach. The illustrate focused on concepts of moderation, proportions, and variety. Illustrated how much of each food group to eat by where it landed on the pyramid, with the food at the bottom of the pyramid representing what to eat the most of and the food at the top of the pyramid representing what to eat the least of.
MyPyramid Food Guidance System	2005	Aligned with the 2005-2010 DGA. Simplified pyramid illustration. Included recommendations for daily amounts of food based on 12 different calorie levels.

Table 2: Food Guides from the USDA for the DGA

MyPlate is used by educators around the country to help consumers develop a healthy eating pattern by emphasizing the key points addressed in the DGA.<sup>17</sup>

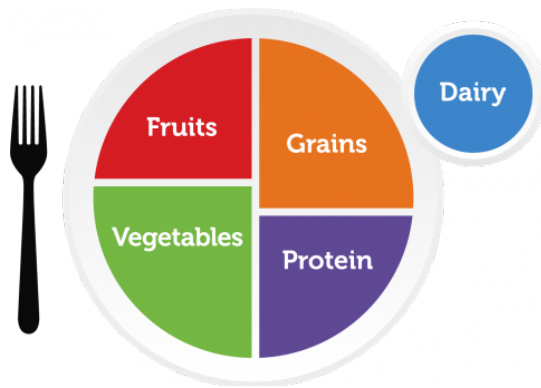


Figure 1: MyPlate

The figure above shows the current MyPlate graphic representing the 2020-2025 DGA. The graphic represents what the ideal plate would be if someone followed the exact recommendations of the DGA at each meal. Each of the four unequal sections in the graphic represents a food group. The largest section on the plate is vegetables, followed by grains, and then protein and fruit. The main recommendations based on the MyPlate graphic are:

- Make half your plate fruits and vegetables, with more emphasis on vegetables.
- One-quarter of your plate should include grains (pasta, rice, bread, etc.) half of which should be whole grains.
- One-quarter of the plate should be a protein source (lean meat, poultry, legumes and beans, nuts, seeds, or soy product).

Millennials' understanding of MyPlate and their adherence to MyPlate is still not fully understood. Studies that discuss the relationship between millennials and MyPlate have tended to examine certain barriers to following the recommendations of MyPlate, with the biggest barrier

suggested being cost. Some studies looked at what it would cost to follow the diet that is described in the MyPlate recommendations.

Clark et al. (2019) conducted a secondary analysis to examine the cost of following the USDA MyPlate guidelines for fruit and vegetable consumption in millennials (termed university students in the study aged 18-30).<sup>18</sup> Participants were given a caloric goal for each day based on age, weight, and physical activity levels and attended a two-hour counseling session on the recommendations of MyPlate. Clark et al. estimated participant's weekly food costs and determined compliance by receiving meal receipts from each participant and weekly recorded dietary intake over 8 weeks. Compliance was also assessed by participants attending weekly 1-hour consultations with a trained researcher and showing photos of each meal to the researcher. If a food receipt was not available, participants were to log what they ate, and the price of each item to share at the weekly consultation. Clark et al found that the compliant group spent an average of  $\$95.73 \pm \$73.33$  per week, while the non-compliant group spent an average of  $\$66.24 \pm \$65.31$  per week ( $p = 0.02$ ).<sup>18</sup> The spending differences remained significant after controlling for sex, age, BMI, and region ( $p < 0.0001$ ).<sup>18</sup> This study suggests that the higher cost of following MyPlate recommendations may be a barrier to the millennial age group from following the recommendations. Another study looked at the cost of following the MyPlate diet, while also factoring in the costs related to recipients of the Supplemental Nutrition Assistance Program (SNAP).

Mulik et al. (2017) estimated the cost of following the MyPlate food guide as well as the additional costs of following a MyPlate diet for someone receiving SNAP benefits. They estimated these costs using the USDA MyPlate guidelines specific for each age and gender and

estimating costs for three meals a day following age-specific guidelines based on retail price data from the USDA.<sup>19</sup> They looked at the cost of following MyPlate for 6 different scenarios that looked at costs based on if fruits and vegetables were fresh, frozen, canned, or a combination of all. Three scenarios were based on if the person ate meat, and the other three looked at a vegetarian diet, with the same variations in fruit and vegetable sources.<sup>19</sup> The results showed that the current SNAP benefits were not enough to supplement a MyPlate diet in all six scenarios, which suggests cost may be a barrier to adhering to the MyPlate diet.

### *What is the diet quality of Millennials?*

In America, the diet quality of millennials is still falling below the DGA expectations. McDaniels et al. (2012) evaluated the dietary patterns and physical activity choices of a group of young adults (mean age of 25.52 years) in the Ohio State University community and comparing it to the Dietary Approaches to Stop Hypertension (DASH) Eating Plan and MyPyramid recommendations.<sup>20</sup> The DASH diet was developed by the National Heart, Lung, and Blood Institute to promote heart health and reduce blood pressure. McDaniel et al. used secondary data from two randomized, double-blind studies that examined the effects of a nutritional supplement on the healing of acute blister wounds that were created on the forearms of healthy, young adult participants. The first study looked at the effect of Omega-3's on the healing of acute blister wounds, while the other study looked at the effect of n-3 oral supplements on the n-6/n-3 ratio in young adults.<sup>21,22</sup> McDaniels et al. examined the demographic, nutritional, physical activity, and body composition data that was collected at the beginning of the two original studies. Results showed that millennials in the study were not meeting 2005-2010 DGA recommendations for 6 out of the 7 nutrients of concern described in the 2010-2015 DGA, namely, calcium, potassium,

fiber, magnesium, Vitamin A, C, and E. In addition, results also found that millennials in the study were only consuming 1 cup of fruit per day and 1.5 cups of vegetables a day, which was less than the recommended 2-2.5 cups recommended for each.<sup>20</sup> Participants in this study were mostly from the Midwest United States and were primarily white, well-educated adults. These similar characteristics show that this study population only represents a small portion of Americans.

A second study by Wang et al. (2014) used National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2010 in the US adult population to determine changes in diet based on changes in nutrition policies and food processing. To determine diet quality, they used the Alternative Healthy Eating Index 2010 (AHEI-2010) with a higher score indicating a better diet quality. The AHEI-2010 was created for the study based on the literature and to focus on nutrients of concern.<sup>23</sup> Using the USDA MyPyramid Equivalents Database they created the food groups described in AHEI-2010 which included vegetables, fruits, whole grains, sugar-sweetened beverages and fruit juices, nuts and legumes, red and/or processed meat, and alcohol. In the data presented from 2009-2010, the millennial age category received a mean score of 33.7 out of 110.<sup>23</sup> This indicates that their diet is far from meeting the dietary guidelines in its entirety.

Another issue with understanding the diet quality of this generation is the wording used in the literature. Most data aggregated millennials with all adults in the population. Future studies should work at disaggregating this population. In addition, the literature suggests that socioeconomic factors such as race, income, ethnicity, education, and environmental conditions influence the food and exercise patterns of millennials. These demographic factors should be

considered when further studying millennial's diet. This relates back to the limitation of the previously discussed studies which generally focus on similar study groups of mostly white, well-educated individuals.

## **Perceptions of Dietary Guidelines for Americans in Millennials**

### *Current Knowledge and How That Affects Perception*

There is a limited understanding of how millennials perceive the DGA. Kologinsky et al. (2007) examined whether DGA knowledge translates to better nutritional knowledge among a group of millennials (males and females aged 18-20 years old).<sup>24</sup> This cross-sectional study used an internet-based survey to collect data on the relationships between self-reported eating behaviors and self-reported nutritional knowledge. The questionnaire was based on MyPyramid and the USDA Diet and Health Knowledge Survey. Understanding and knowledge of the DGA were assessed using the US Department of Agriculture Diet and Health Knowledge Survey, and the lowest possible score was a 36. Results showed participants with a better understanding of the DGA ate more fruit and less protein. They also found that those who had the least amount of knowledge on the DGA had more dairy a day than the current recommendations.<sup>24</sup> These findings were linked to the extensive efforts to promote the consumption of specific foods in the United States, such as the pushing of high protein beverages and snacks, and dairy products.<sup>24</sup> Similar results were found in a study that examined perceptions of milk fat in the United States, as well as Denmark and the United Kingdom (UK).

Similarly, in a study that examined perceptions of milk fat in the United States, Denmark, and the United Kingdom (UK), Bello-Perez et al (2015), found that nutritional knowledge does impact perceptions of milk fat consumption. They also found that where people from each

country looked for their nutrition information impacted the way that they viewed milk fat, either as healthy or unhealthy.<sup>25</sup> In the United States, people were seeking out dietitians for nutritional knowledge more than in the UK or Denmark, which suggests that people are seeking out accurate and beneficial nutritional knowledge.

### **Consumer and Purchasing Behaviors of Millennials**

Millennials' grocery and food shopping behaviors also affect their perceptions of the DGA and how they eat. In a 2015 paper released by the Journal of The Academy of Nutrition and Dietetics (JAND), the academy reviewed the literature regarding millennials' grocery shopping habits, and how this information can be used in practice. The review showed that millennials are grocery shopping differently from other generations and have different strategies when going shopping. Millennials are less loyal to one traditional grocery store and tend to shop around at multiple types of stores and locations to obtain all of their groceries.<sup>26</sup> They are also greatly influenced by recipes that they find online when doing grocery shopping and will shop for specific meals rather than getting pantry and refrigerator staples for the week.<sup>26</sup> Research in other countries has found that taste also plays a role in how some young adults shop.<sup>25,27</sup>

Kuhns et al. (2017) worked with USDA to examine the food purchase decisions of millennial households compared to other generations. This study notes how this generation was born during the Great Recession, an economic downturn that may have affected their food spending.<sup>28</sup> This study noted that millennials place more importance on convenience and experience than previous generations and shop more frequently at gas stations and use same-day delivery services.



Kourouniotis et al. (2016) examined the relationship between taste and dietary behaviors and food choices on a group of millennials (referred to as university students in the study) in Australia. Participants were asked to complete a Food and Diet Questionnaire (FDQ) and a Food Frequency Questionnaire (FFQ). Embedded within the FDQ were questions regarding the importance of taste in food choice on a 5-point scale including 1 (“not important”), 2 (“slightly important”), 3 (“moderately important”), 4 (“very important”), and 5 (“extremely important”).<sup>27</sup> Results showed that 82% of their study participants rated taste as being very or extremely important in making food choices.<sup>27</sup> This was then linked to having poorer diet quality since palatability is linked with higher fat, sugar, and sodium content.

Understanding these perceptions are important because they impact the way people eat. Studies have shown that targeting health and nutrition perceptions may be just as important as promoting healthy eating itself.<sup>29</sup> This may help policymakers and nutrition professionals identify gaps and misconceptions regarding the DGA or a healthy eating style.

