The Impact of Diet Quality on Health-related Quality of Life in College Students

Kayla Parsons  
*University of Maine, kayla.l.parsons@maine.edu*

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THE IMPACT OF DIET QUALITY ON HEALTH-RELATED QUALITY OF LIFE IN COLLEGE STUDENTS

By

Kayla LaShelle Parsons

B.S. University of Maine, 2019

A THESIS

Submitted in Partial Fulfillment of the

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(In Food Science and Human Nutrition)

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Advisory Committee:

Jade McNamara, Assistant Professor of Food Science and Human Nutrition, Advisor

Mona Therrien, Lecturer, Dietetic Internship Program Director

Kathryn Yerxa, Extension Professor, Statewide EFNEP Coordinator
THE IMPACT OF DIET QUALITY ON HEALTH-RELATED QUALITY OF LIFE IN COLLEGE STUDENTS

By:

Kayla LaShelle Parsons

Thesis Advisor: Dr. Jade McNamara

An Abstract of the Thesis Presented in Partial Fulfillment of the Requirements for the Degree of Master of Science (in Food Science and Human Nutrition) December 2021

Objective

The objective of this research was to explore the influence of diet quality on health-related quality of life among college undergraduate students.

Methods

A cross-sectional convenience sample of college students completed an online survey consisting of the Center for Disease Control’s Health Related Quality of Life (HRQOL) modules, shortened Perceived Stress Scale, sleep questionnaire, and the National Cancer Institute’s Fruit and Vegetable Screener. Body mass index (BMI) was calculated using self-reported height and weight. Independent t-test were used to compare HRQOL between students who consumed above/below average fruit and vegetable intake. Two multiple regression analyses were used to determine factors that predicted better HRQOL.

Results

Participants (N=655) were an average of 19.8 ± 1.5 years old, female (63%), and white (84%). The average fruit and vegetable intake (FV) was 2.2 ± 1.3 servings per day. Results indicated students who consumed more than the average intake of FV, (41%) reported more days/month feeling healthy and full of energy (11.9 ± 8.6 vs. 8.9 ± 7.9, p<0.001), and reported less
days/month of poor mental health ($8.5 \pm 8.1$ vs. $11.1 \pm 9.8$, p<0.001) compared to those who consumed less than the average (59%). Two predictors explained 38.5% of variance in days/month when mental health was not good ($r^2= 0.38$, F (2, 639) = 200.11, p<0.001): perceived stress ($\beta = 0.61$, p<0.001) and FV intake ($\beta = -0.08$, p<0.05). Four predictors explained 30.0% of the variance in days/month feeling happy and full of energy ($r^2= 0.29$, F (4, 549) = 58.6, p<0.001): perceived stress ($\beta = -0.46$, p<0.001), BMI ($\beta = -0.11$, p<0.01), FV intake ($\beta = 0.16$, p<0.001), and hours of sleep ($\beta = 0.08$, p<0.05).

**Conclusion**

Students who consumed above the average FV intake reported more days of feeling happy and full of energy and less days of poor mental health, and that modifiable behaviors (FV intake, stress, sleep) impact HRQOL of young adults. This research provides justification for college aimed wellness interventions that advocate for both nutrition education and access to mental health resources to improve overall HRQOL.
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LIST OF ABBREVIATIONS

Body Mass Index: BMI
Center of Disease Control: CDC
Days per Month: D/M
Food Choice Priority Survey: FCPS
Fruit and Vegetable Intake: FVI
Fruit and Vegetable Liking FVL
Fruits and Vegetables Offered: FVO
Health Related Quality of Life: HRQOL
International Physical Activity Questionnaire: IPAQ
Mediterranean Diet Adherence: MDS
Mental Component Scores: MCS
National Cancer Institute: NCI
National Health and Nutrition Examination Survey: NHANES
Physical Component Scores: PCS
Perceived Stress Scale: PSS
Quality of College Life: QCL
Socioeconomic Status: SES
Subjective Vitality: SV
Subjective Well-Being: SWB
The World Health Organization Quality of Life Survey: WHOQOL-BREF
United States Department of Agriculture: USDA
LIST OF DEFINITIONS

Health Related Quality of Life: One’s perception of their overall health and not merely absence of disease.¹,²

Mental Domain: The mental domain of health-related quality of life describes ones’ satisfaction with factors that specifically impact their mental health, such as perceived stress and overall mood.³

Physical Domain: The physical domain of health-related quality of life describes ones’ satisfaction with factors that specifically impact their physical health, such as physical activity levels and sleep quality.³

Social Domain: The social domain of health-related quality of life describes ones’ satisfaction with factors that specifically impact their social health, such as acceptance in their community and personal relationships.³

Environmental Domain: The environmental domain of health-related quality of life describes ones’ satisfaction with factors that impact their perception of their environment, such as perceived safety, the structural environment, and access to resources.⁴

Diet Quality: Diet quality can be defined in many ways. According to the CDC, diet quality is the measurement of how closely one’s diet aligns with the current USDA dietary guidelines. Diet quality is measured by the Healthy Eating Index.⁵

Perceived Stress: the feelings or thoughts that an individual has about how much stress they are under at a given point in time or over a given time period.⁶

Self-Efficacy: reflects confidence in the ability to exert control over one's own motivation, behavior, and social environment.⁷
Socioeconomic Status: the social standing or class of an individual or group. It is often measured as a combination of education, income and occupation.\textsuperscript{8}

Body Mass Index: weight-to-height ratio, calculated by dividing one's weight in kilograms by the square of one's height in meters and used as an indicator of obesity and underweight.\textsuperscript{9}
CHAPTER ONE: INTRODUCTION

1.1 PROBLEM

Young adults have been found to develop unhealthy lifestyle behaviors in response to navigating the college environment. This arises from a multitude of college specific barriers including increased levels of perceived stress and workloads, financial independence, and new living arrangements.\textsuperscript{10-13} Unfortunately, college students are not properly equipped with the resources or knowledge on how to cope with said barriers, such as increased stress levels.\textsuperscript{14} Research shows that in response to stress, college students decrease their consumption of foods that aid in disease prevention (fruits, vegetables, whole grains), and increase intake of non-nutrient dense foods that are high in added sugar, saturated fat, and calories.\textsuperscript{13, 15, 16} These health behaviors can lead to an increased risk for chronic diseases such as diabetes mellitus and heart disease, and often these behaviors continue post-graduation.\textsuperscript{17, 18} Research has also found that college students consistently report having a poor health related quality of life (HRQOL).\textsuperscript{11, 19} HRQOL is indicative of one’s overall mental and physical condition, longevity, and health behaviors.\textsuperscript{20, 21} Within the literature, there are no studies that have identified the connection between diet quality and health related quality of life among college students in the United States. These findings would establish evidence for college aimed wellness interventions that advocate for both nutrition education and increased access to mental health resources in order to improve overall HRQOL.

1.2 HYPOTHESIS AND OBJECTIVES

The objective of this study was to explore the impact that diet quality has on HRQOL in university students. It was hypothesized that (1) students who consumed more fruits and vegetables than their peers will report more days per month of feeling healthy and full of energy,
(2) students who consumed more fruits and vegetables than their peers will report less days per month with poor mental health. It was also hypothesized that (3) fruit and vegetable consumption, perceived stress and sleep health will be predictors of HRQOL among college students.

1.3 LIMITATIONS

The major limitation of this study was that data collection occurred during the midst of the COVID-19 pandemic. This may have altered survey responses surrounding HRQOL and perceived stress levels due to the negative effect that the pandemic has been found to have on mental health, food security, and socioeconomic status (SES).22,23 Current research has found that anxiety caused from COVID-19 is most prevalent in college students (21.5%) compared to healthcare professionals (11.3%) and the general population (8.8%).24 There was also low diversity within the sample, with the majority being mostly white (84%) and female (63%). This cross-sectional study had room for response error because all data was self-reported data. Also, of note, there was a large standard deviation for participants’ answers concerning the healthy days module, which indicated there may have been variability among the HRQOL scores of the sample.
CHAPTER TWO: REVIEW OF THE LITERATURE

2.1 INTRODUCTION

Transitioning into college can impact health behaviors in emerging adults. Higher education not only increases stress from rigorous coursework, but also forces students to develop financial independence, navigate social relationships, as well as a new-found freedom of establishing potentially lifelong health behaviors. HRQOL describes the perceived overall well-being of oneself, with evaluation of physical, mental, social and environmental domains. See Figure 2.1 for details.

Figure 2.1: Domains of HRQOL and Factors that Influence Satisfaction Within those Domains
The physical domain encompasses aspects such as sleep, exercise, hygiene, energy level and diet quality. Within the mental domain, overall mood and stress levels are key factors. Higher scores in the social domain and environmental domain reflect satisfaction with relationships and the surrounding area.

College students consistently report poor HRQOL scores. Higher rates of perceived stress and depression among students has been associated with lower diet quality. Diet quality in college students is also reported as being low, due to low intake of fruits, vegetables, and grains. Research suggests that college students with healthy dietary habits have higher self-efficacy, higher levels of mental health, and lower BMI. Healthy diets are also associated with higher levels of physical activity in college students. Currently, there is limited research about the impact of diet quality on health-related quality of life in college students. The aim of this literature review is to explore the trends of HRQOL and diet quality among college students, discuss the variables that influence HRQOL and diet quality, as well as review existing research exploring the relationship between HRQOL and diet quality.

