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Cover Page Footnote

I would like to thank Dr. Lacey McCormack for her guidance during this research process; as well as for the help she gave me during my capstone and technical writing classes. I would also like to thank Dr. Kendra Kattelmann for being the principle investigator for the getFRUVED study at South Dakota State University, and giving Dr. McCormack and me permission to use the study results for our analysis. Lastly, I would like to thank Professor April Myrick for her guidance writing a professional paper about my capstone project.

The Associations Between Meal Planning and a Healthy Diet for Incoming College Freshmen

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ABSTRACT

Background: Meal planning has been positively associated with a healthier diet among adults; however, there is not much information on how meal planning is associated with young adults, which is why it is important that more research is done on this topic. The goal of this project was to determine the associations between meal planning and a healthy diet for incoming college freshmen at eight universities that participated in the GetFRUVED study.

Results: 1,149 first-year college students passed the initial requirement criteria to participate in the study. The results from this data collection was analyzed to compare important dietary consumption numbers that participants recorded, and knowledge and time spent on meal planning with the baseline GetFRUVED data. For this study, more meal planners tended to have a higher intake of fruit and veggies, fiber, whole grains, fruit and veggies excluding French fries, and NCI fruit and veggie score, as well as a lower intake of sugar, sugar without cereal, and sugar from sugar-sweetened beverages. Controversially, there were no associations between more meal planners and calcium, dairy, and BMI.

Conclusions: Meal planning might be the key to our country's growing obesity problem, especially amongst young adults. More information on meal planning for this age group needs to be gathered so that interventions can be created to address potential barriers, which will help make achieving a healthier diet easier.

Keywords: Prepping, diet, healthy, food, nutrition, quality

INTRODUCTION

Young adult meal planning is an important research topic because of its potential ability to lower rates of adolescent obesity, yet there is not much research on it. Studies show that meal planning for adults is associated with food variety and higher diet quality (Ducrot et al. 2017). These results are not comparable for young adults because of drastic differences in their daily schedules and routines. The purpose of the background literature is to present already available information about meal planning amongst adults and young adults, as well as to point out the gaps in research pertaining to college-aged students.

Most people do not know the difference between meal planning and meal preparations (prepping). While both are beneficial to a healthier diet, they are not the same thing. Meal planning is knowing what you are going to eat for meals for the next few days, or a week ahead of time (Ducrot et al. 2017). Meal prepping is the time spent at home cooking and preparing food to eat right away or store for the next few days (Monsivais et al. 2014).

Not having a meal plan can lead to an increase in unhealthy eating habits, which over time can lead to being overweight and eventually obesity. Having a meal plan allows individuals to plan ahead and live a much healthier lifestyle. Some benefits to meal planning are saving time and money, helping control or maintain body weight, and contributing to an overall more balanced and nutritional diet (Monsivais et al. 2014). Meal planning is important because it encourages meal prepping, which is linked to an improved diet quality (Ducrot et al. 2017).

At this point in time, there is much more research available on meal prepping than there is on meal planning. The research that has been done is mostly focused on the effect of meal planning in adults or people in the workplace, not in young adults. According to the Journal of Occupational and Environmental Medicine, meal planning had a significantly positive effect on the adults who participated in the workplace study. Participants went through a program for healthy eating where the purpose was to help identify barriers about nutrition and the importance of meal planning and then discover ways to help reduce those barriers. Additionally, the program goals were to, "Improve nutrition knowledge, confidence, and eating habits" (Clark et al. 2018). 86% of participants showed significant improvement in all categories, as well as a continued use of the nutrition knowledge in their six-month follow up (Clark et al. 2018).

An age group where meal planning is greatly needed and is currently lacking is in young adults. According to the article, "Food Preparation by Young Adults Is Associated with Better Diet Quality," in a large group of 18-23-year-olds, the majority of the young adults did not meal plan once throughout the week. 36% of the sample population mentioned that a huge contributor to unhealthy eating was a lack of time for a healthy meal-planning schedule (Larson et al. 2006). The few who reported frequent food planning had a higher probability of meeting important dietary requirements; for example, "Fat, calcium, fruits, vegetables, protein, and whole-grains" (Larson et al. 2006).