### **Self-Reported Diet Quality**

Self-reported diet quality in terms of this research is the interpretation or reporting of an individual’s diet, which may or may not accurately represent their true diet quality. Self-reported diet quality or self-reported health have been used in various studies. A study by Woglom et al. (2020) examined the relationship between self-reported diet and objective diet to observe the relationship between the two in young adults.<sup>30</sup> This study used a single self-reported diet quality question, asking participants if they would rate their diet as “excellent,” “very good,” “good,” “fair,” and “poor.” Participants who rated their diet quality as “excellent,” “very good,” and

“good” has a significantly better HEI-2005 score, indicating their self-reported diet quality reflected their actual diet quality.<sup>30</sup>

Lofffield et al. (2014) assessed the validity of single-item, self-rated diet quality questions. This was done using a secondary analysis of survey and biometric data from a cross-sectional sample.<sup>31</sup> This study used a self-rated diet quality question that asked, “In general, how health is your overall diet? Would you say (1) excellent (2) very good (3) good (4) fair or (5) poor?”<sup>31</sup> The number of fruits and vegetables ate the previous day was also measured along with a measure of each participant’s BMI and blood pressure to compare to their self-reported diet quality. Urinary potassium was also measured to examine fruit and vegetable intake since it is positively correlated with fruit and vegetable intake. Participants were also asked the amount of 12 oz sugar-sweetened beverages they consumed daily, and their frequency of eating at fast-food restaurants. Lofffield et al. found that self-reported diet quality was positively related to income and education level. Measured blood pressure and BMI increased with worsening reported diet quality. Better self-reported diet quality was overall associated with lower 24-hour urinary sodium, lower blood pressure, BMI, fast-food intake, but higher fruits and vegetable intake.<sup>31</sup>

### **Mental Health of Millennials**

The mental health of millennials is significant since it can be the cause of or can be related to poor quality. Also, since this is the largest generational cohort it can create other issues in the public health domain. A study by Lucero et al. (2021) examined data from the 2017 National Health Interview Survey (NHIS) to determine the mental health status of millennials. They found that female millennials were more likely to report worthlessness, hopelessness, restlessness, nervousness, and sadness than male millennials.<sup>32</sup>

Mental health in this generation is studied differently than in the past due to the circumstances that occurred due to the current global pandemic, COVID 19. Studies are now looking at mental health challenges that are faced in US adults as an effect of the pandemic. Turchioe et al. (2021) examined the mental health symptoms among adults in an early stage of the COVID-19 pandemic. Mental health symptoms were measured using the Patient-Reported Outcomes Measurement Information System (PROMIS) questionnaire, which asks about the perceived severity of symptoms. Mental health symptoms measured were anger, anxiety, cognitive function, depression, and fatigue. Participants ranged from 18-83, however, results were separated by a generation with millennials accounting for 27.8% of the study population. Participants in the millennial or Gen X generation reported significantly worse mental health symptoms compared to baby boomers.<sup>33</sup> This study also found that females were more likely to show worse mental health symptoms.<sup>33</sup>

### **Technology and Social Media Impact**

Technology and social media have had an influence on millennials for their entire lives and they have used technology to connect with others and seek out information. They are used to having instant access to information, and that is why social media is a great intervention strategy to help target better-eating styles for millennials.<sup>26</sup> Millennials tend to share experiences on social media, and because of that, they gravitate towards certain brands or ideas based on their social media presence. In 2012 it was found that millennials spend 1.8 hours of an 8-hour workday on social media.<sup>13</sup> As of 2019, 90% of millennials own a smartphone, and 100% report that they use the internet. The number of millennials on social media also increased from 75% in 2012, to 86% in 2019.<sup>13,34</sup> Millennials are also more likely to think positively about the internet

and technology with 73% reporting that the internet has had a positive effect on their life.<sup>34</sup> This makes the use of technology and social media important when trying to reach millennials.

There have been some studies and reviews done on the effectiveness of social media as an intervention to get young adults to have a better diet. Klassen et al. (2018) examined social media use for nutrition-related outcomes in millennials (young adults) using a mixed-methods approach to a systematic review.<sup>35</sup> The systematic review used seven databases to find the information for the systematic review (EBSCOhost, PubMed, ProQuest Central, Ovid, Scopus, ERIC, and Emerald) and searched using the predetermined keywords. The inclusion criteria for participants used in the review were that the study participants were young adults, healthy and/or overweight or obese, and were not pregnant. Social media was defined as, “any web-based communication channel dedicated to community-based input, interaction, content-sharing, and/or collaboration.”<sup>35</sup> Outcome measures for studies used in the review were body composition or dietary intake. In total, 21 studies were included in the review. The majority of the studies included took place in the United States and were from within 5 years of the review’s publishing date. The participants in the studies used were typically female and were university students. The results found that participant engagement with social media in the studies varied greatly from 3 to 69%.<sup>35</sup> From the review they learned that millennials like to use social media to look for healthy recipes and health tips, however do not share much about their own personal health through social media. They also found that young adults were willing to accept health and nutrition advice through social media suggesting that further research should be conducted on how to effectively reach young adults on social media and how to effectively communicate

nutrition education through social media. A later systematic review looked at similar aspects of millennial nutrition about social media, but specifically with smartphone-based interventions.

Kim et al (2019) examined the effectiveness of social media interventions on millennials' nutrition, and specifically smartphone-based social media interventions. This review consisted of a systematic review and meta-analysis and examined the effectiveness of smartphone-based interventions on the physical activity status and health of millennials. The inclusion criteria for this systematic review were, that studies "used smartphone-based apps as the primary intervention, included physical activity, body weight, or body mass index (BMI) as outcome measures, and that they were conducted on healthy young adults aged 19-25 years. The results of the review showed modest evidence that smart phone based social media interventions could be effective in improving millennials' physical activity, weight control, diet, and body composition. The review concluded that further research was needed to evaluate the effectiveness of these types of programs.

Other studies have also looked at using mobile devices as a means of intervention with young adults. Brown et al. (2014) evaluated the effectiveness of repetitive nutrition-related texts on millennial's (referred to as college students in study) nutrition knowledge and fruit and vegetable consumption.<sup>36</sup> Brown et al. used repetitive nutrition-related text messaging for the intervention group, and the control group received the same information, however, it was through the mail in a pamphlet.<sup>36</sup> The intervention group ended the 7-week intervention period with greater knowledge on MyPlate and the DGA than the control group. Fruit and vegetable knowledge was also improved in the intervention group, and the intervention group's fruit consumption improved.<sup>36</sup>

## Chapter 3. Methods

### **Research Design**

This study used a cross-sectional design to examine self-reported diet quality and its associations with adherence to the DGA, MyPlate recommendations, food security, consumer behaviors, and mental health outcomes in millennials; and to explore the knowledge and perceptions of millennials regarding the DGA. A mixed-methods approach combining focus groups and survey data was used.<sup>37</sup> This approach allowed for the collection of quantitative data that better-reflected millennials' self-reported diet quality and qualitative data that provided an in-depth look into actual human behavior, experiences, and driving factors for decision making and their perception and knowledge of the DGA.<sup>38</sup>

### **Participant Selection and Recruitment**

Millennials 24-38 years of age, who were English speakers were recruited for the study through convenient sampling. Participants were excluded if they did not fit the age requirement and were non-English speakers. Participants were recruited from across the US were recruited. Participants were recruited via ResearchMatch through The Center for Clinical and Translational Sciences (CCTS) at The Ohio State University. ResearchMatch.org is an online national registry connecting researchers with people who volunteer for studies. A two-stage process was used to recruit participants.<sup>39</sup> The first stage identified individuals who were interested in participating in the study through ResearchMatch. In the second stage, a link to a Qualtrics survey was sent to those who expressed interest in the study. Quantitative data were collected through the survey and information was provided on how to participate in the focus groups.

## **Procedures**

The survey was sent to those who expressed interest in the study on ResearchMatch. Consent for participating in the survey was obtained via ResearchMatch. Once participants completed the survey, they were then given the opportunity to participate in a focus group. Participants who agreed to participate in the focus group were asked to fill out a consent form prior to the focus group Zoom session. Verbal consent for recording the focus group session was obtained during the Zoom session. A total of 3 focus groups that lasted roughly 80 minutes in length were conducted to obtain data on participants' knowledge and perceptions of the DGA and MyPlate. A graduate researcher was present at all focus groups to help obtain data and consent. After the focus group the participants received a \$10 Amazon e-gift card incentive. The study was approved by The Ohio State University Institutional Review Board.

## **Instrument**

The Millennials' Food and Consumer Behavior Survey (FCBS) was derived from validated questions from the 2009-2010 National Health and Nutrition Examination Survey (NHANES), the United States Department of Agriculture (USDA) food security questionnaire, and the Health-Related Quality of Life Measure (CDC HRQOL-4) developed by the Center for Disease Control (CDC). It consisted of seven sections and 45 questions. Sections covered demographic information, self-reported diet quality, knowledge and perceptions of DGA and MyPlate, consumer patterns, shopping behaviors, food security, and mental health.

## **Measures**

### *Demographics*

The demographic section included 10 questions derived from the NHANES 2009-2010 survey. The questions were about age, sex, country of birth, ethnicity, marital status, education level, total of number of people in the household, number of children in the household, employment status, and income. Each question consisted of a multiple-choice answer format, except for the question regarding age in years and number of children in the household. These questions were measured using an open-ended format where participants could fill in the blank.

#### *Self-reported Diet Quality (SRDQ)*

The SRDQ question was derived from the CDC HRQOL-4. It refers to the individual's perception of the quality of their diet from the standpoint of whether it is "healthy" or "not healthy." A single question reflected SRDQ. For example, the question asked, "In general how healthy is your overall diet?" With a 5-point Likert scale (1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent) for the responses, with higher scores indicating better diet quality.

#### *Awareness of MyPlate and DGA*

Awareness of MyPlate and DGA were measured by questions derived from the 2009-2010 NHANES questionnaire. Questions that assessed participants' awareness asked, "Have you ever heard of MyPlate," or "Have you ever heard of the DGA?" Responses were asked in multiple choice with the options yes, no, and don't know. An additional question was used to test knowledge of MyPlate. The question was derived from the MyPlate.gov website. The questions asked, "About how much of your plate should be fruits and vegetables?" A multiple-choice format was used with possible answers being  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{1}{3}$ , or don't know.



### *Consumer Habits*

Consumer habits referred to the amount of money spent on grocery shopping and food and the factors that drive participants to make certain food choices or purchases. Eight questions were used to determine consumer habits. Two questions were related to how easy it is to eat a healthy diet and the other question was related to where participants shopped for groceries. For example, one question asked, “Which of the following would make it easier for you or your family to eat a healthy diet?” Participants were asked to select all the responses that applied. The other six questions were related to the importance of price, nutrition, taste, ease of preparing food, and food safety when buying food. For example, one question asked, “How important are the following when buying food?” Choices included price, nutrition, taste, and preparation easiness. A 4-point Likert scale was used to assess the importance of each variable (price, nutrition, taste, preparation easiness) on a scale of very important, somewhat important, not too important, or not at all important. An addition question under Consumer Habits was used to determine if participants followed a special diet. This was grouped in this category because following a special diet generally leads to specific shopping patterns. The question asked, “Do you follow a specific diet?” Response options were: Paleo, Keto, low or no carbohydrate, gluten free, I do not follow a specific diet, and other.