2.2 HEALTH RELATED QUALITY OF LIFE (HRQOL)

HRQOL describes one’s individual perception of overall well-being, rather than just lacking disease, with considerations of social, mental, environmental and physical health. The transitional experience of college is unique in the fact that all of domains of HRQOL are affected. Changes that impact college student’s HRQOL are constant stressors, such as rigorous coursework, financial independence, lack of sleep, comparatively lower levels of physical activity to previous years of school, and new housing arrangements.
2.2.1 HEALTH RELATED QUALITY OF LIFE TRENDS IN COLLEGE STUDENTS

Students, majoring in healthcare or medical fields, typically have rigorous course loads, which may negatively impact HRQOL.\textsuperscript{12} Cruz et al\textsuperscript{12} conducted a multi-country cross sectional study to explore the trends and measure the domains of HRQOL in a convenience sample of nursing students. The study included nursing students (N= 2,012) from nine different countries: Chile, Egypt, Greece, Hong Kong, India, Kenya, Oman, Saudi Arabia, and the United States of America. Cruz et al\textsuperscript{12} distributed a self-report questionnaire that incorporated socio-demographic questions and the World Health Organization Quality of Life-BREF (WHOQOL-BREF). The WHOQOL-BREF\textsuperscript{34} is a validated, 26 item tool that assesses the perception of the participants’ health in relation to the world that surrounds them. High scores indicate a high rated HRQOL. A multiple linear regression analysis was used to view relationships between demographics (independent variable) and items on the WHOQOL-BREF (dependent variable), as well as all of the domains of HRQOL (mental, physical, social, and environmental). Among all countries, the highest rated domain was physical health, and the lowest rated was the social domain. In the United States, social health was the highest rated domain, while low scores were found in the mental domain. The United States scored the highest for perceived HRQOL with Hong Kong having the lowest score. The major influencers of the domains in the study population were country of residency and the overall perceived quality of life. Age was found to have a negative correlation with HRQOL ($r=-0.02$, $p<0.05$). The United States may have had increased values of quality of life because of the higher income of the nation, ability to enjoy leisure activities, and access to transportation in comparison to countries that may be low or mid-income. This study gave insight to the global trends of health-related quality of life within nursing students,\textsuperscript{12} but lacked in addressing college-specific influences and their role of HRQOL scores among students.
Torres et al\textsuperscript{35} conducted a similar cross-sectional study with the aim of assessing the relationship between consistent social determinants and HRQOL in nursing students (N=444). Social determinants measured were student workload, sleep health, demographics, monthly income, place of residence and if a medical condition was present. Participants were recruited from one college of nursing in the Philippines and subjects completed a survey consisting of the WHOQOL-BREF and a questionnaire about social determinants of health (Cronbach’s $\alpha=0.89$). The majority of the participants were female (n=319, 72%). The grade level of participants was distributed evenly between all four years, with slightly less of the sample being in their third year of college (n=106, 23.9%). Descriptive statistics were used to analyze social determinants.

Similar to Cruz et al,\textsuperscript{12} Torres et al\textsuperscript{33} used a multiple linear regression model to assess the significance between the domains of HRQOL and social determinants. The highest ranked domain among nursing students was the social domain (65.51 ± 16.87), followed by the environmental domain (63.09 ± 13.48), the mental domain (59.57 ±15.60), and lastly, the physical domain (56.09 ± 13.20). The multiple regression analyses indicated that there was a significant positive prediction between being male and an increased physical domain ($\beta=0.13$, $p<0.05$). Other variables that predicted an increase in the physical domain were increased amount of sleep ($\beta=0.23$, $p<0.001$) and absence of a medical condition ($\beta=0.16$, $p<0.0001$). Higher mental domain scores were influenced by being male ($\beta=0.10$, $p<0.05$), not being a first-year student ($\beta=0.10$, $p<0.05$), smaller academic loads ($\beta=0.13$, $p<0.05$), increased hours of sleep ($\beta=0.11$, $p<0.05$), and lack of a medical condition ($\beta=0.11$, $p<0.05$). The environmental domain scores were significantly increased if the participant was given a monthly allowance by their parents ($\beta=0.09$, $p<0.05$).\textsuperscript{35} Torres et al\textsuperscript{35} recognized that social determinants of health
were a major influence to the different domains of HRQOL, but lacked identification of how majoring in specific subjects impacted overall HRQOL of students.

Much like nursing students, students studying dentistry have reported an increased workload compared to other concentrations.\textsuperscript{11} The WHOQOL-BREF was used to determine HRQOL of predoctoral dental students (N= 384) studying in the United States. Participants completed the WHOQOL-BREF and a sociodemographic questionnaire. Pearson’s correlation coefficient and descriptive analysis were used to determine significance levels between the HRQOL domains and demographic items. The average scores of the domains were compared using t-tests. As with previous studies, a multiple linear regression analysis was used to determine the significant influences of each domain on HRQOL scores. The mean age of participants was 26.5 ± 3.7 years old. The year of study was moderately even in the sample, with slightly less of the students being in their second year (16.9\%) of their education. A majority (72.1\%) of the participants were single. The overall HRQOL among students was rated as good, (3.87 out of 5), and their perception of their health was considered neutral or good (3.57 out of 5). The physical domain again was ranked the highest among students, and the mental domain was rated the lowest and was significantly lower in juniors compared to freshman (t= -.218, p<0.05). This suggests that interventions with a focus of improving mental health would be beneficial for students, especially those in their third year of dentistry. However, specific environmental aspects and subdomains of college, such as perception of campus life, that influence HRQOL were not evaluated in this study.

Arslan and Akkas\textsuperscript{19} coined the term Quality of College Life (QCL), which assesses college students’ perception on overall life satisfaction with consideration of social, environmental, mental and physical domains. This concept differs from HRQOL by containing
specified sub-domains that are conditional for college students. For example, one of the environmental subdomains assesses students’ perceptions of clubs and extracurriculars available on campus. The study was influenced by the bottom-up spillover theory which implies that overall life satisfaction improves if one is content with all facets of life, in a hierarchal fashion. In this way, it relates to the concept of the domains of HRQOL.

Arslan and Akkas\textsuperscript{19} hypothesized that students would have greater QCL if academic, social relationships, and academic resource needs were satisfied. University students (N=1,260) were recruited for a mixed-methods, cross-sectional study that incorporated data collection in the form of face-to-face interviews, a demographic survey, and a survey that measured QCL (α=0.70). The items on the QCL portion of the survey were ranked 1-5 by the participants; with 1-2 indicating poor quality, 3 indicating medium quality, and 4-5 indicating high QCL. Structural equation modeling was used to identify relationships between QCL, life satisfaction, and satisfaction with all subdomains. Over half of the participants were male (n=710, 56%), with the mean age being 20.0 ± 2.10 years old, and the average grade point average (GPA) being 2.30 ± 0.60. Only about one quarter of the students lived on campus (n=336, 26.7%). The average rating of QCL among students met the criteria for being of medium quality with a score of 3.03 ± 1.34. Students were least satisfied with the workload subdomain (2.67±1.25), and social satisfaction was the greatest indicator of college quality of life (p<0.05). Arguably, the most important finding was college students’ average general life satisfaction was 2.75 ±1.19 out of 5. A low general life satisfaction implies that many of the student needs were not being met for both the subdomains, as well as the larger domains that can be associated with HRQOL.


### 2.2.2 PHYSICAL HEALTH OF COLLEGE STUDENTS

The physical domain of HRQOL describes one’s perception of physical activity levels, sleeping habits, energy levels, and has been associated with dietary habits. Physical health has been assessed as one of the highest rated domains in students in the United States, but scores are at an insufficient level for optimal health in young adults. College students often find themselves bound to a sedentary lifestyle, with only about 30% of college students meeting the American Heart Association’s recommendations for weekly exercise. Students do not meet the Center of Disease Control (CDC) recommendations of seven hours or more of sleep each night, which is another indicator of poor physical health. Improvement of physical health of college students would positively impact HRQOL.

Ge et al assessed the relationship between physical activity, HRQOL and sleep duration in college students (N=926). This cross-sectional study incorporated the International Physical Activity Questionnaire (IPAQ) to measure physical activity levels, sedentary time, and sleeping duration, and a 12-item short form health survey (12-SF) to measure HRQOL. The majority of students were female 66.7% and the average age was 19.78 ± 1.14 years old. T-tests and Pearson’s chi-square test were used to analyze descriptive data. There were no significant differences in HRQOL between genders. It was found that improved sleep duration was significantly related to higher scores in the mental domain (p<0.05). There was a positive correlation between physical activity frequencies and the physical domain score (p<0.05). Both sleep duration and levels of physical activity have been shown to positively impact the physical and mental domain, and in return increase HRQOL among college students. One limitation to this study was that the researchers did not assess the impact sleep quality had on physical domain
levels. Although this study did identify key behaviors in improving HRQOL, the researchers did not assess factors that influenced or predicted college students’ physical behaviors.

Zhang et al.\(^3\) assessed the predictors of the physical domain and HRQOL in college women. This research was based on the social-ecological model, with the assumptions that intrapersonal factors, interpersonal factors, social and environmental factors all play a role in physical health behaviors. College students (N=235) were recruited for this cross-sectional study during introductory undergraduate courses. The tools used to measure participant outcomes were demographic questions, Sallis’s Self Efficacy for Exercise Barriers,\(^4\) Physical Activity Enjoyment Scale (PACES),\(^5\) Sallis’s Social Support and Exercise Survey,\(^6\) and the Physical Activity Neighborhood Environment Scale (PANES).\(^7\) Levels and frequency of physical activity were assessed using the CDC’s Behavioral Risk Factor Surveillance System Physical Activity Module.\(^8\) HRQOL was assessed using the Young Adult Quality of Life Inventory.\(^9\) The average age of participants was 21 ± 1.7 years, with a majority of participants being white (62%), and non-kinesiology majors (64.3%). Most participants (65.5%) were found to have adequate levels of physical activity. It was found that amount of physical activity was positively correlated with the HRQOL physical domain (r=0.19 p<0.01), but not with the social or mental domain (r=0.02). Using a linear regression model, it was determined that self-efficacy, in response to barriers, (β = 0.33, p < .01) accounted for 17.1% variance of self-reported physical activity. Self-efficacy (β = 0.17, p < .05) and enjoyment of physical activity (β = 0.39, p < .01) accounted for 24.8% variance in the physical domain. The only environmental factor that impacted physical activity levels was crime safety (β = -0.10, p < .01). There was a positive correlation between friend and family support (r=0.36, p<0.01) and enjoyment of physical activity (r=0.28, P<0.05). Overall, students were found to have a positive perception of physical
activity. A limitation to this study was that questions within the survey referenced their experiences and perceptions within the past seven days, which may not be indicative of their average health behaviors throughout college. This study also lacked assessment of the role of sleep behaviors in relationship to physical activity levels.