Having the time available to meal plan is one of the biggest determinants to a healthy diet. In a study of 1,319 adults in 2008-2009, data was collected on how long these people spent meal planning and how it affected their diet quality and health. Those who spent less than one hour a day meal planning and prepping were typically working adults who chose convenience over health. Those people spent more money on food away from home and frequently visited fast food restaurants. The group of people who spent two hours or more a day meal planning indicated, "Higher diet quality, and a significantly higher intake of vegetables, salads, and fruits" (Monsivais et al. 2014).

More research on time spent meal planning and how it affects a young adult's diet needs to occur so the possible benefits to their diet are visible. The adult data cannot be assumed to have the same effect for college students because their schedules and routines are completely different. It is likely that time spent meal planning and a healthy diet could have an even greater positive association for young adults than it does with adults. We know that young adults in college currently do not spend much time meal planning because they eat fast food frequently.

For young adults, "eating on the run was associated with a higher intake of fast food, soft drinks, total fat, and a lower intake of many different healthy foods" (Larson et al. 2009). In an article from the Journal of the Academy of Nutrition and Dietetics, 35% of male young adults and 42% of female young adults reported, "they had little time to sit down and eat a meal" (Larson et al. 2009). Young adults not setting aside the time to meal plan can be associated with the increased amount of fast food eaten.

Meal planning might be the key to our country's growing problem of obesity, especially in young adults. With more information on meal planning for this age group, proper interventions can be created to address potential barriers, which would help make achieving a healthier diet easier. Future research hopes to show that the more meal planning done, the greater chance for a young adult to consume a more healthful diet.

Hypothesis

Meal planning has been shown to be positively associated with a more healthful diet among adults… However, little research on meal planning in young adults exists. First-year college students differ from older adults in that they have completely different schedules and routines, which greatly affects their eating schedules and habits. Therefore, the purpose of this study is to determine the association between meal planning and healthfulness of diet among first-year students from eight universities. The predicted outcome of this study is that the more young adults' meal plan, the healthier their diet will be. We will discover if this prediction is correct by comparing weight, fruit and veggie scores, important dietary consumption numbers that participants recorded, and knowledge and time spent on meal planning with the baseline GetFRUVED data.

MATERIALS AND METHODS

Participants and Recruitment

The USDA-funded Get your Fruits and Vegetables (GetFRUVED) project was started in 2014. The goals of this project were to improve dietary intake, boost physical activity, and control weight gain in first year college students (getfruved.com). The four sites of intervention were the University of Tennessee, the University of Florida, West Virginia University, and South Dakota State University. The control sites for the project were Syracuse University, the University of Auburn, the University of Kansas, and the University of Maine.

College students were recruited for the GetFRUVED study in the summer of 2015. The students needed to be first year college students who met these certain criteria: 18 years of age or older, consuming <2 CE of fruits or <3 CE of vegetables, having a body mass index (BMI) □ 25, be a first-generation college student, have an overweight or obese parent,
come from a low-income background or identify as a racial minority.

Study Design

This study is a cross sectional data analysis of the baseline GetFRUVED data to determine if there is an association between meal planning and a healthy diet in young adults, specifically first year college students.

Data Selection

There were 1,149 individuals who met study eligibility criteria, completed a baseline survey (fall 2015) and had height and weight measured by study staff. For this study, questions from three sections of the GetFRUVED data will be looked at. The first section will include the NCI fruit and vegetable screener, which scores people according to the instructions to give information about the amount of fruit and vegetables they consume. The participants recorded their results in cups, which is converted to CE for analysis purposes. The higher the CE value, the more fruit and vegetables were consumed. The other section of questions that will be looked at are from a set of 28 dietary screener questions, which ask about consumption of important dietary requirements like fiber, calcium, etc. The participant's answers were recorded numerically in mg. The DSQ tool will be used to score the numerical values and put them into variables that can be compared with the other data.