### *Spending Habits*

Spending habits referred to the amount of money participants spent on food in various settings in the past 30 days. Participants were also asked about the average amount of money spent in the past 30 days on food in various settings, such as grocery shopping, dining out, and at stores other than grocery stores and supermarkets. For example, one question asked, “During the

past 30 days, how much money did (you/your family) spend at supermarkets or grocery stores. Please include purchases made with food stamps.” Response ranged from less than \$200, \$201-\$300, \$301-\$400, \$401-\$500, and more than \$500.

### *Food security*

Food security was assessed using five questions from the USDA Food Security Survey. The first question asked, “The food that (I/we) bought just didn’t last, and (I/we) didn’t have money.” Responses included: Often, sometimes, or never true for (you/your household) in the last 12 months. Questions with a response of “yes,” “often,” and “sometimes” are categorized as affirmative responses, where the higher number of affirmative responses the lower the level of food security.<sup>40</sup> The second question asked, “In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough money?” with response options of yes, no, or don’t know. The question that generated a follow-up question was, “In the last 12 months, did (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?” If participants answered yes, it brought them to a question that asked, “How often did this happen?” Responses included: almost every month, some months but not every month, only 1 or 2 months, and don’t know.

### *Mental Health*

Mental health questions were derived from a validated questionnaire from the CDC. Questions were based on how often participants had certain feelings within a 30-day span. An example includes, “Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Response options were within 5-day periods, starting at 1-5 days, then 6-10 days, etc. up

to 30 days. The HQOL healthy days index is calculated by adding the numbers of poor physical and mental health days experienced in the past 30 days and subtracting that from 30.<sup>41</sup>

### *Focus Group Questions*

Focus group questions were based on the Social Cognitive Theory (SCT). The SCT states that learning occurs in a social context with interaction of the person, environment, and behavior.<sup>42</sup> Questions related to the following constructs of the SCT were used: behavior capability, reinforcements, and expectancies. Definitions of each construct can be found in table 3. Focus group questions based off of these SCT constructs can be found in Table 4. The questions used in the focus group guidebook were validated for construct validity.

### **Analysis**

Survey responses that were collected through Qualtrics were analyzed using descriptive statistics. Descriptive analysis included age, sex, income, ethnicity, marital status, number in household, and educational level. Pearson chi-squared tests were also used to determine differences between demographic variables and nutritional knowledge, and to determine if there were relationships between self-reported diet variables such as food security, mental health, and knowledge of the DGA and MyPlate.

Focus groups were recorded and transcribed verbatim via Zoom. A graduate researcher checked the transcript for accuracy. Analysis of the raw data from verbatim was a multi-step process based on methodology from Erlingson et al. 2017.<sup>43</sup> The transcripts were read and reread separately by two researchers (MC and IA) to gain a better understanding of the responses, then were condensed to smaller meaning units, and further labeled into codes. Once the information was put into codes, the two researchers compared their coding to reach agreement. The codes

were grouped with other codes that had a similar meaning into categories. Finally, the categories were grouped into themes. The themes answered the questions, “why, how, in what way, or by what means?” This process was not linear and was rather cyclical with a process of going back and checking and rechecking to make sure the data were fully analyzed.

Social cognitive theory construct	Definition
Environment	The physically external factors that influence behavior
Expectations	The anticipated consequences of a behavior
Self-efficacy	The level of confidence a person holds about performing a behavior
Behavior Capability	The ability of a person to perform a behavior based on knowledge and skill
Reinforcements	The external or internal factors that influence a person continuing or discontinuing a behavior

Table 3: Social Cognitive Theory Constructs and Definitions

\*Constructs and definitions adapted from<sup>42</sup>

Research Objective	SCT Domain	Question	SCT Construct
1. To describe millennials' perceptions and knowledge regarding the recommendations of the 2015-2020 DGA.	Personal	What does healthy eating mean to you?	Behavioral Capability
	Personal	What do you know, if anything, about the Dietary Guidelines for Americans?	Behavioral Capability
2. To explain the knowledge and perceptions of millennials regarding the MyPlate recommendations for healthy eating related to: <ul style="list-style-type: none"> <li>a. Filling half their plate with fruit and vegetables.</li> <li>b. Filling one-quarter of their plate with lean protein and varying the sources of protein.</li> <li>c. Filling one-quarter of their plate with grains, making half of the grain's whole grains.</li> <li>d. Consuming low-fat milk products</li> <li>e. Consuming oils instead of solid fats.</li> </ul>	Personal	What do you know, if anything, about MyPlate?	Behavioral Capability
	Personal	Take a look at the MyPlate logo. What information do you get from this logo?	Behavioral Capability
	Behavioral	Does your plate look similar to MyPlate, or do you think you follow the recommendations presented in this diagram?	Behavioral Capability
	Behavioral	What are some strategies you would use to try to meet these MyPlate recommendations?	Behavioral Capability
	Environmental	What challenges would you face in following these MyPlate recommendations?	Reinforcement
	Environmental	What things in your life do you think would enhance/improve your ability to follow these MyPlate recommendations?	Reinforcement
	Behavioral	Let's focus on the recommendations for specific food groups in the MyPlate graphic <ul style="list-style-type: none"> <li>a. Which would be the easiest to adopt/follow? Why?</li> <li>b. Which would be the hardest to adopt/follow? Why?</li> </ul>	Reinforcement
	Personal	If you were asked to help improve MyPlate, what would be your recommendation(s)?	Expectancies

Table 4: SCT Guided Focus Group Questions

## Chapter 4. Results and Discussion

### **Quantitative Results**

A total of 2,193 people across the United States met the inclusion criteria and were recruited for the study. Out of these, 217 (9.9%) chose to participate. Data were cleaned, with 18 responses removed for having no data, leaving 199 responses analyzed. The majority of survey respondents were employed (83%), white (74%), females (76%), with a predominantly high income of \$100,000 per year or more (58 participants or 32%). They were also predominantly college-educated (83%) (Table 5). The majority of the respondents reported that nutrition was an important consideration when purchasing food (95%). Participants were also predominately food secure with the majority of participants reporting at all times they could afford balanced meals (71%) (see Table 7). About half (43%) of participants reported having 1-5 poor mental health days in the past 30 days. The majority of respondents (78%) also reported that they had less than 10 days in the last 30 days where poor mental or physical health kept them from doing their usual activities (see Table 8).

		n	%
<b>Sex</b>	Female	151	76
	Male	48	24
<b>Ethnicity</b>	Mexican American	9	5
	Non-Hispanic Black	10	5
	Other Hispanic	12	6
	Other race – including multiracial	21	11
	Non-Hispanic White	147	74
<b>Education Level</b>	Less than a high school degree	2	1
	High school diploma or GED	30	16
	Bachelor’s degree	93	48
	Master’s degree	49	25
	Doctorate degree	19	10
<b>Yearly Income for Household</b>	Low (\$0 - \$24,999)	36	20
	Medium (\$25,000.- \$54,999)	41	23
	Medium-High (\$55,000-\$99,999)	46	25
	High (> \$100,000)	58	32
<b>Employment Status</b>	Currently Employed	157	83
	Not employed, someone else in the household provides income	20	11
	Not employed receiving government benefits	12	6
<b>Marriage Status</b>	Married	69	36
	Separated/Divorced	13	7
	Never married	110	57
<b>Self-Reported Diet Quality</b>	Great	73	37
	Good	68	34
	Not Good	57	29
<b>Importance of nutrition when buying food</b>	Very important	72	42
	Somewhat important	90	53
	Not too important	8	5
	Not at all important	1	0.5

Table 5: Survey Respondent Demographics (N = 199)

The majority of participants reported being food secure and that there was never a time when they could not afford to eat balanced meals in the last twelve months. Less than one third (29%) of participants reported that they could not afford to eat balanced meals in the last 12 months. The majority (80%) of participants said they did not have to cut the size of their meal because there was not enough money for food (see table 6).

		N	%
“The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?	Often	18	9
	Sometimes	29	15
	Never	147	76
“(I/we) couldn’t afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?	Often	20	10
	Sometimes	37	19
	Never	137	71
In the last 12 months, 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	30	15
	No	154	80
	Don’t know	10	5
**How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?	Almost every month	17	57
	Some months but not every month	7	23
	Only 1 or 2 months	5	17
	Don’t know	1	3
In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?	Yes	40	20
	No	151	79.5
	Don’t know	1	0.05
In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?	Yes	30	16
	No	158	83
	Don’t know	2	1

Table 6: Participants’ Food Security (N=194)

The majority of respondents reported 10 or fewer days with poor mental health in the last 30 days (65%). The majority of respondents also reported that they had 5 or fewer days with poor mental health affecting their usual daily activities (65%) (see Table 7).



		N	%
Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?	0 days	12	6
	1-5	82	43
	6-10	30	16
	11-15	23	12
	16-20	16	8
	21-25	14	7
	26-30	16	8
	During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?	0 days	47
1-5		56	35
6-10		20	13
11-15		13	8
16-20		14	9
21-25		4	2
26-30		6	3

Table 7: Participants' Mental Health (N = 193)

Importance of nutrition when purchasing food	Self-Reported Diet Quality		
	<i>Great</i>	<i>Good</i>	<i>Not Good</i>
<i>Very Important</i>	41 (57.0%)	23 (32.0%)	8 (11.0%)
<i>Somewhat Important</i>	20 (22.2%)	34 (37.8%)	36 (40.0%)
<i>Not too important</i>	2 (25%)	2 (25%)	4 (50%)
<i>Not at all important</i>	0 (0%)	0 (0%)	1 (100%)

Table 8: Differences in SRDQ (Q11) by Importance of Nutrition When Purchasing Food (Q22b)

Among participants who said nutrition was very important when purchasing food, 41 (57.0%) had great self-reported diet quality. Participants who said that nutrition was somewhat important when purchasing food, 20 (22.2%) had great self-reported diet quality. Participants who said that nutrition was not too important when purchasing food, 2 (25%) had great diet quality. A Fisher's exact test found a significant association between self-reported diet quality and the importance of nutrition when purchasing food ( $p = 0.019$ ).

Results showed that participants who placed a higher importance on nutrition, had a higher self-reported diet quality. This is supported by existing literature. For example, Buyuktuncer et al. (2018) assessed if the use of information on the nutrition facts label was associated with a high diet quality in millennials. This study found that millennials who use nutrition labels more frequently when buying food had an overall better diet quality.<sup>44</sup> Diet quality was measured using the Healthy Eating Index from 2005 (HEI-2005), where a higher score indicates a better diet quality. The participants who reported they looked at nutrition labels every time when buying food had higher HEI-2005 scores for total fruit, whole fruit, vegetables, and whole grains.<sup>44</sup> In addition, Appelhans et al. (2017) found that objectively documented household food purchases yielded a reasonably accurate estimate of overall diet quality given in the form of 24-hour recall.<sup>45</sup> Diet quality was assessed using HEI-2010, and food purchases were assessed by participants providing food and drink purchase receipts over a 14-day period. Christoph et al. (2017) examined the relationship between use of Nutrition Facts labels on packages and weight-related behaviors. This study found that greater use of Nutrition Facts in women was associated with a greater likelihood of engaging in healthy weight control behaviors.<sup>46</sup>

Food Insecurity	Self-Reported Diet Quality		
	<i>Great</i>	<i>Good</i>	<i>Not Good</i>
<i>Often</i>	5 (25.0%)	3 (15.0%)	12 (60.0%)
<i>Sometimes</i>	9 (24.3%)	9 (24.3%)	19 (51.4%)
<i>Never</i>	57 (41.6%)	56 (41.0%)	24 (17.4%)

Table 9: Association Between SRDQ (Q11) and Food Insecurity (Q39)

Of participants who reported they often couldn't afford to eat balanced meals, 5 (25%) had a great self-reported diet quality. Among participants who reported they sometimes couldn't afford to eat balanced meals, 9 (24.3%) had a great self-reported diet quality. Among participants who reported they never couldn't afford to eat balanced meals, 57 (41.6%) had a great self-reported diet quality (see Table 7). A Pearson's chi-squared test was performed and a significant association between self-reported health and food security was observed ( $p < 0.001$ ).