Cahuas et al\textsuperscript{46} aimed to identify the association between physical activity (PA) and sleep in college students (N=1,143) with depressive symptoms. Students, enrolled in an introductory physical education course, were recruited to complete the Center for Epidemiologic Studies of Depression Survey (CES-D, $\alpha > 0.85$),\textsuperscript{47} the IPAQ-SF ($\alpha = 0.76$), and the Pittsburgh sleep quality index (PSQI, $\alpha = 0.75$). A stepwise multiple linear regression was used to assess to what extent PA and sleep quality predicted depressive symptoms. Descriptive analyses reported that 71% of students participated in moderate to vigorous activity, with males reporting more moderate to vigorous exercise compared to females (76% vs 65%). Students on average reported adequate sleep quality, with 20% of all participants indicating poor sleep levels. Forty percent of students reported having depressive symptoms, as indicated by the CES-D. The regression model indicated that physical activity levels and sleep quality had significant impact on rates of depression ($F=77.29$, $p<0.0001$), and accounted for 35.3% variance. This study indicated the influential role of physical behaviors on mental health but lacked in assessment of the role of HRQOL among students. Research concerning college students’ specific physical health behaviors and its relationship to HRQOL is further needed in order to properly assess overall wellness. More research concerning the ties between physical health behaviors and other HRQOL domains, such as the mental domain, would be beneficial in further understanding predictors of HRQOL among college students.
2.2.3 MENTAL HEALTH AND HEALTH RELATED QUALITY OF LIFE

The mental domain of HRQOL describes one’s perception of perceived stress, overall mood levels, and mental health satisfaction. College students’ learned behaviors play a major role in the perception of their environment, and therefore influence the mental domain of HRQOL. Shermeyer et al.14 aimed to examine how college students’ daily coping mechanisms influenced their perception of overall well-being. Shermeyer et al.15 explained that coping mechanisms generally fall into four categories: problem focused engagement (PFE), problem focused disengagement (PFD), emotion focused engagement (EFE), and emotion focused disengagement (EFD). In this study, all coping mechanisms and their association with negative mood, positive mood, and quality of life were analyzed with multilevel multivariate regression. Participants (N=74) were recruited from a single university through an online registration process. The sample was primarily female (85%), and white (69%). Participants were asked to complete a daily electronic survey over the course of one week. Students initially met in-person, with the principal investigator for instructions, on the online software. The online software consisted of questions that asked about stressful events during the day and level of stress experienced. Answers were on a Likert scale of 1-7, with 7 indicating that an event caused extreme stress. The Coping Strategies Inventory48 was incorporated and measured which coping strategies were used throughout the day. The students’ overall mood throughout the day was assessed with a 12-item daily mood scale.49 Quality of life was measured with a single day from the Kemp Quality of Life Scale.50

The average daily stress among students was 4.56 ± 1.58 out of 7. Students’ daily average response of having a positive mood was 1.62 ± 0.64, which indicated low incidents of feeling cheerful. On average, students rated their daily quality of life as 4.84 ± 1.41 out of 7. Upon
analysis, positive mood was significantly correlated with a higher quality of life (r=0.11, p<0.001). Specific coping mechanisms were associated with different moods. Problem focused disengagement (p<0.01) and emotional focused engagement (p<0.001) were both associated with higher instances of negative mood. Emotional focused disengagement was associated with lower quality of life (p<0.001), higher negative mood (p<0.001), and lower positive mood (p<0.001).

From this study, it can be concluded that health interventions geared towards college students should incorporate education about avoiding emotional focused disengagement and problem focused disengagement in order to improve HRQOL. One critique of the study is the small sample size, which lowered its ability to be generalized to all college students.

Sivertsen et al\textsuperscript{51} conducted a large epidemiological cohort study using a National Students Health and Wellness Study, SHoT, with a focus of exploring the mental health status of college youth (N=69,632) in Norway. The SHoT survey was conducted in four-year intervals from 2010 to 2018, among full-time Norwegian university students under the age of 35. The following instruments are included in the survey: the Hopkins Symptoms Checklist,\textsuperscript{52} Perfectionism Subscale (from the Eating Disorder Inventory),\textsuperscript{53} UCLA Three Item loneliness Scale,\textsuperscript{54} Eating Disturbance Scale,\textsuperscript{55} Satisfaction with Life Scale,\textsuperscript{56} Positive and Negative Affect Schedule,\textsuperscript{57} Adult Psychiatric Morbidity Survey (APMS),\textsuperscript{58} the Child and Adolescent Self-harm in Europe Study (CASE),\textsuperscript{59} Bullying Victim Questionnaire,\textsuperscript{60} Somatic Symptom Scale,\textsuperscript{61} and the Alcohol Use Disorder Identification Test (AUDIT).\textsuperscript{62} A bulk of the survey’s instruments measured mental health and overall well-being, as well as smaller sections dedicated to physical well-being, health behaviors, and other information. One of the major findings was that in 2018, 29% of participants reported severe mental problems as evidence by receiving a 2.0 or more on the Hopkins Symptom checklist-25 (HSCL-25). Poor quality of life, which was defined as
perceiving mental health, somatic health, and health behaviors as low quality, was indicated in 15% (n=10,445) of the participants. The major strength of this study was the large sample size, which implied that these findings might be generalizable to other university students. A limitation of the study was the lack of demographic information (race, gender, ethnicity) about the participants, with findings not representing underserved groups. This study also lacked to address confounding variables or potential mediators of mental health and HRQOL among young adults; these unknown mediators have an imperative role in fully grasping and being able to address issues within the mental domain of students.

Seo et al\textsuperscript{63} conducted a cross sectional study which examined if perceived stress and quality of life (QOL) were mediated by healthful lifestyle choices or presence of depressive symptoms. This study was conducted in university students studying in the health and medical field (N=197). Participants were excluded from the study if they were younger than 19 years old, diagnosed with Major Depressive Disorder as classified by the DSMM-5, or taking any type of medication. Advertisements and applications for participant recruitment were available in the university’s healthcare center, which students were likely to enter because of required annual check-ups. Upon completing the application, students were notified if they had met the criteria for the study. During an annual checkup, students completed the survey in the presence of a trained research assistant. The survey contained the following instruments: the Perceived Stress Scale-10 (PSS-10)\textsuperscript{64}, The Center for Epidemiologic Studies Depressive Symptoms Scale (CES-D)\textsuperscript{47}, the WHOQOL-BREF\textsuperscript{34}, and a Health-Promoting Lifestyle Profile Scale (HPLP-2)\textsuperscript{10}. The PSS-10 is a validated scale that measures the frequency of thoughts and feelings regarding stressful situations that occurred during the previous month. Scores range between 1-10, with scores of 1-4 indicating low stress, scores of 5-6 indicating intermediate stress, and scores higher
than seven indicating a high level of stress. The HPLP-2 is a 52-item survey that assesses most health behaviors such as physical activity, spiritual growth, stress management skills and relationships. Higher scores are related to higher acts of health promoting behaviors. Pearson chi-square tests, student’s t-tests, and Pearson correlation coefficients were used to analyze and compare descriptive demographic data about participants. The researchers concluded that depressive symptoms and health-promoting lifestyle behaviors mediated the relationship between perceived stress and quality of life ($R^2 = 0.61, p < .001$). Consistent with previous research, students scored the lowest in the psychological domain. This study established that depressive symptoms and health promoting behaviors should be a main focus when trying to improve perceived stress, overall quality of life, and psychological domain scores. However, the relationship between perceived stress and specific components of the physical domain, such as sleep duration, were not addressed.

Średniawa et al evaluated the relationship between stress levels, insomnia and coping strategies in Polish University students (N=264) in a cross-sectional study that spanned across seven different universities in Poland. Participants were chosen based on random selection from 1-2 courses at the participating universities. Students completed the survey in front of a researcher during class. The survey consisted of demographic and behavior questions: age, gender, chronic disease, sleep length, PA, smoking, past psychological consultations and their source of income. The questionnaire also included the Perceived Stress Scale-10 (PSS-10), an abbreviated version of the Coping to Problems Experienced Inventory (mini-COPE), and the Athens Insomnia scale (AIS). The mini-COPE inventory measures, which coping strategies are used by individuals and how often, in response to stressful situations. The mini-COPE features fourteen different coping strategies, with participants ranking how often they use each strategy in
response to a stressful situation. The AIS is a validated survey that assessed sleep length and quality among participants. Scores are calculated from the sum of the 0-3 rating from each item on the survey. A score of 0 to 5 indicates normal sleep, a score of 6-10 indicates minor problems with sleep, and a score above 11 indicates insomnia. These data were analyzed with Chi-square, student t-tests, and Spearmen’s Rank correlation coefficient. Students with chronic disease reported higher levels of stress compared to other students (p=0.006). Almost a fifth of students (19%) reported insomnia and the level of insomnia was positively correlated with the level of perceived stress (r=0.44, p<0.001). Students with insomnia were more likely to use coping methods like denial, self-blame, and substance abuse (p<0.05). This study reiterates that high levels of stress and stress’s impact on sleep influence daily coping mechanisms that are negatively associated with HRQOL.14

Young adults in college are faced with a unique environment that requires adequate stress management skills in order to navigate through hardships. Mental health dwindles in college students due to maladaptive coping strategies, increased levels of perceived stress, and depressive symptoms.14, 32, 63 These same indicators of poor mental health, along with socioeconomic status (SES), personal attitudes, the on and off campus environment, and peer approval,13, 15, 67, 68 are major influences of food choices in college students.

2.3 DIET QUALITY

Diet quality refers to the healthfulness within one’s diet as based on The United States Department of Agriculture’s (USDA) Dietary Guidelines for Americans.69 Overall diet quality and variation in diet can be quantified using the Healthy Eating Index, which was developed by the USDA and the National Cancer Institute (NCI) to measure adherence to the dietary guidelines for Americans, independent of quantity of intake.70 The healthy eating index is a
measurement of diet quality that is independent of quantity. Incoming college students are faced with a new independence that allows them to develop their own dietary behaviors, much of which are influenced by personal characteristics, environmental factors and previously learned behaviors. College students are an at risk population for chronic disease due to inadequate fruit, vegetable and grain consumption.\textsuperscript{27} A diet absent in these foods hinders the intake of fiber and phytonutrients, leading to an increased risk of diet-related chronic disease.\textsuperscript{71, 72} Diet quality of college students is influenced by a myriad of factors including: perceived stress, socioeconomic status, attitudes towards nutrition, accessibility and environmental factors.\textsuperscript{27, 68, 73} Diet quality is also strongly correlated with mental health, physical health and social health.\textsuperscript{4} High scores of diet quality play a role in increased self-confidence, self-esteem, and self-efficacy, which improves both mental and social health.\textsuperscript{74, 75} Post-graduation, emerging adults become accustomed to poor health behaviors that were the norm in college\textsuperscript{17, 76}. It is vital to assess behaviors and attitudes towards healthy eating in order to decrease the risk for diet-related chronic disease and work to improve HRQOL.

2.3.1 ATTITUDES TOWARDS HEALTHY EATING BEHAVIORS AMONG COLLEGE STUDENTS

Healthy eating attitudes, used to describe the perception, whether negative or positive, of including healthful eating habits into one’s lifestyle,\textsuperscript{77} are a large contributor to diet quality in college students.\textsuperscript{73} Fyler et al\textsuperscript{73} surveyed 18-25 year old college students (n=1,579) to assess the relationship between healthy eating attitudes, diet quality and body satisfaction using a shortened body shape questionnaire,\textsuperscript{78} five statements from a national consumer survey developed by the U.S Food and Drug Administration (FDA),\textsuperscript{79} and a food frequency questionnaire. All data was analyzed with ANOVA, with Fisher’s least significant difference used as comparisons among all
variables. A vast majority of students perceived their diet as very poor or poor (n=1,339, 84.8%). Participants with higher perceived diet quality had higher scores of healthy eating attitudes (p<0.001). Participants with a moderate to mild concern with their body weight had a lower healthy eating score compared to students who were not concerned with their body (0<0.001). A majority of this study’s sample (84.8%) believed that their diet was of low quality, and research supports that college students would benefit if their college environment was equipped to support healthful eating patterns.