We measured questions about meal planning using 10 items adapted by Strong (Strong et al. 2008) and tested by Kattelmann (Kattelmann et al. 2014). Participants were asked how often in the past 3 months they had: "1) reminded myself that planning quick and simple meals is important, 2) told myself that healthy meals do not require a lot of work, 3) reminded myself to eat in moderation, 4) told myself to allow room for an occasional treat food or dessert for just plain enjoyment, 5) reminded myself to think about my beverage choices, and 6) told myself that fruits and vegetables should be included in every meal." For self-regulation for healthy meal behavior, participants indicated how often they had: 1) planned quick, easy, and healthy snacks; 2) selected beverages with health in mind; 3) purposely added vegetables to meals and snacks; and 4) was flexible and sensible in food choices. Likert scaled responses (1=never and 5=always) scores were summed.

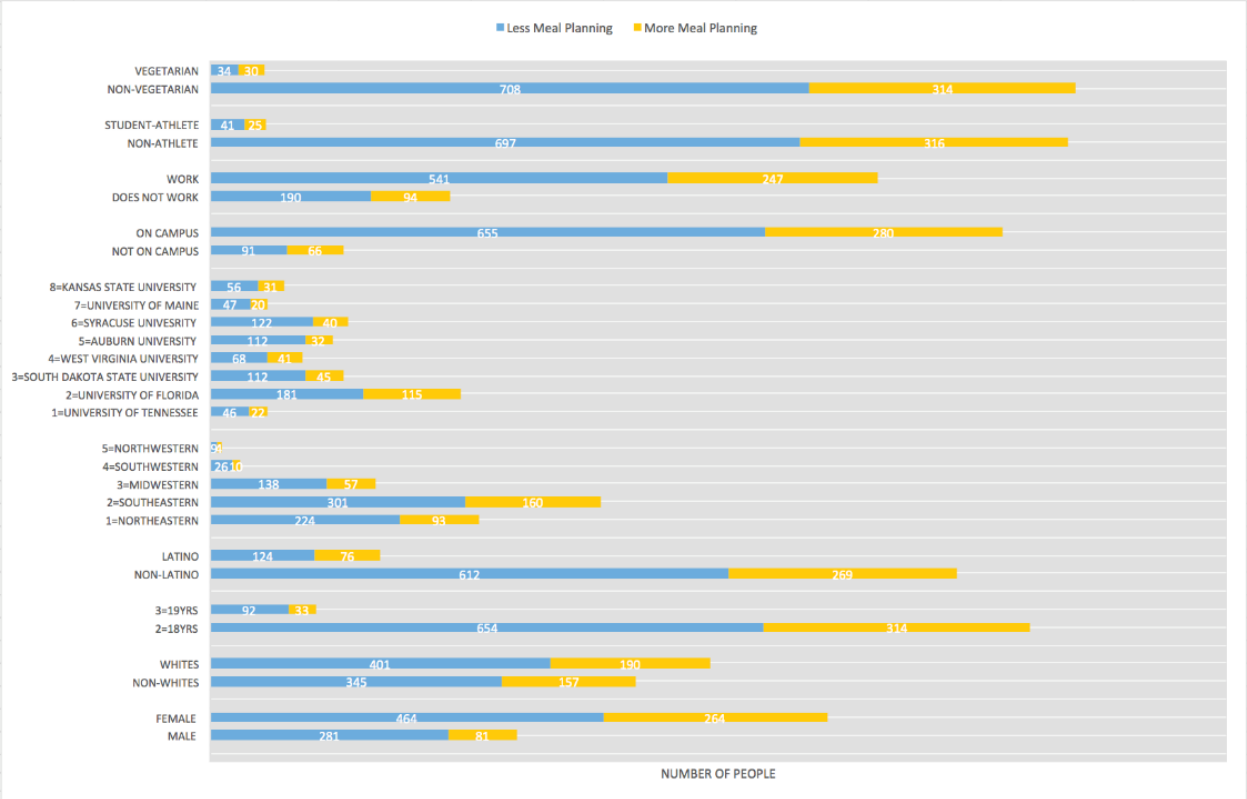

Figure 1: The number of participants for each demographic category are broken down into "more meal planning" or "less meal planning" based on their answers to the ten survey questions.