Results showed that the more of those who reported that they often could not afford to eat balanced meals, the poorer their self-reported diet quality. Similar studies have been seen in the literature. For example, Leung et al. (2014) examined the cross-sectional differences in dietary intake and diet quality based on household food security using NHANES data. This study also used the HEI-2005 as a measurement of diet quality. The results of this study showed that food insecurity was significantly associated with a lower HEI-2005 score.<sup>47</sup> Another study by Robaina et al. (2013) also examined the relationships between food security, diet quality, and BMI in food pantry users.<sup>48</sup> A convenience sample of food pantry clients in Connecticut was used recruited for the study. Food security was measured using the USDA screener, and fruit and vegetables consumption being measured with the Block Food Frequency Questionnaire. Total scores ranged from 0-50. This study found that those who were food secure were over twice as likely to eat more fruit, vegetables, and fiber than those were who food insecure.<sup>48</sup>

Mental Health	Self-Reported Diet Quality		
	<i>Great</i>	<i>Good</i>	<i>Not Good</i>
<i>0-5 days</i>	48 (46.6%)	34 (33.0%)	21 (20.4%)
<i>6-15 days</i>	10 (30.3%)	14 (42.4%)	9 (27.3%)
<i>16-30 days</i>	4 (16.7%)	8 (33.3%)	12 (50.0%)

Table 10: Association Between SRDQ (Q11) and Mental Health (Q47)

Among participants who reported that 0-5 days of poor mental health kept them from daily activities, 48 (46.6%) self-reported their diet quality to be great. For those with 6-15 days of poor mental health that kept them from daily activities, 10 (30.3%) self-reported their diet quality to be great. Participants with 16-30 days of poor mental health that kept them from daily activities, 4 (16.7%) self-reported their diet quality to be great (see Table 8). A Fisher's exact test showed a significant association between self-reported diet quality and mental health ( $p = 0.019$ ).

Results showed that participants who reported fewer mental health days in the past 30-day period also reported a great self-reported diet quality. Similar results were found in the literature. Wattick et al. (2018) examined the relationship between diet intake and mental health in a group of millennials in Appalachia. This study found that lower fruit and vegetable intake was a predictor of depression in males, and increased added sugar intake was a predictor of anxiety.<sup>49</sup> However, this study did only find association between diet quality and mental health in males, which our study helped to fill the gap.

<b>Table 11: Association between self-reported diet quality (Q11) and income (Q9)</b>			
	Self-Reported Diet Quality		
Income	<i>Great</i>	<i>Good</i>	<i>Not Good</i>
<i>Low</i>	13 (36.1%)	8 (22.2%)	15 (41.7%)
<i>Medium</i>	10 (24.4%)	19 (46.3%)	12 (29.3%)
<i>Medium-High</i>	18 (39.1%)	17 (37.0%)	11 (23.9%)
<i>High</i>	28 (48.3%)	18 (31.0%)	12 (20.7%)

Table 11: Association Between SRDQ (Q11) and Income (Q9)

Among those who reported a low yearly income, 13 (36.1%) had a great self-reported diet quality. Those who had a medium yearly income, 10 (24.4%) had a great self-reported diet quality. Of the participants who reported a medium-high yearly income, 18 (39.1%) had a great self-reported diet quality. Finally, of those with a high yearly income, 28 (48.3%) had a great self-reported diet quality (see Table 9). A Person's chi-squared test was run and a significant association between self-reported diet quality and income was observed ( $p = 0.08715$ ).

Participants with a higher income had a higher self-reported diet quality. This has been supported in the literature. Hiza et al. (2012) used the HEI-2005 to describe the relationship between diet quality and different socioeconomic factors, with one being income. They found that there was a positive association between high income and intake of total vegetables, dark green and orange vegetables and legumes, and whole grains.<sup>50</sup> In addition, Darmon et al. (2015) completed a systematic review to examine the contribution of food costs to socioeconomic inequalities in diet quality. Studies included in the review if they linked diet quality, socioeconomic status, and food prices. Results showed that those with higher socioeconomic status (income) consumed a higher-quality diet leading to better health outcomes. This study also

described that foods of less nutritional value tend to cost less, causing those with a lower socioeconomic status or income to eat a lower quality diet.<sup>51</sup>

<b>Table 12: Association between self-reported diet quality (Q11) and education level (Q7)</b>			
	Self-Reported Diet Quality		
Education Level	<i>Great</i>	<i>Good</i>	<i>Not Good</i>
<i>Up to HS</i>	6 (18.8%)	9 (28.1%)	17 (53.1%)
<i>Bachelor's</i>	34 (37.0%)	34 (37.0%)	24 (26.0%)
<i>Master's and higher</i>	32 (47.0%)	23 (33.8%)	13 (19.1%)

Table 12: Association between SRDQ (Q11) and Education Level (Q7)

Participants who had a high school degree or lower, 6 (18.8%) had a great self-reported diet quality. Among participants who had a bachelor's degree, 34 (47.0%) had a great self-reported diet quality. Of participants who had a master's degree and higher, 32 (47.0%) had a great self-reported diet quality (see Table 10). A Pearson's chi square test found a significant association between self-reported diet quality and education level ( $p = 0.006$ ).

Results showed that those with a higher level of education had a better self-reported diet quality. Hiza et al. (2012) also found that adults with a college diploma or higher had higher scores for whole fruit, total vegetables, and whole-grains based on HEI-2005 scores.<sup>50</sup> This indicates that adults with a higher education were also shown to have a better diet quality. This study also found that those with a high school education or lower had a higher HEI-2005 score for saturated fats and sodium than all other education levels, indicating a poorer diet quality.<sup>50</sup>

MyPlate Adherence	Self-Reported Diet Quality		
	<i>Great</i>	<i>Good</i>	<i>Not Good</i>
<i>Yes</i>	20 (42.5%)	15 (32.0%)	12 (25.5%)
<i>No</i>	50 (34.7%)	52 (36.1%)	42 (29.2%)

Table 13: Association Between SRDQ (Q11) and MyPlate Adherence (Q47)

Among participants who said they adhered to the recommendations of MyPlate, 20 (42.5%) had a great self-reported diet quality. Of participants who reported they did not adhere to the recommendations of MyPlate, 50 (34.7%) had a great self-reported diet quality (see Table 11). A Pearson’s chi squared test found there was not a significant association between self-reported diet quality and MyPlate adherence ( $p = 0.61$ ).

Results showed no significant association between MyPlate adherence and self-reported diet quality. Another master’s thesis conducted at California State University, Long Beach found similar results. Their study examined if knowledge and/or use of MyPlate correlated to a better diet quality. This study used the HEI as a measurement of diet quality and found there was no significant correlation between those who have tried a MyPlate plan and those who have not and a better diet quality.<sup>52</sup> Even though this study supports our findings, the majority of the current literature currently does not support these findings, and there is more research needed to understand the relationship between MyPlate adherence and self-reported diet quality. Another master’s thesis conducted at California State University, Long Beach found similar results. Jahns et al. (2018) examined if there was a relationship between the prevalence of those who reported being familiar with the MyPlate and diet quality in adolescents.<sup>53</sup> This study found that recognition of MyPlate was associated with a higher quality, however, they did not look at associations between following the recommendations of MyPlate and diet quality.<sup>53</sup> Additional

research is needed to understand the relationship between MyPlate adherence and self-reported diet quality.

This study consisted of white, educated, high income, food secure individuals. Our results showed self-reported diet quality to be great or high among those who placed high importance on nutrition, were food secure, had higher income, and higher education. Our results showed there was no association between MyPlate adherence and self-reported diet quality. Although the majority of participants fell within these categories, our results showed that millennials with a high school education and those with low income reported lower diet quality. Several studies support this in the literature.<sup>47,50</sup> It seems that interventions are needed for millennials who fall within these categories to improve self-reported diet quality, and possibly create better health outcomes.

### **Qualitative Results**

A total of 3 focus groups were conducted with 2-3 participants per group. Participants were asked a total of 10 questions about their knowledge and perceptions of MyPlate and the DGA. The questions were divided into three SCT constructs: behavioral capability, reinforcements, and personal.

#### *Behavioral Capability*

Behavioral capability refers to the ability of a person to perform a behavior based on knowledge and skill. Six questions were asked under this construct. For example: (1) What does healthy eating mean to you?; (2) What do you know, if anything, about the DGA?; (3) What do you know, if anything, about MyPlate?; (4) Take a look at the MyPlate logo. What information do you get from this logo?; (5) Does your plate look similar to MyPlate, or do you think you



follow the recommendations presented in this diagram?; (6) What are some strategies you would use to try to meet these MyPlate recommendations?

The first question asked under this construct was broad to create a rapport within the group. The first question was, “What does healthy eating mean to you?” Most participants mentioned healthy eating in terms of foods to limit. For example, participants also suggested eating whole rather than processed foods, nutrient dense versus food not cooked at home, and drinking water instead of sodas. Some participants also viewed healthy eating in a more positive light and used terms such as eating a variety of food, eating in moderation and getting the required nutrients. Fruits and vegetables were often mentioned as healthy foods.

- *And kind of just avoiding like I mentioned before, avoiding anything that wasn't really made in my kitchen like not completely avoiding it I can't do that but um just trying to limit myself, I guess, or put limitations or in moderation rather. Everything in moderation.*
- *... I'd sort of like kind of useful rule of thumb is um eating as much as you need but not more and like eating closer to whole foods, rather than like processed foods.*
- *So for me, I try to get a wide variety of vitamins, minerals, I try to target the big macro nutrients, such as carbohydrates, proteins. Um and just also get a wide variety of foods within the vegetable and fruit category as well just to maximize the various nutrients and phytochemicals I can obtain.*

The second question under behavioral capability asked about participants general knowledge of the DGA. The question was, “What do you know, if anything, about the Dietary Guidelines for Americans?” A few individuals noted they knew nothing about the DGA.

However, the majority associated the DGA with the Food Pyramid or MyPlate. One person actually had a fair knowledge of the DGA because of the involvement of an advisor faculty.