2.3.2 COLLEGE SPECIFIC SCENERIOS THAT INFLUENCE DIET BEHAVIOR

The college environment contains unique influences on dietary behavior for emerging adults. College students’ dietary habits are determined by housing arrangements, access to on-campus meal plans, increased social activity, socioeconomic status, and food insecurity. It is paramount that students’ environments promote healthful eating patterns for preventative measures against diet-related chronic disease in order to promote better overall quality of life.

Laska et al conducted a longitudinal study that explored how the college environment is a key influence when considering the rationale behind students’ dietary behavior. College students were instructed to complete a 38-item food purchasing habits survey and were given a digital food tracker where they logged all food and drink consumed over the course of a week. When recording meals electronically, participants were asked several probing questions including who they were eating with, where they were eating, if any other activities were occurring while eating, and if they had previously planned this meal before consuming it. Logistic regression was used to determine significance (p-values) between the students’ eating environment and foods chosen. Half of all eating occasions (46%) occurred alone among all participants, many participants (63%) did not plan ahead for their meal prior to consumption, and
over one quarter (26%) of participants watched television during mealtimes. Meals that did not include multi-tasking (such as watching television) were associated with more healthful eating habits like drinking water instead of sugar-sweetened beverages and an increased consumption of fruit, vegetables, cereal, grains and entrées. Meals consumed at home were more likely to be eaten alone, while watching television (51%, p<0.05), in comparison to meals consumed eating away from home. When going out to eat participants were more likely to eat fried foods compared to nonfried foods (9% vs 4%, p<0.05). Compared to students who lived off campus, students living on campus were more likely to consume meals that included fruits & vegetables (44% v 28%, p>0.05) and milk (28% v 11%, p<0.05). Findings indicate that a majority of young adults were consuming meals by themselves with no prior planning involved, and this lack of planning was resulting in eating more convenience foods. The importance of teaching home meal preparation and pre-contemplated food choices in young adults were discussed by the researchers. However, this study did not assess how students’ own priorities concerning food choice impacted their diet or meal setting.

Vilaro et al\textsuperscript{27} assessed the relationship between food choice priorities and consumption of fiber, added sugars from both beverages and food sources, and fruit and vegetable consumption over the freshman year. Data was collected from students (N=1,149) at two timepoints, fall and spring semester. Surveys included a food choice priority survey (FCPS)\textsuperscript{81} and the National Cancer Institute (NCI) dietary screener.\textsuperscript{82} FCPS indicates which factors play a role in daily intake of all foods. Choices ranged from advertising environment and health aesthetics to busy life preferences. Dietary intake was measured with the NCI’s dietary screener which asked the participants how often they consumed different food groups within the past month. BMI was gathered, in the fall, through self-reports for baseline data. In the spring, BMI was calculated, in
person, with use of stadiometers and scales. All variables were assessed using a multiple linear regression model. During the follow up assessment in the spring, it was found that 95% of freshman did not meet the daily requirements for fruit and vegetable intake or fiber. Students who were driven by health aesthetics tended to consume more fruits, vegetables, and fiber and consumed less sugar-sweetened beverages and added sugar. Students who were influenced by their advertising environment (social media, television ads) increased their sugar-sweetened beverage intake and added sugar intake. Students whose food choices were more dependent on their busy lifestyle were less likely to consume fruits and vegetables, and more likely to consume sugar-sweetened beverages and added sugars (p<0.05). With the majority of students not consuming adequate fruits and vegetables due to lifestyle, students may benefit from on-campus vendors where they can easily access an assortment of fruits and vegetables in between classes. It is important to note that this study did not assess the role of socioeconomic status (SES) in dietary choices.

SES may be a major factor that influences diet quality among college students as well. Merhout et al\textsuperscript{67} identified the importance of factors that predict poor diet quality among college students from different SES. A random sample of freshman and sophomores (N=148) were recruited in a cross-sectional study through online invitation. The survey consisted of a food frequency survey in which participants were asked to recall two weekdays and one weekend day of eating. Sociodemographic questions were asked in relation to the student’s year in college, race, gender, if they were enrolled in a meal plan, and their family’s income relative to 200% of the federal poverty level. Upon assessment of the sample’s average income level, criteria were changed to using an alternative cut off of 100% and 300% of the poverty level to adhere to the population. A majority of the sample was female (60%) and 17% fell below or equal to 200% of
the federal poverty level, which is an income of $48,000/year for a family of four. Low SES was associated with higher intake of unhealthy food items (sugar-sweetened beverages and added sugars) and lower intake of healthy items (fruits, vegetables, and whole grains) \((p<0.05)\). This study assessed SES based on the student’s family income in relation to the poverty level, which may be an inaccurate representation of the student’s own personal financial situation and one may argue assessing living arrangements is more accurate in predicting diet quality of college students compared to their family’s overall income.

Much like SES, living arrangements during college can influence the dietary habits of students. Brunt and Rhee\(^8^3\) aimed to assess this relationship by recruiting students \((N=585, M\) age: 21.1 ± 4.57) to participate in an online survey looking at sociodemographic factors, self-reported anthropometrics, and a food frequency questionnaire. Students’ living arrangements were divided into three categories: living with parents \((n=35, 6\%)\), living on campus \((n=220, 38\%)\), and living off campus \((n=330, 56\%)\). General linear univariate procedures analyzed relationships between student residence, anthropometric data, health behavior and food intake. Those who lived on-campus consumed a wider variety of fruits \((F(2, 582) = 6.81, p< 0.001)\), vegetables \((F(2, 582) = 3.19, p <0.05)\), fruits and vegetables combined \((F(2, 582) = 6.73, p< 0.01)\), dairy products \((F(2, 582) = 6.96, p< 0.001)\), and grains \((F(2, 582) = 4.09, p<0.05)\) compared to students living off campus. Students who lived on campus or with family also consumed more ice cream and milk desserts \((F(2, 582) = 4.09, p<0.05)\), fruit juice \((F(2, 582) = 3.16, p<0.05)\), and baked goods \((F(2, 582) = 7.25, p<0.001)\) than students who lived off campus. Thirty percent of students reported consuming less than one serving of fruit within the prior three days, and 55% reported consuming less than one serving of grains. The results of this study indicate that both students living off and on campus are not meeting adequate intake of fruits and
vegetables. Assessing the college environment should not be limited to dormitories and the university itself, but also the availability of grocery stores, convenience foods, off campus housing, and access to public transportation. Addressing students’ health behaviors and food insecurity of those who are not living on campus is critical in fully understanding barriers to healthy eating while attending college.

Mirabitur et al\textsuperscript{31} examined the association between college students’ SES, food security, fruit and vegetable intake, and if the associations changed depending on housing with or without food provision. A random convenience sample of 5,000 students at a large midwestern university were recruited to complete an online survey with 514 participants being used for final data collection. The survey items included questions about housing, demographics, car access, daily fruit and vegetable intake and the USDA Food Security Survey.\textsuperscript{84} Most participants were undergraduates (60%), lived off campus with roommates (45%) or lived on campus in either a dormitory or fraternity/sorority house (31%). Most students had accessibility to a vehicle (74%). Chi-square tests and multiple linear regression models were used to assess relationships between sociodemographic variables, food security, and fruit and vegetable (FV) intake. Food security levels in this sample were staggering, with 41.5% of participants experiencing either low or very low food security. Students with high food security consumed the most servings of FV per day at 4.9 servings (95% confidence interval [CI]: 4.6, 5.2), followed by students who reported low food security consuming 4.5 servings (95% confidence interval [CI]: 4.1, 4.9), and students with very low food security who consumed 4.3 servings (95% confidence interval [CI]: 3.5, 5.0). Students with marginal food security had the smallest FV intake at 4.0 servings per day (95% confidence interval [CI]: 3.6, 5.0). Students with access to a vehicle had significantly increased fruit and vegetable consumption (p=0.008). Factors that increased likelihood of lower food
security were being without car access (p<0.05) and being an undergraduate student compared to
being a masters or PhD student (p<0.001). This study showed that environmental factors such as
transportation, university dining halls, and meal plans play a role in diet quality of college
students due to decreased access to healthful foods. One limitation of this study was that it did
not address students’ overall attitudes towards incorporating grains, fruits, or vegetables, into
their diet.

The college environment uniquely impacts diet quality of students due to its role in
accessibility and advertising environment. College students may also be transitioning to
financial independence which may impact food security levels, SES, and food choice priorities.
These college specific environmental aspects can impede diet quality among emerging adults.

One of the key components of advantageous diet quality is fruit and vegetable consumption,
which research has continuously found to be low in college students. Poor diet quality can be an
indicator for both poor mental and physical health behaviors. The following section will
describe the trends of fruit and vegetable intake among college students and how they relate to
both mental and physical domain of HRQOL.

### 2.3.3 FRUIT AND VEGETABLE CONSUMPTION IN COLLEGE STUDENTS

Correlations have been found between high levels of stress and lack of fruit and vegetable
consumption in college students. The current USDA Dietary Guidelines for Americans
recommend consuming 1-2 cups of fruit and 1-3 cups of vegetables per day. Despite how
crucial these food groups are in the prevention chronic disease and the potential influence on
HRQOL, many college students are not consuming adequate amounts. Not only does this put
college students at greater risks for chronic diseases later in life, but positive lifestyle and dietary
choices can also drastically minimize healthcare costs by reducing the risk of heart disease,
diabetes, and cancer.\textsuperscript{89} The consumption of fruits and vegetables should be heavily advocated on campus in order to increase positive eating behaviors.\textsuperscript{90}