Data Analysis

All analyses were conducted using Stata version 14.1 (College Station, TX: StataCorp LP). Participants are grouped by their meal planning scores into either 'more' or 'less' meal planning. Descriptive statistics for the entire study sample will be run, in addition to determining if any demographic characteristics differ between the two meal planning groups. Differences will be examined using t-tests and chi-squared tests. Characteristics of 'high' meal planners will be presented (see Figure 1 above). Each individual diet outcome will serve as the dependent variable in a linear regression examining the significance of meal planning

score as an independent variable while controlling for demographic characteristics that may be associated with diet outcomes, including sex and vegetarian status.

RESULTS

The results for associations between meal planning and healthfulness of diet in young adults can be seen in Table 1 below. For questions 1, 2, 6, 7, 8, 9, and 10 there was a positive association for NCI fruit and veggie score, fiber, whole grains, fruit and veggies, and fruit and veggies excluding French fries. There was a negative association with questions 1, 2, 6, 7, 8, 9, and 10 for sugar, sugar without cereal, and sugar from sugar sweetened beverages. There was no association between questions 1, 2, 6, 7, 8, 9, and 10 for calcium, dairy, and BMI.

Table 1: The more meal planner's category and their meal planning knowledge and dietary factors results can be seen below. The demographic characteristics mentioned in Figure 1 and Table 2 were controlled so that the meal planning score could be seen as an independent variable.

getFRUVED Meal Planning Survey Questions	NCI Fruit and Vegetable Score		Fiber (gm)		Calcium (mg)		Sugar (tsp)		Sugar without Cereal (tsp)		Whole Grains (ounce)		Dairy (cups)		Fruit and Vegetables (cups)		Fruit and Vegetables Excluding french fries (cups)		Sugar from Sugar-Sweetened Beverages (tsp)		BMI	
	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value	Coefficiant	P-value
1. Remind myself that planning quick and simple meals is important.	0.37	**0.011**	1.15	**0.001**	42.44	0.341	-1.57	**0.007**	-1.44	**0.008**	-1.44	**0.008**	0.01	0.931	0.20	**0.006**	0.22	**0.003**	-1.42	**0.029**	-0.32	0.278
2. Tell myself that healthy meals do not require a lot of work.	0.70	**0.000**	1.64	**0.000**	61.68	0.17	-1.91	**0.001**	-2.06	**0.000**	0.34	**0.000**	0.05	0.513	0.31	**0.000**	0.33	**0.000**	-2.03	**0.002**	0.20	0.497
3. Remind myself to eat in moderation.	0.15	0.260	0.62	0.060	-50.08	0.233	-2.51	**0.000**	-2.47	**0.000**	0.21	**0.003**	-0.06	0.357	0.14	**0.037**	0.16	**0.017**	-2.86	**0.000**	1.43	**0.000**
4. Tell myself to allow room for an occational treat food or dessert for just plain enjoyment.	-0.15	0.262	0.60	0.066	118.41	**0.004**	2.07	**0.000**	2.12	**0.000**	-0.14	**0.044**	0.19	**0.003**	0.11	0.123	0.08	0.223	0.97	0.108	0.23	0.387
5. Remind myself to think about my beverage choices.	0.10	0.479	0.26	0.448	-2.14	0.961	-3.05	**0.000**	-2.77	**0.000**	0.01	0.860	0.02	0.812	0.12	0.105	0.12	0.091	-3.56	**0.000**	0.06	0.840
6. Tell myself that fruit and vegetables should be included in every meal.	0.99	**0.000**	2.17	**0.000**	22.40	0.601	-2.20	**0.000**	-2.34	**0.000**	0.29	**0.000**	-0.01	0.918	0.57	**0.000**	0.58	**0.000**	-2.50	**0.000**	-0.26	0.348
7. Planned quick, easy, and healthy snacks.	0.67	**0.000**	1.60	**0.000**	29.32	0.504	-1.94	**0.001**	-2.16	**0.000**	0.36	**0.000**	0.00	0.992	0.30	**0.000**	0.34	**0.000**	-2.26	**0.000**	-0.22	0.436
8. Select beverages with my health in mind.	0.54	**0.000**	0.72	**0.035**	-46.03	0.286	-5.25	**0.000**	-5.06	**0.000**	0.20	**0.008**	-0.07	0.271	0.20	**0.005**	0.23	**0.001**	-6.02	**0.000**	-0.44	0.124
9. Purposely added vegetables to my meals and snacks.	1.02	**0.000**	2.02	**0.000**	10.49	0.800	-2.96	**0.000**	-2.84	**0.000**	0.29	**0.000**	-0.03	0.592	0.53	**0.000**	0.55	**0.000**	-3.11	**0.000**	-0.43	0.116
10. Was flexible and sensible with my food choices.	0.62	**0.000**	1.64	**0.000**	7.76	0.85	-2.08	**0.000**	-2.08	**0.000**	0.35	**0.000**	-0.03	0.690	0.27	**0.000**	0.30	**0.000**	-2.11	**0.000**	-0.36	0.180