- *I know nothing. I am blissfully ignorant.*
- *I don't know much about the guideline itself I'm like familiar with the pyramid and MyPlate a little bit, but the guidelines I don't know much about.*
- *So I think um in terms of Dietary Guidelines, I think I will have a little bit of a biased view because my committee members, two of them actually served on the most recent Dietary Guidelines.*

The third question asked, “What do you know, if anything, about MyPlate?” The majority of participants had heard of MyPlate. In describing what they knew about MyPlate, most participants commented on the food groups represented on MyPlate such as, meat, vegetables, and fruits associated with the MyPlate icon. Only one respondent stated that she did not know a lot about MyPlate.

- *So just like everyone else said it's a plate that's supposed to represent the different food groupings, that you should be eating and so. About one fourth should be fruits. I think three fourths should or not, three fourths I think it's one fourth too should be vegetables. I think the other side is grains and protein and then on top of that, as well as the dairy group and it's just supposed to be kind of a guideline for daily in daily food intake.*
- *I don't know a lot and I, I do have it on my phone, and I had it on my phone from last semester, when we had one lecture about nutrition.*

The fourth question related to behavioral capability asked, “Take a look at the MyPlate icon. What information do you get from this icon?” Several participants mentioned that the circle

shaped dairy portion on MyPlate referred to as a glass of milk. In addition, participants commented that they did not realize that dairy is a part of MyPlate. Some participants mentioned that they thought that MyPlate was unrealistic and unrepresentative of the meals they consumed or the way they “filled their plates.” For example, it was mentioned that MyPlate does not take into account dietary restrictions, cultural preferences, and barriers to food access such as food insecurity issues. Participants stated that they viewed MyPlate as a Western ideal in that it does not take into consideration other cultural groups that might not fill their plates in this manner. They emphasized that this was not the way their eat for each meal of the day.

- *Also it appears that dairy is in the shape of its circular thing my first thought is, is it supposed to be a glass of milk.*
- *I think it's not the ideal way to be presenting I think it's a good thing we should be looking towards like ideally but it's not a realistic way everyone's eating every single meal of the day.*
- *What the message that it's portraying is that people have access to these food groups which, I think that's not always the case when it comes to like disparities in like health disparities and across different races, ethnicities like underserved groups that it might be hard to afford a lot of like the healthier items.*
- *For me, the biggest one is the grains group because it is only about like ½ or ¾ of the dinner plate and grains is not necessarily a staple for everyone's culture and so it's assuming that everybody eats grains and grains is just a subcategory of carbohydrates, which is one of the macronutrients, it's just it's kind of categorizing it based on an American Western standard American diet and that's not necessarily true for all the cultures.*

Question five was used to elicit information about whether participants follow recommendations suggested in the MyPlate icon. The question, “Does your plate look similar to MyPlate, or do you think you follow the recommendations presented in this diagram?” The majority of respondents reported that they did not follow the recommendations presented in MyPlate. Several reasons were suggested, for example, participants generally felt that it was not realistic. For example, it was mentioned that it was not easy to follow the recommendations of MyPlate because food choices are made with the preferences of other in mind i.e., one’s partner. Other reasons given for not being able to follow the recommendations were because of the need to consider what is convenient when choosing meals. MyPlate was viewed as a very large meal that would be for dinner or the weekend, not a meal that someone would have daily.

- *I do not eat like this. I had sleep for lunch um, and I think I had like a banana for breakfast.*
- *I don't eat like this it's not for me at least it's not realistic.*
- *I would love to follow the guidelines more closely, but I can tell that some of it's also affected by my household too. Like, especially after moving in with my partner and how he really enjoys certain foods that aren't as healthy.*
- *Right now, at this stage of my life it's all about convenience whatever I can get on the table fairly quickly that's what we're having. It it's not just at home, but that goes for work to if we're having a little busy day I might not eat.*

Question six was used to determine strategies participants would use to help them meet the recommendations presented in MyPlate. Participants were asked, “What are some strategies you would use to try to meet the recommendations presented in MyPlate? The majority of respondents thought that preparing or planning meals in advance would be the best strategy to

meet the MyPlate recommendations. Another strategy suggested by participants was making meals as convenient and as easy as possible due to time constraints.

- *I think planning helps a lot. Planning from making a shopping list of what to get at the grocery store to what I actually get at the grocery store to you know laying things out ahead of time.*
- *Trying to meal prep ahead in advance and I'm trying to think, okay, how can I make this as easy as possible, what is convenient possible to just like microwave go back and just get my food after five minutes.*

Question seven and eight assessed participants' perceptions of MyPlate. They were asked, "Let's focus on specific food groups in the MyPlate graphic. Which would be the hardest to adopt/follow and why. Which would be the easiest to adopt/follow and why?" Protein was reported as the easiest food group to meet the recommendations for several participants. Fruits were reported as the second easiest, then grains and vegetables were tied. No one reported dairy as being the easiest food group to follow. Interestingly, grains were reported as the hardest food group to follow MyPlate recommendations for. This is surprising due to the fact that grains are highly represented in a typical Western diet. The reasoning for this was that one participant noted that she does not eat grains in general, with another saying they would not know how to eat the portion/serving of grains suggested by MyPlate.

- *Protein for me. There's so many options you've got your eating things like jerky and and like nuts and dried beans and chicken and beef and pork and there's, I think there's so many options.*

- *I'd say grains would probably be my struggle finding, something that was healthy enough to have that large of a portion of every night.*
- *For me it would probably be I guess I grains because, like I'm like always on the run I don't really eat lot of bread um probably don't really get a whole lot of grains at all I don't know why I just don't really eat a lot of bread or like anything kind of like that wheat products.*

### *Reinforcements*

The reinforcement construct describes the external or internal factors that influence a person continuing or discontinuing a behavior. The environmental questions asked in the focus group were: (1) What are some challenges you would face in following these MyPlate recommendations?; (2) What are some things in your life that you think would enhance/improve your ability to follow these MyPlate recommendations?

The first question in the reinforcements construct asked, “What are some challenges you would face in following these MyPlate recommendations?” A prevalent challenge that participants stated they would face in following the MyPlate recommendations was overcoming existing barriers. These barriers included “picky eaters” in the household, financial barriers, and food access barriers. Another environmental barrier participants stated that created a challenge in following MyPlate recommendations that is specific to this current period of is overcoming the grocery shopping and food access barriers that have come from the COVID-19 pandemic. A final challenge for participants was overcoming challenges of time management, such as being able to plan meals in advance and making sure there is the time to prepare meals.

- *The biggest issue we have, I want to go back to the MyPlate picture that vegetable section is really large and I have a picky eater . . . We end up with green beans or corn or peas in the vegetable section and buying fruits buying vegetables trying new things from an economical standpoint can be difficult that stuff is expensive.*
- *Here in Hawaii we don't always get shipments on time so sometimes there are portions of food that are missing, especially now with covid I mean we did go about two months at the beginning of it, where you know we just weren't getting shipments of food.*
- *Most people like my colleagues like we come back from work or like you know finish up work and we're so like drained that there's no way we're going to make everything on that plate.*

The second question asked in the reinforcements construct was, “What are some things in your life that you think would enhance/improve your ability to follow these MyPlate recommendations?” Responses to this question reflected responses presented in the behavioral construct question, “What are some strategies you would use to try to meet the recommendations presented in MyPlate?” with the most prevalent response being to use meal planning and prepping. An example of this was to actually reference the grocery list participants made in advance at the grocery store. Another prevalent theme was social media and applications that some participants were already exposed to but wanted to utilize more to enhance and improve their ability to follow MyPlate’s recommendations.

- *I think for me kind of like Stephanie was saying, probably plan out better like grocery list and go into the grocery store with a purpose.*
- *And what has helped me is using Apps. So, using the Noom app has been helpful in terms of categorizing by color not color of the food per se but in terms of like their health part of it.*

## *Expectancies*

The expectancies SCT construct describes the anticipated consequences of a behavior. There was only one question asked under the expectancy construct of the SCT. The question asked was, “If you were asked to improve MyPlate what would be your recommendation(s)?” The responses to this question were insightful and reflected ways in which nutrition professionals could more effectively connect with millennials. The most prevalent response by participants was to make MyPlate look more like the original Food Pyramid. It was suggested that this could occur by adding pictures, adding specific servings for each food group, and including the sugars and fats section that is reflected on the original Food Pyramid. Along with these suggestions was the suggestion to make the recommendations of MyPlate clearer to show what exactly the Plate represents, each meal of the day, or all the foods that should be consumed within an entire day. The final suggestion presented in response to this question was making MyPlate more representative of how meals vary by cultures, how people follow specific diets, and representing that different people may have different dietary needs.

- *I guess, like the thing I would add to it is like I like that the other one (Food Pyramid) like they talk about how many servings, you should have but I don't see that in this one.*
- *Maybe like a visual, pictures or something in each little category to help with not only with the people who are illiterate, but just to help give ideas to people that are that I don't know, might need visuals.*
- *It is really up for interpretation, when you look at this . . . whether it's a represents your whole day together or if this is just dinner or this is every single meal so find some way to make it a little more obvious what it is that they're recommending I guess.*



- *Just like this picture, make it seem more like accessible too. People are like normalizing are validating that it's okay to eat junk food or even like the idea of utensils like having like a variety of utensils or like maybe it be like a lunch tray and there's like chopsticks to spoons to but yeah the fork can stay too, and I don't know, like other things just to make it seem more culturally sensitive as well.*

### **Focus Groups Discussion**

The following four themes emerged from the focus group discussion: MyPlate as being unrealistic; MyPlate can be improved by aligning it more to MyPyramid; Meal planning and preparation as the best strategy to meet MyPlate recommendations.

*Theme 1: MyPlate being seen as unrealistic.* Participants viewed MyPlate as being unrealistic because it did not take into account cultural preferences, dietary restrictions, barriers to food access, and time constraints. In addition, many viewed it as a Western ideal. These aforementioned factors all have an impact on diet quality and whether or not DGA guidelines and recommendations are followed. Millennials are a generation born between the early 1980s and late 1990s and are the most diverse generation to date. As a result they have a unique way of seeing the world. For example, Winham (2009) showed that culture plays an integral role in people's food choices and lifestyle decisions.<sup>54</sup> This study also mentioned that health care messages may conflict with cultural beliefs for many minorities.<sup>54</sup> The group of millennials seemed to recognize the importance in food selection and choices and based on their knowledge felt tha the DGA and MyPlate did not sufficiently reflect cultural preferences. It should be noted that in the 2020-2025 version of the DGA, the need to tailor preferences is acknowledged. For example, the present recommendations encourage Americans to, “customize and enjoy nutrient-

dense food and beverage choices to reflect personal preferences, cultural traditions, and budgetary considerations.” However, this group of millennials felt that this was not communicated clearly through the MyPlate icon, which reflects responses from the focus groups. It seems that even though this is stated clearly in the DGA, steps must be taken to have this message clearly depicted through MyPlate.

Some participants mentioned that the MyPlate recommendations were unrealistic because it reflects more of a “Western” ideal diet. They were referring specifically to the fact that food groups are separated and that fruits are placed together with other food groups on MyPlate. Some focus group participants of Hispanic and Asian nationality mentioned that they generally would not put fruit on the “Plate.” More often than not, they use fruits as a dessert or a snack. These individuals mentioned their meals generally consist of food groups that are mixed together.