Ramsay et al\textsuperscript{28} aimed to understand what factors contributed to low fruit and vegetable intake (FVI) within college students. Ramsay et al\textsuperscript{28} conducted a retrospective cohort study to compare childhood fruit and vegetable offering (FVO) with dietary habits and preferences as an emerging adult. Full time college students (N=676) between the ages of 18-25 were randomly selected from two universities to participate in the FVL Survey. The survey consisted of five portions: (1) FVI, (2) FVO as a child, (3) current and previous preferences, (4) a list of currently liked and disliked fruits and vegetables, previously liked fruits and vegetables, disliked and forced to eat fruits and vegetables, (5) and health-related demographic questions. All categorical data was recategorized to be dichotomous and analyzed using contingency analysis tables. Spearmen’s rank correlation was used to identify any relationships between FVL and FVI recall scores and recollection of FVO as a child. The Pearson chi-square test was used to examine associations between demographics and FVL and FVI. Most students were white (n=554, 84\%), female (n=426, 63\%), and a majority were not overweight as children (n=560, 83\%). Results showed that FVO as a child impacted current FVL as an adult (p<0.001). Overall, there was a decreased FVI when comparing childhood to current habits. Females reported liking fruits and vegetables more than males (p<0.05). Upperclassmen (juniors and seniors) reported liking vegetables more than underclassmen (p<0.05). Fruits and vegetables were more disliked in those with overweight or obesity (p<0.001). These results indicate that it is crucial to develop strategies for fruits and vegetables promotion in emerging adults entering college, such as increasing self-efficacy for eating fruits and vegetables, despite the barriers of lacking or been forced to consume foods as a child.
Odum and Xu\textsuperscript{7} examined the relationship between self-efficacy concerning fruits and vegetables and consumption with the impact of living in a low SES area. Having fruit and vegetable self-efficacy describes one’s confidence in the ease or difficulty of consuming fruits and vegetables. Scores for self-efficacy ranged from 4-20, with 20 indicating high self-efficacy for eating fruits and vegetables. Undergraduate students (N=1,503) that attended a southern rural college were asked to complete demographic profiles, fruit and vegetable frequency items, and a fruit and vegetable efficacy scale ($\alpha =0.91$). Hierarchal multiple regression analyses were used to evaluate any significance between demographic factors and self-efficacy on fruit and vegetable consumption. A majority of the participants were Non-Hispanic White (69.7%), followed by Non-Hispanic Black (17.2%), Hispanic (6.9%), Pacific Islander (3.1%), or identified as other (3.2%). Most students were freshmen (76.6%), female (59.1%), and about one third of the participants (34.5%) reported a BMI over 25. Students indicated that they consumed the recommended amounts of both fruits and vegetables about three days a week ($M=2.95 \pm 1.92$ and $M=3.84 \pm 2.04$) respectively. It was found that students who identified as Asian or Pacific Islander, Non-Hispanic White, and other significantly consumed fruit more days out of the week and had higher scores of fruit and vegetable self-efficacy, compared to students who identified race as Hispanic, Non-Hispanic Black, and American Indian or Alaskan Native ($p<0.001$). Females had higher scores of fruit self-efficacy and vegetable self-efficacy compared to males ($p<0.001$). Using beta weights, it was found that students’ confidence in acquiring fruit was the biggest predictor for fruit self-efficacy ($\beta = .299$, $p<0.0001$). In vegetables, perceived difficulty of obtaining vegetables ($\beta = .203$, $p<0.0001$) and confidence ($\beta = .200$, $p=0.001$) were strong predictors of vegetable self-efficacy. Odum and Xu\textsuperscript{18} explained how promotion of fruit and vegetable intake through a multi-level approach with incorporating multiple levels of university
services could be beneficial in reaching more students. Increased confidence and self-efficacy concerning healthful dietary choices may have a positive impact not only on personal health but may also influence dietary behaviors of students’ peers in college.\textsuperscript{91}

With college being a very social time in an adult’s life, there is need to understand how diet quality is influenced by social bias. Nix and Wengreen\textsuperscript{91} conducted a randomized control trial among college students (N=167) with the aim of determining the accuracy of fruit and vegetable self-reported intake in the presence of normative and descriptive messages about their consumption. This study evaluated the effect of social bias on university students concerning fruit and vegetable consumption. The participants were recruited from Utah State University and were split into four groups; (1) the control (no messaging during recording of fruit and vegetable intake) (n=41), (2) a group that received a standard USDA nutrition recommendation (n=40), (3) a group that received a message stating they consumed 80\% less fruit and vegetable than their peers (n=44) or (4) consumed 80\% more fruit and vegetable than their peers (n=42). The messaging for groups 3 and 4 was sent regardless of what the actual intake was. Baseline data fruit and vegetable intake was collected one week prior to the experiment with completion of NCI’s Fruit and Vegetable Screener.\textsuperscript{92} ANOVA was conducted to compare the relationships between total fruit and vegetable daily intake and perceived fruit and vegetable intake. The average BMI of participants was 23.1, a majority of participants were female (76\%), and identified as European American (94\%). There was no difference in fruit and vegetable consumption between the baseline data for all groups. Participants who received the message, stating that they consumed 80\% less fruit and vegetable than their peers (low norm group), increased their fruit and vegetable consumption by .5 cup within one week (F=4.95, p<0.05).
After one week of data collection, both the low norm group (F=44.38, p<0.0001) and the control (F=7.392, p<0.05) increased fruit and vegetable intake, with the low norm group consuming an additional cup compared to their initial baseline levels. There were no significant differences of fruit and vegetable intake among the other groups. These results show that social pressure plays a significant role in dietary choices among college students, and that students aim to have as healthful diets as their peers. Increased fruit and vegetable intake may be motivated by social approval from college peers. One limitation to this study was that a follow-up questionnaire was not offered, which would have indicated the impact of social pressure over time in terms of fruit and vegetable intake.

Adequate fruit and vegetable intake is recommended for the prevention of diet-related chronic disease due to the high amounts of fiber, essential vitamins and minerals. Also of note are the anti-inflammatory properties of fruits and vegetables. Currently, college students are an at-risk group for diet-related chronic disease due to their low consumption of these healthful foods. Some of the factors that influence fruit and vegetable consumption include grade level, forced fruit and vegetable intake as a child, low self-efficacy when making food choices, and attitudes towards healthful behavior. Also, fruit and vegetable intake can be dependent on peer approval, which may be an ineffective way for students to select foods because most college students perceive themselves as having a very poor or poor diet.73 Research also indicates a relationship between lower levels of mental health and lower levels of diet quality among college students, as will be described in the following section.

2.3.4 DIET QUALITY AND MENTAL HEALTH

As stated when discussing health-related quality of life (HRQOL), the mental domain is generally rated low among college students in the United States.12 Two thirds of students report
having moderate to high levels of perceived stress,\textsuperscript{32} which has shown to significantly influence eating behaviors.\textsuperscript{14, 32, 75} This section will focus on understanding how factors such as stress, depressive symptoms and diet quality influence mental health status in college students.

Emond et al\textsuperscript{25} conducted a randomized control trial that assessed the influence of academic stress on eating behaviors in college females (N=167). Waist to hip ratios, BMI, and a modified state-trait anxiety inventory were administered before the intervention. The state-trait anxiety inventory measured if temporary or longstanding stress scenarios affected participants ($\alpha = .56$). Participants were asked if they over-ate or under-ate in response to stress. The intervention consisted of playing films with the goal of manipulating the feelings of either academic stress (a film about exams), attachment stress (a film about maternal relationships), or evoking no emotion as the control (a film about travel). During the intervention, participants were offered a large variety of foods based on prior research\textsuperscript{16, 26, 93-95} including: candy, tortilla chips, fresh fruit, cherry tomatoes, bottled water, gummy bears, and individually packaged cheeses. Food weight was measured before and after the intervention to determine how much was consumed.

All data was analyzed with a univariate ANOVA to understand the significance of the interactions between variables.\textsuperscript{25} A chi-square test was used to see the comparison of different levels of stress after watching the videos. The film about exam stress elicited more feelings of state anxiety in comparison to the maternal film and the neutral film. ($M=46.08 \pm 11.95$, vs $33.81 \pm 11.08$ vs $31.40 \pm 4.97$, $p<.001$). Interestingly, there were significant eating differences among students (stress over-eaters vs stress under-eaters) when watching the academic stress film ($p<0.05$), while there was no difference in students’ eating while watching the attachment stress film.\textsuperscript{25} This result suggests that stressors caused by an academic setting have a unique influence
on eating behaviors in comparison to other life stressors. The college setting involves both an increase in academic stressors and independence in choosing health behaviors, which gives rise to the need to incorporate more healthful coping mechanisms rather than consumption of comforting foods when stressed. Academic stress has been shown to have a significant influence on female college students’ dietary patterns, as can be seen in the following study.

Zellner et al\textsuperscript{26} developed a two-pronged experiment with the objective of (1) observing the effect of stress on dietary choices on females in a laboratory setting and (2) conducting a survey where participants used self-report to indicate their food selection when stressed. In the first part of the study, only females (n=34, Mean age=22 years old) were included because of the high pressure to diet adherence in young women. Participants were asked to complete either a solvable (n=17) or unsolvable anagram (n=17) within a ten-minute time period. While participants were aiming to solve these puzzles, foods such as peanuts, candy coated chocolate, grapes, and potato chips were offered for them at any point. After the ten-minute mark, the anagrams were collected, and participants were asked to fill out a survey which measured agitation levels. After completion of the survey, participants were debriefed, and the leftover food offered in the room was then weighed. The group that had the solvable anagram reported less amounts of stress compared to the group with the unsolvable anagram (M=0.7 ± 1.1, vs M=5.8 ± 3.0, p<0.05), and consumed more grapes (M=15.6g ± 22.3 vs 4.0 g ±7.2, p<0.05). The stressed group consumed more candy than the non-stressed group (M=6.9 g ±10.4 vs 1.2 ±2.4, p<0.05). There was no difference in consumption of potato chips or peanuts. With the second part of this study, both men (n=41) and women (n=128) participated in completing an Eating-When-Stressed questionnaire which asked if they over or under ate during stressful situations. Students were randomly selected to complete the survey. Students who perceived themselves as
“stress overeaters” provided details about their diets when stressed. Women reported more overeating when stressed compared to men (46% vs 17%), with men more likely to undereat compared to women (54% vs 37%). People who use overeating as a coping mechanism for stress also reported having a more restrictive diet on a day-to-day basis (p<0.05). Sixty-seven percent of individuals who reported being stress-overeaters (64% of all participants) stated sweet foods were usually consumed when stressed, with chocolate being the most mentioned choice. Seventy percent of individuals who reported eating chocolate when stressed also stated that they usually restricted chocolate from their diet because of fear of weight gain (52%). Fifty-three percent of all stress-overeaters stated that they consumed the foods that were usually avoided because it generally boosts their moods, but only 22% said that it was because they enjoyed the taste of the food. Both portions of this experiment indicated that increased levels of stress in students leads to higher consumption of foods high in added sugar, and that these were foods that participants generally tried to restrict in their normal diet. Findings support that increased levels of perceived stress increases the likelihood of consuming comfort foods, which can lead to unintentional weight gain.26 In addition to levels of perceived stress, depressive symptoms should also be considered to fully comprehend the relationship between dietary choices and mental health.13

Ansari et al13 conducted a cross-sectional study that aimed to assess the relationship between stress and depressive symptoms and diet quality using a perceived stress scale-4 (PSS-4),6 Beck’s Depression Inventory,96 and a food frequency questionnaire. This study was conducted at seven European Universities and recruited a large sample of students (N=3,706) from varying backgrounds and ages.11 A majority of the participants were female (n=2,699) and had a mean age of 24.9 ± 8.6 years old. Each food group that was indicated by the food frequency questionnaire was analyzed univariably with gender, but then all data was analyzed
with multiple linear regressions to find if there was any significance between consumption of food groups and stress or depressive symptoms. Results indicated that females were more likely than males to have higher depressive symptoms. In females, high perceived stress, as well as depressive symptoms, were associated with higher rates of consumption of sweets, snacks, fast food and sugar-sweetened beverages (p<0.05). Female participants were also less likely to consume fruits and vegetables and cereal products when stressed (p<0.05). A higher perceived stress score in men was positively correlated with consumption of fast food (p<0.05), and negatively correlated with eating salad or raw vegetables. Male depressive symptoms were positively associated with higher rates of consumption of sweets (p<0.001), snacks (p=0.001), and fast food (p<0.001), while fresh fruits and all vegetables were negatively associated (p<0.001). From this research, it can be gathered that both perceived stress and depressive symptom play a role in dietary choices. Students who experienced high depressive symptoms and stress consumed foods higher in saturated fat, salt, calories and added sugar and consumed less foods containing fiber and phytonutrients. This finding coincides with trends that have been found across Europe, which is described in the following study.