For question 3, there was a positive association for fiber, whole grains, fruit and veggies, fruit and veggies excluding French fries and BMI. There was a negative association with question 3 for sugar, sugar without cereal, and sugar from sugar-sweetened beverages. There was no association between question 3 and NCI fruit and veggie score, calcium, and dairy.

For question 4, there was a positive association for calcium, sugar, sugar without cereal, and dairy. There was a negative association with question 4 for whole grains. There was no association between question 4 and NCI fruit and veggie score, fruit and veggies, fruit and veggies excluding French fries, sugar from sugar-sweetened beverages, and BMI.

For question 5, there were no positive associations. There was a negative association with question 5 for sugar, sugar without cereal, and sugar from sugar-sweetened beverages. There was no association between question 5 and NCI fruit and veggie score, fiber, calcium, whole grains, dairy, fruit and veggies, fruit and veggies excluding French fries, and BMI.

Table 2: The results for the associations between demographic characteristics and meal planning experience for the 1,149 college freshmen who met the initial GetFRUVED eligibility criteria and participated in the survey are below.

	Overall, n (%)	Less Meal Planning, n (%)	More Meal Planning, n (%)	P-value
Sex				**0.000**
- Male	363 (33)	281 (38)	81 (23)	
- Female	729 (67)	464 (62)	264 (77)	
White				0.757
- Non-whites	502 (46)	345 (46)	157 (45)	
- Whites	593 (54)	401 (54)	190 (55)	
Age				0.172
- 2=18yrs	970 (89)	654 (88)	314 (90)	
- 3=19yrs	125 (11)	92 (12)	33 (10)	
Latino				**0.041**
- Non-latino	883 (82)	612 (83)	269 (78)	
- Latino	200 (18)	124 (17)	76 (22)	
Region				0.47
- 1=Northeastern	319 (31)	224 (32)	93 (29)	
- 2=Southeastern	461 (45)	301 (43)	160 (49)	
- 3=Midwestern	195 (19)	138 (20)	57 (18)	
- 4=Southwestern	36 (4)	26 (4)	10 (3)	
- 5=Northwestern	13 (1)	9 (1)	4 (1)	
University				**0.006**
- 1=University of Tennessee	68 (6)	46 (6)	22 (6)	
- 2=University of Florida	296 (27)	181 (24)	115 (33)	
- 3=South Dakota State University	159 (15)	112 (15)	45 (13)	
- 4=West Virginia University	109 (10)	68 (9)	41 (12)	
- 5=Auburn University	144 (13)	112 (15)	32 (9)	
- 6=Syracuse Univesrity	162 (15)	122 (16)	40 (12)	
- 7=University of Maine	67 (6)	47 (6)	20 (6)	
- 8=Kansas State University	87 (8)	56 (8)	31 (9)	
Campus				**0.003**
- Not on campus	157 (14)	91 (12)	66 (19)	
- On campus	937 (86)	655 (88)	280 (81)	
Doesn't Work				0.586
- Does not work	284 (26)	190 (26)	94 (28)	
- Work	790 (74)	541 (74)	247 (72)	
Student-Athlete				0.258
- Non-athlete	1015 (94)	697 (94)	316 (93)	
- Student-athlete	66 (6)	41 (6)	25 (7)	
Vegetarian				**0.007**
- Non-vegetarian	1024 (94)	708 (95)	314 (91)	
- Vegetarian	64 (6)	34 (5)	30 (9)	