In addition, focus group participants mentioned time constraints to be a reason why MyPlate recommendations are unrealistic. Millennials in this study mentioned that they do not have time to include all the food groups in each meal of the day and thought a huge time commitment is needed to make this happen. These millennials emphasized that convenience was a significant factor in their food choices.<sup>55,56</sup> Also mentioned, was that eating according to the MyPlate recommendations would be too expensive, which was reflected in our quantitative data. This was shown with participants who reported a lower income also reporting a lower self-reported diet quality.

*Theme 2: MyPlate can be improved by aligning it more to the Food Pyramid.* In suggesting ways to improve MyPlate, millennials suggested making MyPlate more like the Food Pyramid. They mentioned doing so by adding more information regarding the exact

recommendations for serving sizes. They suggested that this information was not clear in MyPlate. This may be due to the time period in which millennials grew up. Millennials were born in the late 1980s-1990s and the Food Pyramid was taught in schools from 1992 until it was replaced with MyPlate in 2005, this might be why certain aspects of the Food Pyramid are so appealing to this generation.<sup>57</sup> Slavin et al (2016) also reported on the need to make MyPlate recommendations clearer, and to use better labeling, specifically in the protein section of the graphic.<sup>58</sup>

*Theme 3: Meal planning and preparation as the best strategy to meet MyPlate recommendations.* Preparing meals and food shopping in advance were cited as the best strategies to meet the recommendations of MyPlate. Hanson et al. (2019) investigated if there was a relationship between meal planning behaviors and greater fruit and vegetable intake and BMI in college students.<sup>59</sup> Fruit and vegetable intake was measured using the National Cancer Institute's Fruit and Vegetable Intake Screener, and meal planning frequency was measured using a short survey that was originally developed to assess the impact of cooking interventions. This study found that practicing meal planning behaviors was associated with greater fruit and vegetable intake.<sup>59</sup> In addition, Camargo et al. (2019) compared the characteristics of meals planned by high and low health-conscious adults in Brazil. Participants who matched inclusion criteria were asked how they would grocery shop for a dinner for two by using scenarios.<sup>60</sup> Results showed that adults who were in the high health-conscious group planned healthier meals with more whole grains, fruits, and vegetables than in the low health-conscious group.<sup>60</sup>

Our findings demonstrated that millennials expressed difficulty in following MyPlate recommendations for a variety of reasons and that self-reported diet quality was associated with

a number of variables. The majority of the group did not have previous knowledge of the DGA and associated it with MyPlate or the Food Pyramid, which is what the majority of them learned in school. Participants were, however, familiar with MyPlate. Participants expressed a need for clearer recommendations on MyPlate to make it easier to understand, which reflected some qualities that the Food Pyramid possessed.

## **Conclusions**

The focus of this study was to examine self-reported diet quality and its associations with adherence to MyPlate recommendations, food security, consumer behavior and mental health outcomes in millennials and to explain the knowledge and perceptions of millennials regarding the Dietary Guidelines for American and MyPlate recommendations. The findings of this study showed that there are several socioeconomic factors such as income, education, as well as the importance of nutrition that keep millennials from achieving optimal diet quality as evidenced by the qualitative and quantitative data. Participants' awareness of MyPlate did not translate into knowledge of the DGA. Work needs to be done by the health professionals to increase millennials' knowledge of the DGA and to target MyPlate messages specific to the needs of that group.

## **Limitations**

This study provided valuable information on millennials and their diet quality, consumer behavior and knowledge, and perception of the DGA. However, participants were mostly white, educated, females. This could be a result of using ResearchMatch, an online platform managed by a University (Vanderbilt University). In addition, there was a small percentage of male respondents or who were in a lower income bracket or had a lower level of education. Another

limitation was that the portion of millennials who were immigrants were not reflected in the focus groups. In the FCBS survey, 30 participants (14%) answered that they were born somewhere other than the 50 United States. Focus group participants were not immigrants, although some expressed that they were second generation of parents who were immigrants. Future studies should examine the knowledge and perceptions of the DGA in the large immigrant population portion of the millennial generation. Caution should be taken in interpreting the results as it can only be generalizable to the target population. This study was cross-sectional, as a result, causation cannot be determined. Additionally, as with most self-reported survey instruments there may have been self-report bias.

There are also inherit limitations when using focus research. Focus groups may rely heavily on group interactions and the dynamic of the group. Some participants may over-contribute or under-contribute, potentially influencing the way others respond. Three separate focus groups were conducted to alleviate this potential.

### **Implications and Future Work**

This study showed that millennials had limited knowledge of the DGA but had a better knowledge of MyPlate. Millennials should be targeted in interventions to improve diet quality and to prepare nutrition information geared to their specific needs and preferences. Future iterations of the MyPlate icons should be clearer in regard to recommendations and should consider the diverse needs of millennials. Focus group participants also mentioned that the price of food and the cost of following the MyPlate recommendations made it hard to follow the MyPlate recommendations. Quantitative data mirrored that finding. Results showed that a lower

income is associated with a lower self-reported diet quality. Policy makers should also focus on ways to make healthier eating more attainable across all socioeconomic groups.

## Chapter 5. Examination of the Knowledge and Perceptions of Millennials Regarding the Present Dietary Guidelines for Americans and MyPlate

### **Abstract:**

**Objective:** To examine the associations between millennials' SRDQ, adherence to MyPlate recommendations, food security, consumer behavior and mental health outcomes.

**Methods:** Millennials (24-38 years of age) residing within the US were recruited via ResearchMatch.org for a cross-sectional survey-based study. Questions were derived from validated national surveys measured demographics, SRDQ, consumer behavior, food security, and mental health. Descriptive statistics characterized the sample. Pearson's Chi-squared tests explored the relationships among SRDQ and variables of interest.

**Results:** Respondents (n = 199) were mostly female, non-Hispanic White, employed, college educated, and one-third of individuals with incomes >\$100,000. Strong positive relationships were observed between SRDQ and mental health, food security, perceived importance of nutrition when purchasing food. No association was observed between MyPlate adherence and SRDQ.

**Conclusions and Implications:** SRDQ of predominantly non-Hispanic white, high-income millennials was associated with consumer behaviors, mental health outcomes, and food security. Millennials should be targeted in interventions to improve diet quality of Americans. Future studies should consider the diverse needs of millennials and target more diverse audiences.

### **INTRODUCTION**

The Dietary Guidelines for Americans (DGA) provide evidence-based nutrition information and recommendations to help Americans of all ages make healthy food and beverage choices and improve the quality of their diets. Research has increasingly tied health with quality of overall diet rather than individual nutrients, known as diet quality.<sup>1</sup> A high diet quality based on the current 2020-2025 DGA is characterized by focusing on nutrient-dense foods and beverages, limiting those higher in added sugar and saturated fat, and sodium, and staying within calorie limits.<sup>2</sup> From the extensive research put into creating the DGA there is strong evidence that a healthy eating pattern that follows the recommendations of the DGA is associated with a reduced risk of chronic diseases and overweight and obesity.<sup>2</sup>

Research shows that millennials, the largest generational cohort in the US, struggle to meet the recommendations of the DGA and research shows that there is increasing obesity and a poor diet quality among this group. This may be due to sociodemographic factors such as income, shopping habits, mental health, and education levels. If millennials adopt a better understanding and perception of the DGA, it could possibly result in incident of preventable chronic disease and obesity could result.

However, limited information exists on the diet quality of millennials and their perceptions of the DGA. It is important to focus on millennials. Pew Research Center showed that the millennials are projected to continue to increase in size until about 2033.<sup>6</sup> This is mainly because of the high number of young immigrants entering the US. Focusing on the knowledge, perceptions, and factors that affect diet quality in this population at this stage of their life is necessary as it can promote better health outcomes and improved quality of life in one of the largest groups in the US. The objective of this study was to examine self-reported diet quality and its associations with adherence to the DGA, MyPlate recommendations, food security, consumer behavior and mental health outcomes in millennials and to explain the knowledge and perceptions of millennials regarding the DGA and MyPlate recommendations.

## **METHODS**

### **Participants and Recruitment**

This study used a cross-sectional design and a mixed-methods approach that combined focus groups and survey data.

English speaking Millennials 24-38 years of age (n = 199) from across the US were recruited for the study. Participants were recruited via ResearchMatch through The Center for Clinical and



Translational Sciences (CCTS) at The Ohio State University. Participants were predominantly non-Hispanic White (74%), college-educated (83%), females (76%), with about 1/3 of participants making >\$100,000 per year (32%). Participants were also mostly employed (83%). ResearchMatch.org is an online national registry connecting researchers with people who volunteer for studies.

### *Procedures*

The survey was sent to those who expressed interest in the study on ResearchMatch. Once participants completed the survey, they were then given the opportunity to participate in a focus group. A total of 3 focus groups that lasted roughly 80 minutes in length were conducted to obtain data on participants knowledge and perceptions of the DGA and MyPlate. A graduate researcher was present at all focus groups to help obtain data and consent. At the completion of the focus group the participants received their \$10 Amazon gift card incentive. The study was approved by The Ohio State University Institutional Review Board.

### *Instruments and Measures*

The Millennials' Food and Consumer Behavior Survey (FCBS) was derived from validated questions from the 2009-2010 National Health and Nutrition Examination Survey (NHANES), the United States Department of Agriculture (USDA) food security questionnaire, and the Health-Related Quality of Life Measure (CDC HRQOL-4) developed by the Center for Disease Control (CDC). It consisted of seven sections and 45 questions. Sections covered demographic information, self-reported diet quality, knowledge and perceptions of DGA and MyPlate, consumer patterns, shopping behaviors, food security, and mental health.

The demographic section included 10 questions derived from the NHANES 2009-2010 survey. The questions were about age, sex, country of birth, ethnicity, marital status, education level, total of number of people in the household, number of children in the household, employment status, and income. Each question consisted of a multiple-choice answer format, except for the question regarding age in years and number of children in the household. These questions were measured using an open-ended format where participants could fill in the blank.

The SRDQ question was derived from the CDC HRQOL-4. It refers to the individual's perception of the quality of their diet from the standpoint of whether it is "healthy" or "not healthy." A single question reflected SRDQ. For example, the question asked, "In general how healthy is your overall diet?" With a 5-point Likert scale (1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent) for the responses, with higher scores indicating better diet quality.

Awareness of MyPlate and DGA were measured by questions derived from the 2009-2010 NHANES questionnaire.

Questions that assessed participants' awareness asked, "Have you ever heard of MyPlate," or "Have you ever heard of the DGA?" Responses were asked in multiple choice with the options yes, no, and don't know. An additional question was used to test knowledge of MyPlate. The question was derived from the MyPlate.gov website. The questions asked, "About how much of your plate should be fruits and vegetables?" A multiple-choice format was used with possible answers being  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{1}{3}$ , or don't know.