Similarly, Mikolajczyk et al\textsuperscript{(15)} aimed to examine whether poor nutritional habits are associated with stress and depressive symptoms and whether the relationships differ by country and gender in a sample from three European countries (N=1,839). This data was collected as part of a Cross National Student Health Survey. Students were from Germany (38%), Poland (27%), and Bulgaria (35%). The average age of the participants was 20.6 ± 2.3 years old. This cross-sectional study incorporated a survey that included a 12-item food-frequency questionnaire, the PSS-14\textsuperscript{(6)}, and a modified Beck Depression Index.\textsuperscript{(96)} The survey was given at the end of a lecture in natural science, social sciences, language, and law and economy courses. The food frequency
questionnaire asked the participants to self-report how often they consume sweets, cakes/cookies, snacks, fast/canned foods, fresh fruits, raw and cooked vegetables and salads, meat, fish, milk products and cereal. Participants rated on a five-point scale how often they consumed the category of food, ranging from several times a day to never. This specific scale had not been validated but was similar to other food frequency questionnaires that have been validated. The Beck Depression Inventory (M-BDI) measures a specific symptom of depression intensity and frequency. The data collected was analyzed with a linear regression for two outcomes, perceived stress and depressive symptoms. In all countries, consumption of sweets and cakes were more common in females than males, while the consumption of fast food was more common in males. Females consumed slightly more fruits, vegetables, salads, cooked vegetables, milk products, and cereal compared to males (p<0.05). Females reported higher score of perceived stress and depressive symptoms compared to males. For males, none of the consumption of the food groups was associated with perceived stress or depressive symptoms. In contrast, females’ intake of carbohydrates such as sweets, cookies and snacks, had a significant association with perceived stress (p<0.05). A less frequent consumption of fruits and vegetables was associated with higher depressive and perceived stress scores in females only. These findings coincide with previous research, indicating that female college students experience high rates of perceived stress and depressive symptoms, which in return lowers overall diet quality. While the relationship between depression, stress and dietary choices has been established in European students, this relationship needs to be elucidated in the United States college population.

Kandiah et al\textsuperscript{95} conducted an experiment evaluating the impact of stress on consumption of comfort foods in female midwestern college students (N=272, ages 17- 26 years). Participants
were recruited from one Family and Consumer Sciences department in a midwestern state university to complete a 45-item survey. The survey was comprised of five parts: (1) demographic information, (2) current distress, (3) eating habits, (4) foods eaten when not under stress, and (5) foods eaten when under stress. The distress questions were created at the University of Wisconsin and were validated by different healthcare professionals (registered dietitians, psychologist, a family relations professor, and the university’s physician). This portion of the survey was also piloted with 30 students before use. The next three portions of the survey asked questions around behaviors of eating both with and in absence of stress. Individual survey items concerning stressors were validated using Cronbach alpha with scores ranging from 0.74 to .87. ANOVA was used to compare the dependent variables with the assumption of equal variance. Ninety-seven students indicated that they were full-time students and taking 12-18 credits. For data analysis, Kandiah divided the participants into two groups: students taking 12-16 credit hours to students taking 17 to 18 credit hours. It was found that participants with greater credit hours reported more environmental stress compared to those taking less credit hours (P<0.05). Eighty-one percent of the sample (n=221) reported that they experience a change in appetite when stressed, and of those students, 63% (n=139) stated that they had increased appetites when in stressful situations. A majority of students (80%) perceived their everyday dietary behaviors as healthy, but only 30% of students felt they were making healthful food choices when stressed. Seventy-four percent of students reported that they consumed two or more snacks when experiencing stress (P<0.05). More sweet foods were consumed in those who had an increased appetite when stressed compared to those who had a decreased appetite (difference of means = 0.58, p<0.01) or no change in appetite (difference of means = 0.84, p<0.01). Consistent with previous studies, an increased consumption of high sugar and high fat
meals may be due to the psychological comfort that foods can provide. Research supports that students rely on comfort foods that generally contain high calories, saturated fat, and added sugar to help improve feelings of stress and depression, which leads to the question of how overall HRQOL and diet quality are related.

2.3.5 DIET QUALITY AND HEALTH RELATED QUALITY OF LIFE

Diet quality has been found to influence both physical and mental health.\textsuperscript{23, 29, 73, 95} Unfortunately, there has been limited research assessing the influence diet quality has on HRQOL within the college population. This research is necessary in order to create interventions that promote healthful eating and to improve HRQOL among students.

Backhaus et al\textsuperscript{4} conducted one of the only studies that compared the relationship between HRQOL and diet in college students. Backhaus specifically assessed adherence to the Mediterranean Diet and HRQOL among college students in Italy (N=1,684). Students completed a demographic questionnaire, a Mediterranean Diet based food frequency questionnaire (α= 0.64), smoking status (α= 0.64), and a HRQOL 12 item Short-Form survey (SF-12, α= 0.84) as an in-class assignment. Backhaus grouped the items from SF-12 into either a mental component category or a physical component. Mediterranean diet adherence was measured from the food frequency survey. ANOVA and t-tests were used to analyze relationships between Mediterranean diet adherence (MDS), mental component scores (MCS), and physical component scores (PCS). Most participants in this study were freshman in college (41%) and female (62.8%). The average score for the food frequency questionnaire was above five (5.3 ±1.8) which indicated that students were adhering to a Mediterranean Style diet, with freshman and sophomores more likely to adhere compared to seniors and graduate students (5.35 vs 4.97, p<0.05). The average mental component score was 41.3 ± 10.0 out of 100. The average physical component score was 52.9 ±
6.0 out of 100. When comparing demographic factors, physical component scores were higher in those from southern Italy compared to students located in central Italy (54.23 ± 5.99 vs Rome =53.53 ± 5.88 and Cassino = 51.85 ± 5.93, p<0.005). Also, students studying in the healthcare field were more likely to have higher physical component scores (P<0.005). Gender differences were prevalent in MCS with females being more likely to score lower compared to males (40.46 ± 10.07 vs 42.63 ± 9.65, p<0.005). Students from southern Italy were more likely to score lower as well compared to students from central Italy (39.75 ± 10.48 vs 41.20 ± 9.62 and 41.87 ± 9.99, p=0.008). Physical component scores were positively associated with MDS (β= 0.30, p< 0.0005), among students in the medical and healthcare field (β= 2.23, p<0.0005), or studying languages and modern literature (β= 2.63, p<0.0005). Both low MCS (β= -0.16, p<0.005) and smoking cigarettes (β= -0.64, p<0.005) were negatively associated with PCS. Mental component scores were inversely associated with PCS (β= -0.46, p<0.005), being female (β= -2.79, p<0.005), studying engineering (β= -2.77, p<0.001) or economics and law (β= -2.77, p=0.007). Interestingly, adherence to the Mediterranean diet was inversely predicted by studying healthcare or medicine (β= -0.31, p<0.001), and being an older student (β= -0.38, p<0.001). The significance between diet adherence and higher scores in the physical component may be due to the lifestyle factors that are associated with the traditional Mediterranean diet, which consists of (1) frugal consumption of foods, (2) preparing and eating meals with family, (3) eating seasonally, (4) daily active transport, such as walking, and (5) prioritizing sleep. This study also discussed the importance of promoting both physical activity and a healthy diet in order to increase overall HRQOL. A limitation of this study is that it does not address all of the domains of HRQOL, leaving to question the impact of the Mediterranean diet adherence scores on both
the environmental and social domain. Satisfaction of each domain of HRQOL contributes to students’ perception of life and overall attitude and affect.

Jackson and DiPlacido\textsuperscript{29} investigated if overall student’s subjective well-being (SWB) and diet quality is moderated by the subjective vitality (SV) of the students. SWB, much like measurements of HRQOL, focuses on one’s perception of life while also incorporating evaluation of positive and negative affect. Students studying psychology (N=73) were asked to participate in a questionnaire that consisted of the: Satisfaction with Life Scale (\( \alpha = 0.85-0.87 \)), the Positive and Negative Affect Schedule (\( \alpha = .90 \)), the Subjective Vitality Scale (\( \alpha =0.91 \)), the estimated daily intake scale-sugar (\( \alpha = .90 \)), and the NHANES Dietary Screener Questionnaire.\textsuperscript{82} The prevalence of plant-based diets and animal-based diets were also assessed. Pearson correlation coefficients were used to examine the directionality of relationships between variables. Most participants were female (80.8%, n=59), and identified as white (80.8%, n=59). The average BMI among participants was 25.64 (range =18-38.4), and the average age was 20.5 (range= 18-35) years old. Subject vitality was positively associated with plant-based diets (\( r=.243, p<0.05 \)), life satisfaction (\( r=.683, p<.001 \)), and physical activity (\( r=.710, p<.001 \)), and negatively associated with negative affect (\( r=-.431, p<.001 \)) and estimated daily intake of sugar (\( r=-.239, p=.042 \)). These results are significant in displaying the role of diet in overall life satisfaction. Participants who consumed a plant-based diet, which is well-known for its anti-inflammatory benefits, had higher levels of subject vitality, perceived overall life satisfaction and an improvement in the physical health domain. Further research is necessary in investigating the relationship between overall health perception and diet quality among emerging adults.
2.4 GAP IN THE RESEARCH

Currently, there is a gap in the research determining how diet quality influences HRQOL in college students. Findings in this area are crucial because university students are not only facing extremely high stress and depression rates, but are also at risk for developing nutrition-related chronic disease due to the low intake of fruits and vegetables, high intake of added sugars from sweets and sugar-sweetened beverages, and increasing rates of overweight or obesity.\textsuperscript{14, 15, 63, 95, 98} Understanding the full impact of diet quality on HRQOL in college students would give evidence for holistic interventions that incorporate tools, not only geared towards improvement of diet quality, but also mental, physical, environmental, and social aspects of health in order to improve HRQOL. Food choices of university students are complex and in order to improve overall diet quality, approaches should be aimed towards addressing multiple aspects in the college lifestyle. It should also be noted that much of the research surrounding health habits of college students are limited to convenience samples consisting of mostly female, white students. More diverse population samples are necessary in order to understand how to improve the health behaviors and in return HRQOL of marginalized students.