There were ten demographic characteristics that were controlled during the analyses so that they would not skew the meal planning data results. Half of the demographic characteristics ended up being significantly associated with more or less meal planning. The demographic characteristics that had an association with meal planning are sex, Latino status, university, campus living situation, and vegetarian status (see Table 2 above).

DISCUSSION AND CONCLUSIONS

We found multiple areas were our results support our hypothesis. More meal planners (Survey questions 1, 2, 6, 7, 8, 9, and 10) were seen to have a higher NCI fruit and veggie score, as well as a higher intake of fiber, whole grains, fruit and veggies, and fruit and veggies excluding French fries. Additionally, more meal planners had a lower intake of sugar, sugar without cereal, and sugar from sugar-sweetened beverages. Out of the eleven healthy diet factors that were being examined, eight factors followed our prediction of meal planning leads to a healthy and quality diet. Surprisingly, the three factors that ended up having no significant association with high meal planners were calcium, dairy, and BMI. This is contradictory to our hypothesis because we assumed that a healthy and quality diet would lead to a significant association with BMI.

Survey questions three, four, and five all had different associations between the eleven dietary factors. As seen in Table 1, survey questions three is the only question that lead to a positive association with BMI. This could be because those who remind themselves to eat in moderation are typically leading a healthier lifestyle and are in better shape. Question four regarded

occasional treats and deserts did lead to an increased intake of calcium, sugar, sugar without cereal, and dairy, which is to be expected because these are all common ingredients in dessert items. For question five, we also saw expected results because the question is in regard to thinking about beverage choices and shows decreased amounts of sugar, sugar without cereal, and sugar from sugar-sweetened beverages, which is a key ingredient in many beverage choices.

We have seen with results of previous studies with adults that the more time spent meal planning, the healthier the diet (Monsivais et al. 2014). Our results follow a similar pattern and support our hypothesis that meal planning can aid young adults in having a healthy and quality diet. As previously noted, schedules and eating habits for adults and young adults vary drastically, which means that intervention programs to get adults and young adults to understand the importance of meal planning, as well as implement the practice, are going to be vastly different.

With the growing problem of obesity, meal planning is the key that could make a difference in a young adult's life. If meal planning were to be taught at schools or in the home while growing up, it is likely that young adults would carry these healthy lifestyle practices into college and adulthood. Even with the results of our study, more research needs to be done with less limitations to lead to more confirmed associations and results for this age group. I hope that future research is geared towards meal planning in college-aged people, so that potential barriers can be addressed, and interventions can be created to overcome the barriers and promote a healthier lifestyle in young adults everywhere.

LIMITATIONS

For our cross-sectional study analysis, there are a few limitations present. The first being our findings cannot be used to analyze behavior over a period of time. We are limited to the data collection time period for the freshmen answering the survey questions. Another limitation is that cause and effect cannot be determined. With our results, we can only determine associations among participants and meal planning, not if meal planning is guaranteed to lead to a healthier diet. Recall bias is another factor that should be taken into account because participants were asked to record their own answers to certain questions, and their recall of information may have been skewed. Lastly, there were potentially better tools that could have been used for the collection of diet data, which we were not able to use because of constraints we needed to work within while conducting the study. Some of these limitations could have been avoided if more young adults participated in the survey and if the data was collected over a longer time period. Because of these limitations, continued research on this topic is extremely important in order to draw the appropriate conclusions.

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