Consumer habits referred to the amount of money spent on grocery shopping and food and the factors that drive participants to make certain food choices or purchases. Eight questions were used to determine consumer habits. Two questions were related to how easy it is to eat a

healthy diet and the other question was related to where participants shopped for groceries. For example, one question asked, “Which of the following would make it easier for you or your family to eat a healthy diet?” Participants were asked to select all the responses that applied. The other six questions were related to the importance of price, nutrition, taste, ease of preparing food, and food safety when buying food. For example, one question asked, “How important are the following when buying food?” Choices included price, nutrition, taste, and preparation easiness. A 4-point Likert scale was used to assess the importance of each variable (price, nutrition, taste, preparation easiness) on a scale of very important, somewhat important, not too important, or not at all important. An additional question under Consumer Habits was used to determine if participants followed a special diet. This was grouped in this category because following a special diet generally leads to specific shopping patterns. The question asked, “Do you follow a specific diet?” Response options were: Paleo, Keto, low or no carbohydrate, gluten free, I do not follow a specific diet, and other.

Spending habits referred to the amount of money participants spent on food in various settings in the past 30 days. Participants were also asked about the average amount of money spent in the past 30 days on food in various settings, such as grocery shopping, dining out, and at stores other than grocery stores and supermarkets. For example, one question asked, “During the past 30 days, how much money did (you/your family) spend at supermarkets or grocery stores. Please include purchases made with food stamps.” Response ranged from less than \$200, \$201-\$300, \$301-\$400, \$401-\$500, and more than \$500.

Food security was assessed using five questions from the USDA Food Security Survey. The first question asked, “The food that (I/we) bought just didn’t last, and (I/we) didn’t have

money.” Responses included: Often, sometimes, or never true for (you/your household) in the last 12 months. Questions with a response of “yes,” “often,” and “sometimes” are categorized as affirmative responses, where the higher number of affirmative responses the lower the level of food security.<sup>40</sup> The second question asked, “In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough money?” with response options of yes, no, or don’t know. The question that generated a follow-up question was, “In the last 12 months, did (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?” If participants answered yes, it brought them to a question that asked, “How often did this happen?” Responses included: almost every month, some months but not every month, only 1 or 2 months, and don’t know.

Mental health questions were derived from a validated questionnaire from the CDC. Questions were based on how often participants had certain feelings within a 30-day span. An example includes, “Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Response options were within 5-day periods, starting at 1-5 days, then 6-10 days, etc. up to 30 days. The HQOL healthy days index is calculated by adding the numbers of poor physical and mental health days experienced in the past 30 days and subtracting that from 30.<sup>41</sup>

Focus group questions were based on the Social Cognitive Theory (SCT). The SCT states that learning occurs in a social context with interaction of the person, environment, and behavior.<sup>42</sup> Questions related to the following constructs of the SCT were used: behavior capability, reinforcements, and expectancies. The questions used in the focus group guidebook were validated for construct validity.

## *Analysis*

Survey responses that were collected through Qualtrics were analyzed using descriptive statistics. Descriptive analysis included age, sex, income, ethnicity, marital status, number in household, and educational level. Pearson chi-squared correlations were also analyzed to determine relationships between demographic variables and nutritional knowledge. Pearson chi-squared correlations were also conducted to determine if there were relationships between self-reported diet variables such as food security, mental health, and knowledge of the DGA and MyPlate.

Focus groups were recorded and transcribed verbatim via Zoom. A graduate researcher checked the transcript for accuracy. Analysis of the raw data from verbatim was a multi-step process based on methodology from Erlingson et al. 2017.<sup>43</sup> The transcripts were read and reread separately by two researchers (MC and IA) to gain a better understanding of the responses, then were condensed to smaller meaning units, and further labeled into codes. Once the information was put into codes, the two researchers compared their coding to reach agreement. The codes were grouped with other codes that had a similar meaning into categories. Finally, the categories were grouped into themes. The themes answered the questions, “why, how, in what way, or by what means?” This process was not linear and was rather cyclical with a process of going back and checking and rechecking to make sure the data was fully analyzed.

## RESULTS

### Quantitative

A total of 2,193 people across the United States met the inclusion criteria and were recruited for the study. Out of these, 217 (9.9%) chose to participate. Data were cleaned, with 18

responses removed for having no data, leaving 199 responses analyzed. The majority of survey respondents were employed (83%), white (74%), females (76%), with a predominantly high income of \$100,000 per year or more (58 participants or 32%). They were also predominantly college-educated (83%). The majority of the respondents reported that nutrition was an important consideration when purchasing food (95%). Participants were also predominately food secure with the majority of participants reporting at all times they could afford balanced meals (71%). About half (43%) of participants reported only having 1-5 poor mental health days in the past 30 days. The majority of respondents (78%) also reported that they had less than 10 days in the last 30 days where poor mental or physical health kept them from doing their usual activities. Among participants who said nutrition was very important when purchasing food, 41 (57.0%) had great self-reported diet quality. Out of participants who said that nutrition was somewhat important when purchasing food, 20 (22.2%) had great self-reported diet quality. Participants who said that nutrition was not too important when purchasing food, 2 (25%) had great diet quality. A Fisher's exact test found a significant association between self-reported diet quality and the importance of nutrition when purchasing food ( $p = 0.019$ ).

Out of participants who reported they often couldn't afford to eat balanced meals, 5 (25%) had a great self-reported diet quality. Among participants who reported they sometimes couldn't afford to eat balanced meals, 9 (24.3%) had a great self-reported diet quality. Among participants who reported they never couldn't afford to eat balanced meals, 57 (41.6%) had a great self-reported diet quality. A Pearson's chi-squared test was performed and a significant association between self-reported health and food security was observed ( $p = 1.453e-05$ ).

Among participants who reported that 0-5 days of poor mental health kept them from daily activities, 48 (46.6%) self-reported their diet quality to be great. For those with 6-15 days of poor mental health that kept them from daily activities, 10 (30.3%) self-reported their diet quality to be great. Participants with 16-30 days of poor mental health that kept them from daily activities, 4 (16.7%) self-reported their diet quality to be great. A Fisher's exact test showed a significant association between self-reported diet quality and mental health ( $p = 0.019$ ).

Results showed that participants who reported fewer mental health days in the past 30-day period also reported a great self-reported diet quality. Similar results were found in the literature. Wattick et al. (2018) examined the relationship between diet intake and mental health in a group of millennials in Appalachia. This study found that lower fruit and vegetable intake was a predictor of depression in males, and increased added sugar intake was a predictor of anxiety.<sup>49</sup> However, this study did only find association between diet quality and mental health in males, which our study helped to fill the gap.

Among those who reported a low yearly income, 13 (36.1%) had a great self-reported diet quality. Those who had a medium yearly income, 10 (24.4%) had a great self-reported diet quality. Of the participants who reported a medium-high yearly income, 18 (39.1%) had a great self-reported diet quality. Finally, of those with a high yearly income, 28 (48.3%) had a great self-reported diet quality. A Person's chi-squared test was run and a significant association between self-reported diet quality and income was observed ( $p = 0.08715$ ).

Participants who had a high school degree or lower, 6 (18.8%) had a great self-reported diet quality. Among participants who had a bachelor's degree, 34 (47.0%) had a great self-reported diet quality. Of participants who had a master's degree and higher, 32 (47.0%) had a

great self-reported diet quality. A Pearson's chi square test found a significant association between self-reported diet quality and education level ( $p = 0.006$ ).

Among participants who said they adhered to the recommendations of MyPlate, 20 (42.5%) had a great self-reported diet quality. Of participants who reported they did not adhere to the recommendations of MyPlate, 50 (34.7%) had a great self-reported diet quality (see Table 11). A Pearson's chi squared test found there was not a significant association between self-reported diet quality and MyPlate adherence ( $p = 0.61$ ).

### Qualitative Results

The following three themes emerged from the focus group discussion: MyPlate as being unrealistic, MyPlate can be improved by aligning it more to MyPyramid, and Meal planning and preparation as the best strategy to meet MyPlate recommendations.

*Theme 1: MyPlate being seen as unrealistic.* Participants viewed MyPlate as being unrealistic because it did not take into account cultural preferences, dietary restrictions, barriers to food access, and time constraints. In addition, many viewed it as a Western ideal. These aforementioned factors all have an impact on diet quality and whether or not DGA guidelines and recommendations are followed. Millennials are a generation born between the early 1980s and late 1990s and are the most diverse generation to date. As a result they have a unique way of seeing the world. These aforementioned factors all have an impact on diet quality and whether or not DGA and MyPlate recommendations are followed. For example, Winham (2009) showed that culture plays an integral role in people's food choices and lifestyle decisions.<sup>54</sup> This study also mentioned that health care messages may conflict with cultural beliefs for many minorities, which reflects responses from the focus groups.<sup>54</sup> A few participants mentioned that the MyPlate



recommendations were unrealistic due to the way that it was not culturally inclusive and followed a “Western” ideal diet. In addition, focus group participants mentioned that time constraints were a reason why the MyPlate recommendations are unrealistic and the USDA has been seeing that millennials do prefer foods that are more convenient than other generations.<sup>55,56</sup> Also mentioned, was that eating according to the MyPlate recommendations would be too expensive, which was reflected in our quantitative data.

*Theme 2: MyPlate can be improved by aligning it more to the Food Pyramid.* Our focus group findings show that one of the main ways participants suggested to improve MyPlate was centered around making it more like the Food Pyramid. They suggested doing so by adding more labeling like servings sizes and pictures and stating what the exact recommendations are. This may be due to the time period in which millennials grew up. Millennials were born in the late 1980s-1990s and the Food Pyramid was taught in schools from 1992 until it was replaced with MyPlate in 2005, which may be why certain aspects of the Food Pyramid are so appealing to this generation.<sup>57</sup> Slavin et al (2016) also reported on the need to make MyPlate recommendations clearer, and to use better labeling, specifically in the protein section of the graphic.<sup>58</sup>

*Theme 3: Meal planning and preparation as the best strategy to meet MyPlate recommendations.* Preparing meals and food shopping in advance were cited as the best strategies to meet the recommendations of MyPlate. Hanson et al. (2019) investigated if there was a relationship between meal planning behaviors and greater fruit and vegetable intake and BMI in college students.<sup>59</sup> Fruit and vegetable intake was measured using the National Cancer Institute’s Fruit and Vegetable Intake Screener, and meal planning frequency was measured using a short survey that was originally developed to assess the impact of cooking interventions.

This study found that practicing meal planning behaviors was associated with greater fruit and vegetable intake.<sup>59</sup> In addition, Camargo et al. (2019) compared the characteristics of meals planned by high and low health-conscious adults in Brazil. Participants who matched inclusion criteria were asked how they would grocery shop for a dinner for two by using scenarios.<sup>60</sup> Results showed that adults who were in the high health-conscious group planned healthier meals with more whole grains, fruits, and vegetables than in the low health-conscious group.<sup>60</sup>

## DISCUSSION

Our findings showed that participants who placed a higher importance on nutrition, had a higher self-reported diet quality. This has been supported in the literature. For example, Buyuktuncer et al. (2018) assessed if the use of information on the nutrition facts label was associated with a high diet quality in millennials. This study found that millennials who use nutrition labels more frequently when buying food had an overall better diet quality.<sup>44</sup> Diet quality was measured using the Healthy Eating Index from 2005 (HEI-2005), where a higher score indicates a better diet quality. The participants who reported they looked at nutrition labels every time when buying food had higher HEI-2005 scores for total fruit, whole fruit, vegetables, and whole grains.<sup>44</sup>

Findings also showed that the more who reported that they often could not afford to eat balanced meals, the poorer their self-reported diet quality. Similar studies have been seen in the literature. For example, Leung et al. (2014) examined the cross-sectional differences in dietary intake and diet quality based on household food security using NHANES data. This study also used the HEI-2005 as a measurement of diet quality. The results of this study showed that food insecurity was significantly associated with a lower HEI-2005 score.<sup>47</sup>

There was also no significant association between MyPlate adherence and self-reported diet quality. Another master's thesis conducted at California State University, Long Beach found similar results. Their study examined if knowledge and/or use of MyPlate correlated to a better diet quality.