2.5 CONCLUSION

University students are faced with changes in aspects of social, physical, mental, and environmental health when entering college due to increased rates of stress and depression, increased workload, financial independence, changed access and availability to healthful foods, and lack of sleep.\textsuperscript{19, 31, 32, 63} Many students indicate that they overeat when faced with academic stress, often reaching for comfort foods that are high in saturated fat, added sugar, and calories while also consuming less fruits and vegetables.\textsuperscript{13, 95, 99} It is necessary to understand diet quality
and its role in all of the domains of HRQOL in order to create adequate interventions geared towards helping college students prevent chronic disease through nutrition education.
CHAPTER THREE: METHODOLOGY

3.1 STUDY DESIGN

This cross-sectional study aimed to understand the influence of diet quality on HRQOL among undergraduate college students (N=655) using an online questionnaire that addressed sociodemographic factors, perceived stress levels, fruit and vegetable intake and HRQOL perceptions.

3.2 SETTING, RECRUITMENT, AND PARTICIPANTS

Data collection occurred on September 1, 2020 and was kept open until September 30, 2020. Approval was obtained from the University of Maine’s Institutional Review Board on March 11, 2020. Informed consent (Appendix A) was included at the beginning of the survey and completion of the survey implied consent. Undergraduate students were invited to participate in data collection via their school email, which was obtained from the university’s listserv.

Students were incentivized to participate in the survey by being entered into a raffle to win a $25 gift card.

All responses were generated using Qualtrics Software, Copyright © 2020 Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. All responses were then downloaded to Excel™ to manage participant data. Data was then analyzed using Statistical Package for the Social Sciences (SPSS) Version 26.0 (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp) on November 2, 2021.

Students included in analysis attended college full-time (at least 12 credit hours), had complete data sets, and were between 18-24 years old. Participants who completed the Qualtrics survey in less than thirty minutes were excluded from analysis. Students with BMI’s of less than
16 and over 40 were excluded from analysis to remove outliers. A final sample of 655 students was obtained.

### 3.3 SURVEY INSTRUMENTS

Demographic questions, such as age, gender identity, year in college, and living arrangements, were included in the online survey. Fruit and vegetable intake was measured using the National Cancer Institute’s Fruit and Vegetable Screener. HRQOL was measured using the CDC’s Healthy Days Module. A shortened Cohen’s Perceived Stress Scale was used to measure the perceived stress levels among students. Two items asking about sleep quality were also included in the survey.

### 3.4 STATISTICAL ANALYSIS

All statistical analyses were conducted using SPSS software, version 26. Frequency distributions were used to analyze the participants’ categorical data. Central tendency methods were used to examine continuous data, such as weight and height. Paired t-tests were used to compare HRQOL items between students who consumed above the sample’s average fruit and vegetable intake and students who consumed the average and below. Significance levels were set at p<0.05. Pearson’s correlation coefficients were used to indicate the strength of the relationship between HRQOL items and health behaviors and perceptions of college students. Multiple linear regression analyses were used to determine the health behaviors (independent variable) that influenced HRQOL (the dependent variable) among college students. Standardized regression weight, β, was used to explain the relationship between the health behaviors and HRQOL, as well as the gravity of influence.
CHAPTER FOUR: RESULTS

4.1 DESCRIPTIVE ANALYSIS

A majority of the data was retrieved from the University of Maine’s undergraduate students (88%) compared to students from Rutgers’s university (22%). Most students were white (83.9%) and female (62.6%), representing the Northeast which also has a predominantly white (65%) and female (51%) population. The average age of the students was 19.8 ± 1.6 years old. The average BMI of the sample was considered healthy at 24.7 ± 5.1. Most of the sample consisted of freshman students (30.2%), followed by seniors (27.3%), sophomores (22.0%) and juniors (20.3%). See Table 1.1 for further demographic details.

*Table 1.1: Participants’ Demographic Information (n=655)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD) or % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, year</td>
<td>19.8 (1.6)</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>24.7 (5.0)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>62.6</td>
</tr>
<tr>
<td>Male</td>
<td>33.8</td>
</tr>
<tr>
<td>Other</td>
<td>3.6</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>83.9 (504)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5.4 (35)</td>
</tr>
<tr>
<td>Native American</td>
<td>4.6 (30)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>2.0 (13)</td>
</tr>
<tr>
<td>Other</td>
<td>4.1 (27)</td>
</tr>
<tr>
<td>Year in College</td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>30.2 (198)</td>
</tr>
<tr>
<td>Sophomore</td>
<td>22.2 (145)</td>
</tr>
<tr>
<td>Junior</td>
<td>20.3 (133)</td>
</tr>
<tr>
<td>Senior</td>
<td>27.3 (179)</td>
</tr>
</tbody>
</table>

Most students did not have a university dining plan (60%) and lived off campus (59.2%). Students more frequently reported living with roommates or friends (65.9%) compared to family
(18.2%), living alone (11.6%) and other (4.3%). Over one quarter of students (30.1%) stated that within the past twelve months they worried whether their food would run out before they could buy more, and 18.7% of students reported that the food that they had didn’t last and they did not have money to buy more. See Table 1.2 outlining the participants’ college specific environmental aspects.

Table 1.2: Participants’ Environmental Characteristics (n=655)

<table>
<thead>
<tr>
<th>Variable</th>
<th>%, (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dining Plan</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>40 (262)</td>
</tr>
<tr>
<td>No</td>
<td>60 (393)</td>
</tr>
<tr>
<td>Living Situation</td>
<td></td>
</tr>
<tr>
<td>On Campus</td>
<td>40.8 (267)</td>
</tr>
<tr>
<td>Off Campus</td>
<td>59.2 (388)</td>
</tr>
<tr>
<td>Currently Living With</td>
<td></td>
</tr>
<tr>
<td>Friends/Roommates</td>
<td>65.9 (432)</td>
</tr>
<tr>
<td>Family</td>
<td>18.2 (119)</td>
</tr>
<tr>
<td>No one</td>
<td>11.6 (76)</td>
</tr>
<tr>
<td>Other</td>
<td>4.3 (28)</td>
</tr>
</tbody>
</table>

The average intake of servings of fruits was $0.78 \pm 0.62$ servings and the average intake of vegetables without French fries was $1.5 \pm 0.95$ servings, with a combined total of about $2.2 \pm 1.3$ servings per day of fruits and vegetables. The range of the combined servings of fruits and vegetables without fries varied from $0.03$ servings to $7.19$ servings per day. The majority of participants were consuming less than the USDA’s recommendation of five servings per day.

Less than one quarter reported their perceived general health as poor or fair (n= 147, 22.5%), while a majority of students rated their general health as good, very good, or excellent (n=508, 77.4%). A majority of students rated their overall sleep quality within the past week as fairly good (n= 408, 62.4%), followed by students ranking their sleep quality as fairly bad (n= 164, 25%), very good (n= 62, 9.4%) or very bad (n=21, 3.2%). Days per month being reported
with physical health not being good were relatively low (3.5 ± 5.8 days) and there were few days in which poor physical health prevented students from usual activities (1.8 ± 3.6 days). Average mental health not being good were 10.1 ± 9.3 days per month. Poor mental health prevented students from usual activities 5.1 ± 6.7 days out of the month. Students on average reported 12.6 ± 10.3 days out of the month feeling tense, worried, or anxious, and 8.1 ± 8.7 days out of the month feeling sad, blue or depressed. See table 1.3 for details concerning both diet quality and indicators of HRQOL.

*Table 1.3: Undergraduate Students’ Mental and Physical Characteristics*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD), or % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived General Health Status</td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>3.7 (24)</td>
</tr>
<tr>
<td>Very Good</td>
<td>29.3 (192)</td>
</tr>
<tr>
<td>Good</td>
<td>44.4 (291)</td>
</tr>
<tr>
<td>Fair</td>
<td>19.8 (130)</td>
</tr>
<tr>
<td>Poor</td>
<td>2.7 (18)</td>
</tr>
<tr>
<td>Rating of Overall Sleep Quality</td>
<td></td>
</tr>
<tr>
<td>Very Good</td>
<td>9.4 (62)</td>
</tr>
<tr>
<td>Fairly Good</td>
<td>62.4 (409)</td>
</tr>
<tr>
<td>Fairly Bad</td>
<td>25.0 (164)</td>
</tr>
<tr>
<td>Very Bad</td>
<td>3.2 (21)</td>
</tr>
<tr>
<td>D/M* without Enough Rest or Sleep</td>
<td>1.85 (0.8)</td>
</tr>
<tr>
<td>Perceived Stress Score</td>
<td></td>
</tr>
<tr>
<td>D/M with Physical Health Not Being Good</td>
<td>3.5 (5.7)</td>
</tr>
<tr>
<td>D/M with Mental Health Not Being Good</td>
<td>10.1 (9.3)</td>
</tr>
<tr>
<td>D/M Feeling Tense, Worried or Anxious</td>
<td>12.6 (10.3)</td>
</tr>
<tr>
<td>D/M Feeling Sad, Blue or Depressed</td>
<td>8.1 (8.7)</td>
</tr>
<tr>
<td>Fruit and Vegetable Intake without French fries, servings</td>
<td>2.2 (1.3)</td>
</tr>
<tr>
<td>Fruit Intake, servings</td>
<td>0.8 (0.6)</td>
</tr>
<tr>
<td>Vegetable Intake, servings</td>
<td>1.5 (9.5)</td>
</tr>
</tbody>
</table>

*D/M: Days per month*

**4.2 PAIRED T-TESTS**

Forty-one percent of participants consumed about the average (2.2 ±1.3 servings per day) for fruit and vegetable intake, leaving 59% of participants consuming the average amount or less.
Those who consumed above the average fruit and vegetable intake reported more days per month feeling healthy and full of energy (11.96 ± 8.59 days) compared to students who consumed the average or below (8.60 ± 7.89 days), t(652) = -4.63, p<0.001. Also, those who consumed above the average FV intake reported less days per month when mental health was not good (8.55 ± 8.15 days) compared to students who consumed the average or below (11.11 ± 9.8 days), t(39) = 3.48, p=0.001. See figure 2.2.