Results showed that those with a higher level of education had a better self-reported diet quality. Hiza et al. (2012) also found that adults with a college diploma or higher had higher scores for whole fruit, total vegetables, and whole-grains based on HEI-2005 scores.<sup>50</sup>

Participants with a higher income had a higher self-reported diet quality. This has been supported in the literature. Hiza et al. (2012) used the HEI-2005 to describe the relationship between diet quality and different socioeconomic factors, with one being income. They found that there was a positive association between high income and intake of total vegetables, dark green and orange vegetables and legumes, and whole grains.<sup>50</sup>

Our findings also demonstrated that millennials expressed difficulty in following MyPlate recommendations for a variety of reasons and that self-reported diet quality was associated with a number of variables. The majority of the group did not have previous knowledge of the DGA and associated it with MyPlate or the Food Pyramid, which is what the majority of them learned in school. Participants were, however, familiar with MyPlate. Participants expressed a need for clearer recommendations on MyPlate to make it easier to understand, which reflected some qualities that the Food Pyramid possessed.

The focus of this study was to examine self-reported diet quality and its associations with adherence to MyPlate recommendations, food security, consumer behavior and mental health outcomes in millennials and to explain the knowledge and perceptions of millennials regarding

the Dietary Guidelines for American and MyPlate recommendations. The findings show that there are several socioeconomic factors such as income, education, and importance of nutrition that keep millennials from achieving optimal diet quality as evidenced by the qualitative and quantitative data. Participants' awareness of MyPlate did not translate into knowledge of the DGA. Work needs to be done by the health professionals to increase millennials' knowledge of the DGA.

### Limitations

This study provided valuable information on millennials and their diet quality, consumer behavior and knowledge, and perception of the DGA. However, participants were mostly white, educated, females. This could be a result of using ResearchMatch which means the data from this study can only be generalizable to that specific population. There was not a large number of respondents who were male or who were in a lower income bracket or had a lower level of education. As with most self-reported survey instruments there may have been self-report bias. Also, due to this being a cross-sectional study, causation cannot be determined.

There are also inherent limitations when using focus group methodology. Focus groups rely heavily on group interactions and the dynamic of the group. Some participants may over-contribute or under-contribute, potentially influencing the way others respond. Three separate focus groups were held to alleviate this potential. Since the focus group data was also cross-sectional, without any follow-up this also did not allow for further exploration and follow-up that may arise from focus group discussion.

### **Implications for Research and Practice**

This study also provided insight into how to design a DGA icon that appeals to the current largest U.S. generational population. This study indicates that millennials have limited knowledge of the DGA and have a better knowledge of MyPlate. Millennials should be targeted in interventions to improve diet quality and to prepare nutrition information geared to their specific needs and preferences. Future iterations of DGA icons should be clearer in regard to recommendations and should consider the diverse needs of millennials. Focus group participants also mentioned that the price of food and the cost of following the MyPlate recommendations made it hard to follow the MyPlate recommendations, and the quantitative data mirrored that by showing that a lower income is associated with a lower self-reported diet quality. This indicates that policy makers should also focus on ways to make healthier eating more attainable across all socioeconomic statuses.

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## Appendix A. Focus Group Guidebook

1. What does healthy eating mean to you?
2. What do you know, if anything, about the Dietary Guidelines for Americans?
  - a. If “yes”: Where did you get this information?
3. What do you know, if anything, about MyPlate?
  - a. Do you use it? To what extent do you use it?
  - b. Take a look at the MyPlate logo. What information do you get from this logo?
4. Does your plate look similar to this plate, or do you think you follow the recommendations presented in this diagram?
  - a. If “no”: How close is your diet to these MyPlate recommendations?
  - b. If “no”: What strategies would you use to try to meet these MyPlate recommendations?
5. What challenges would you face in following these MyPlate?
6. What things in your life do you think would enhance/improve your ability to follow these MyPlate recommendations?
7. Let’s focus on the recommendations for specific food groups on the MyPlate graphic.
  - a. Which would be the easiest to adopt/follow? Why?
  - b. Which would be the hardest to adopt/follow? Why?
8. If you were asked to help improve MyPlate, what would be your recommendation(s)?

Appendix B. Millennials Food and Consumer Behavior Survey

**Age in years:** \_\_\_\_\_

**Sex:**  Male  Female  Nonbinary

**Ethnicity:**  Mexican American  Other Hispanic  Non-Hispanic White  
 Non-Hispanic Black  Other race, including multiracial  Don't know

**Country of Birth:**

Born in 50 US states or Washington, DC  Other

**Education Level:**

Less than high school degree  High school graduate or GED  Bachelor's degree   
Master's degree  
 Doctorate degree

**Total number of people in the household:**

1  2  3  4  5  6  7  8 or more

**Marital Status:**

Married  Divorced  Separated  Never married  Living with partner

**Employment status:**

Currently employed  Not employed, someone else in the household provides income  
 Not employed, receiving government benefits  Retired

**Number of children aged 5 years or younger in the household:**

0  1  2  3 or more

**Number of children aged 6-17 years old in the household:**

0  1  2  3 or more

**Total annual household income:**

<input type="checkbox"/> \$0 to \$4,999	<input type="checkbox"/> \$25,000 to \$34,999	<input type="checkbox"/> \$75,000 to \$99,999
<input type="checkbox"/> \$5,000 to \$9,999	<input type="checkbox"/> \$35,000 to \$44,999	<input type="checkbox"/> \$100,000 and over
<input type="checkbox"/> \$10,000 to \$14,999	<input type="checkbox"/> \$45,000 to \$54,999	<input type="checkbox"/> Refused
<input type="checkbox"/> \$15,000 to \$19,999	<input type="checkbox"/> \$55,000 to \$64,999	<input type="checkbox"/> Don't Know
<input type="checkbox"/> \$20,000 to \$24,999	<input type="checkbox"/> \$65,000 to \$74,999	

1. In general, how healthy is your overall diet? Would you say. . .

- Excellent  Very good  Good  Fair  
 Poor
2. Do you current follow a specific diet
    - Paleo (stone-age diet, avoid processed foods, dairy, sugar)  Keto (high-fat, low-carb diet)  Low or no carbohydrate diet  Gluten Free  I do not follow a specific diet  Other: \_\_\_\_\_
  3. Are you familiar with the Dietary Guidelines for Americans? (If answer is yes they will be directed to question 4 and 5)
    - Yes  No  Refused  Don't know
  4. Where did you hear about the Dietary Guidelines for Americans?
    - School  Internet  Social media  Other (please specify): \_\_\_\_\_
  5. Have you heard anything negative regarding the Dietary Guidelines for Americans? (If yes, directed to question 6, if no directed to question 7)
    - Yes  No
  6. Please elaborate on the negative comments you heard regarding the Dietary Guidelines for Americans:
 

\_\_\_\_\_
  7. Have you heard of MyPlate?
    - Yes  No  Refused  Don't know
  8. Have you looked up the MyPlate plan on the internet?
    - Yes  No  Refused  Don't know
  9. Have you tried to follow the MyPlate recommendations?
    - Yes  No  Refused  Don't know
  10. Which food groups below are featured on the MyPlate graphic? (Select all that apply)
    - Vegetables  Fruits  Carbohydrates  Grains  Meat  Protein  Dairy  Sweets/desserts
  11. About how much of your plate should be fruits and vegetables?
    - ¼  ½  1/3  Don't know
  12. About how much of your plate should be grains?
    - ½  1/3  ¼  1/5

13. Which of the following would make it easier for you or your family to eat a healthy diet? (select all that apply)
- Knowing more ways of preparing healthy foods
  - Knowing quicker ways of preparing healthy foods
  - Having more information to help me decide if foods are healthy
  - Knowing more about cooking
  - Other: \_\_\_\_\_
14. Where do you buy the majority of your groceries?
- Grocery store/supermarket
  - Convenient store
  - Pharmacy
  - Dollar store
  - Walmart or a similar super store
  - Other: \_\_\_\_\_
15. When you buy food from a grocery store or supermarket, how important is “price”? Would you say very important, somewhat important, not too important, or not at all important?
- Very important
  - Somewhat important
  - Not too important
  - Not at all important
  - Never buy from a grocery store or supermarket
  - Refused
  - Don’t know
16. When you buy food from a grocery store or supermarket, how important is “nutrition”?
- Very important
  - Somewhat important
  - Not too important
  - Not at all important
  - Refused
  - Don’t know
17. When you buy food from a grocery store or supermarket, how important is “taste”?
- Very important
  - Somewhat important
  - Not too important
  - Not at all important
  - Refused
  - Don’t know
18. When you buy food from a grocery store or supermarket, how important is “how easy the food is to prepare”?
- Very important
  - Somewhat important
  - Not too important
  - Not at all important
  - Refused
  - Don’t know
19. When you buy food from a grocery store or supermarket, how important is “how well the food keeps after it’s bought (in other words, how soon it spoils)”?
- Very important
  - Somewhat important
  - Not too important
  - Not at all important
  - Refused
  - Don’t know

20. During the past 30 days, how much money (did your family/did you) spend at supermarkets or grocery stores? Please include purchases made with food stamps.  
 Less than \$200  \$301-\$400  \$401-\$500  More than \$500
21. During the past **30 days**, about how much money (did your family/did you) spend on food at stores other than grocery stores or supermarkets?  
 Less than \$50  \$51-\$100  \$101-\$200  \$201-\$300
22. During the past 30 days, how much money (did your family/did you) spend on eating out? Please include money spent in cafeterias at work or at school or on vending machines.  
 Less than \$50  \$51-\$100  \$101-\$200  \$201-300  More than \$300
23. During the past 7 days, how many times did (someone else in your family/you) cook food for dinner or supper at home?  
 \_\_\_\_\_ times  Refused  Don't know

“The food that (I/we) bought just didn't last, and (I/we) didn't have the money to get more.”

24. Was that often, sometimes, or never true for (you/your household) in the last 12 months?  
 Often  Sometimes  Never True

“(I/we) couldn't afford to eat balanced meals.”

25. Was that often, sometimes, or never true for (you/your household) in the last 12 months?  
 Often  Sometimes  Never True

26. 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 wasn't enough money for food?  
 Yes  No  Don't know

*If previous question was answered with yes, the following question will be displayed:*

27. 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  Only 1 or 2 months  Don't know



28. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?  
 Yes    No    Don't know
29. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?  
 Yes    No    Don't know
30. Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?  
 0 days    1-5 days    6-10 days    11-15 days    16-20 days    21-25 days  
 26-30 days
31. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?  
 0 days    1-5 days    6-10 days    11-15 days    16-20 days    21-25 days  
 26-30 days