*Figure 2.2: The Difference Between HRQOL of Students who Consumed above the Average Fruit and Vegetable servings (n= 269) Compared to Students who Consumed the Average and Below (n=396)*

4.3 Pearson Correlation Coefficients

Number of days of feeling healthy and full of energy was negatively correlated with perceived stress (r=-.494, p<.0001), positively correlated with fruit and vegetable consumption (r=.221, p<0.001), and negatively correlated with BMI (r=-.174, p<.001). Number of days with
mental health not being good was positively correlated with greater perceived stress levels 
\( r = .616, p < 0.001 \), a higher BMI \( r = .125, p = .003 \), more hours being sedentary during a weekday 
\( r = .086, p = .029 \), and negatively correlated with days feeling healthy and full of energy 
\( r = -.471, p < 0.001 \).

4.4 MULTIPLE LINEAR REGRESSION ANALYSIS

Two predictors explained 38.5% of variance in days per month when mental health was 
not good \( r^2 = 0.38, F (2, 639) = 200.11, p < 0.001 \): perceived stress \( \beta = 0.61, p < 0.001 \) and fruit 
and vegetable intake \( \beta = -0.08, p < 0.05 \). There was a negative relationship between fruit and 
vegetable intake and days per month being reported with poor mental health. Four predictors 
explained 30.0% of the variance in days per month feeling happy and full of energy 
\( r^2 = 0.29, F \) 
\( (4, 549) = 58.6, p < 0.001 \): perceived stress \( \beta = -0.46, p < 0.001 \), BMI \( \beta = -0.11, p < 0.01 \), 
fruit and vegetable intake \( \beta = 0.16, p < 0.001 \), and hours of sleep \( \beta = 0.08, p < 0.05 \). These 
results indicate that there is a negative relationship between days per month feeling healthy and 
full of energy and perceived stress levels and BMI. In both HRQOL items, it was found that 
perceived stress and fruit and vegetable intake were the most influential predictors for HRQOL 
levels. See table 1.4 and table 1.5 for summaries of the multiple linear regression analyses.
Table 1.4: Summary of Regression for Days Per Month Reporting Feeling Healthy and Full of Energy in College Students (N=655)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B</th>
<th>SE (B)</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Hours of Sleep per Night</td>
<td>.54</td>
<td>.23</td>
<td>.09</td>
<td>2.35</td>
<td>.02*</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>-.18</td>
<td>.06</td>
<td>-0.11</td>
<td>-3.10</td>
<td>.002*</td>
</tr>
<tr>
<td>Fruit and Vegetable Intake without Fries</td>
<td>-.96</td>
<td>.22</td>
<td>.16</td>
<td>4.51</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Perceived Stress Levels</td>
<td>-4.88</td>
<td>.39</td>
<td>-0.46</td>
<td>-12.54</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

* represents a significant p-value

Table 1.5: Summary of Regression for Days Per Month Reporting Poor Mental Health in College Students (N=655)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B</th>
<th>SE (B)</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit and Vegetable Intake without Fries</td>
<td>-.53</td>
<td>.22</td>
<td>-.08</td>
<td>-2.46</td>
<td>.014*</td>
</tr>
<tr>
<td>Perceived Stress Levels</td>
<td>7.30</td>
<td>.37</td>
<td>-.61</td>
<td>-19.57</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

* represents a significant p-value
CHAPTER FIVE: DISCUSSION

The objective of this study was to explore the impact that diet quality has on HRQOL in university students. It was hypothesized that (1) students who consumed more fruits and vegetables than their peers will report more days per month of feeling healthy and full of energy, (2) students who consumed more fruits and vegetables than their peers will report less days per month with poor mental health, and (3) fruit and vegetable consumption, and perceived stress, and sleep health would be predictors of HRQOL among college students. All three hypotheses were confirmed in that those who consumed more fruits and vegetables had better HRQOL outcomes and that other behavioral factors (stress and sleep) were important variables that influence HRQOL of college students.

5.1 DISCUSSION

A cross-sectional study was conducted to evaluate the health behaviors of college undergraduates to develop a deeper insight on the impact of diet quality and other indicators have on HRQOL. Results were consistent with the hypotheses and found that students who consumed more fruits and vegetables than their peers reported more days per month feeling healthy and full of energy and less days per month experiencing poor mental health. Findings also showed that perceived stress, fruit and vegetable intake, BMI, and average hours of sleep per night influenced students’ HRQOL. These findings are both innovative and key in validating the impact of diet quality on HRQOL of college students in the United States. These results determined significant influences of perceived physical health and mental health in a population that is at risk for developing diet-related chronic disease and give evidence for prioritizing both stress management and nutrition education for future college-aimed health interventions.
5.2 HEALTH RELATED QUALITY OF LIFE

HRQOL was evaluated using the CDC’s Healthy Days Module,\textsuperscript{3} which has an emphasis on evaluating the perception of mental and physical health among participants. College students perceived their general health and physical domain as adequate, but described their mental health as being poor with frequent feelings of being tense, worried and anxious. Although the results indicated that students felt that their physical and general health was not an issue, it was also reported that students only felt healthy and full of energy for about one third of the month. Similarly, previous research has found that students in the United States rate their physical health as the highest ranked HRQOL domain, despite average rates of physical activity and sleep duration not meeting recommended guidelines.\textsuperscript{12, 30, 33, 38, 39} Previous research coincides with current findings that most college students view their general health as good.\textsuperscript{33, 35, 39} These findings suggest that college students are experiencing a disconnect between perceived health levels, and actual adherence to national guidelines, such as the Physical Activity Guidelines for Americans.\textsuperscript{103} From these findings and previous research, it can be suggested that college students may need more physical health education in order to improve energy levels and overall HRQOL.

The mental domain was perceived as poor in a large portion of participants, which is consistent with all previous research aimed in evaluating HRQOL among college students.\textsuperscript{12, 14, 35, 51} Poor mental health has been seen as prominent barrier for many students in higher education, with high rates of perceived stress, major depressive symptoms, and anxiety in both college undergraduates and graduate students.\textsuperscript{13, 15, 63, 104} The large body of research that has assessed college health has found several indicators of perceived poor mental status including personal affect, lack of appropriate coping skills, presence of chronic disease, increased
academic workload, depressive symptoms, poor sleeping habits, and increased levels of perceived stress. Both previous research and the results from the research at hand suggests college students’ mental health is specifically impacted by the college environment, and therefore in order to increase HRQOL of students, it would be essential to improve access to mental health resources on college campuses.

5.3 FRUIT AND VEGETABLE INTAKE AND STRESS

Current findings indicated that the two biggest predictors for HRQOL were fruit and vegetable intake and perceived stress levels, both of which have been identified in the literature as areas needing improvement within the college population. In this study, on average, college students reported moderate amounts of perceived stress, and frequent feelings of being tense, worried or anxious. Fruit and vegetable intake was also poor among college students in this study, with the average intake being less than half of the USDA recommended guidelines of five servings of fruits and vegetables per day. Both low fruit and vegetable intake and high levels of perceived stress in college students are common findings throughout the literature. Extensive research has assessed the relationship between these variables, finding that high levels of perceived stress negatively impacts fruits and vegetable intake of college students. This pattern has been found to be relevant across some genders, with high levels of perceived stress being associated with a decreased consumption of fruits and vegetables in females, and reduced intake of raw vegetables among male students. Academic stress, specifically, has been found to have a profound effect on dietary choices in college students. Upon further investigation, researchers have identified that students have maladaptive stress coping strategies, which lead to a greater intake of comfort foods. These foods are generally higher in saturated fats, added sugar, and calories. These findings suggest that perceived
stress levels and fruit and vegetable intake go hand-in-hand, with increased levels of stress reducing the intake of fruits and vegetables.  

5.4 FRUIT AND VEGETABLE INTAKE AND HEALTH RELATED QUALITY OF LIFE

Students who consumed more fruits and vegetables than their peers reported higher levels of HRQOL, as evidenced by reporting more days per month feeling healthy and full of energy, and less days per month with poor mental health. These findings are novel as fruits and vegetable intake act as a predictor for HRQOL in college students. Two previous studies exist in the literature evaluating diet quality and perceived health among college students. Both of which support the findings in this study in that nutrient dense diets, such as a plant-based diet and the Mediterranean diet, are positively associated with HRQOL scores.  

In this study, increased fruit and vegetable intake improves the number of days per month of feeling healthy and full of energy, which is an indicator of HRQOL. This may be due to the positive impact fruit and vegetable consumption has on healthy lifestyle behaviors. Increased fruit and vegetable intake has been associated with greater levels of physical activity, longer sleep duration, and reduced rates of overweight and obesity. Previous research has supported that health promoting lifestyles are key factors in maintaining a healthy BMI, which has been found to impact perceived energy levels. Adequate sleep duration has an imperative role in moderating appetite and hunger, energy expenditure, and lowering the risk of anxiety or depression. Fruit and vegetable intake has an integral role in promoting positive health behaviors among college students, and therefore advances physical health. Increased fruit and vegetable consumption has a significant effect on mental health status among college students. Wattick et al concluded that fruit and vegetable intake was a predominant indicator of depression among males. Wattick’s findings are consistent with a results from a National
Canadian Health Survey, in which significant correlations between increased fruit and vegetable intake and a reduced rate of depressive symptoms among college students were reported.

Previous and current findings suggest that increased fruit and vegetable consumption inversely affects poor mental health among college students. These associations may impact why students who reported consuming more servings of fruit and vegetables reported fewer days per month with poor mental health compared to their peers, resulting in a better HRQOL. From these findings, it can be deducted that educational and environmental change initiatives that encourage fruit and vegetable consumption in college students may build a foundation for improved mental health status, HRQOL, as well as diet quality.

5.5 DIET QUALITY, STRESS AND HEALTH RELATED QUALITY OF LIFE

HRQOL is the perception of one’s overall wellbeing, without simply stating there is a lack of disease. Young adults who attend higher educational institutions are faced with multiple stressors that deteriorate both mental and physical health status, both of which are key components of HRQOL. In this study, the two largest predictors for HRQOL among college students were fruit and vegetable intake, an indicator for diet quality, and perceived stress levels. These findings are relatively similar to the small body research surrounding diet quality and HRQOL in traditional college students. For example, Backhaus concluded that HRQOL was influenced by adherence to the Mediterranean diet, a diet rich in a variety of fruits and vegetables, as well as the student’s area of study which arguably would influence levels of perceived stress. Jackson and Diplacido’s results varied slightly, citing that an adherence to a plant-based diet and overall perception of health were the greatest indicators of HRQOL. It can be suggested from both the current results and previous research, that diet quality and
management of stress levels impacts HRQOL in traditional college students. Researchers have identified that students’ poor diet quality is influenced by unmanaged stress levels, both of which were found to be leading causes of poor HRQOL. With chronic stress being a prominent characteristic of this population, it can be presumed that students are unfortunately prime candidates for both a low HRQOL and an increased risk for diet-related chronic disease.

5.6 LIMITATIONS

Limitations of this study included that the majority of the sample were white and identified as female. These demographic trends were also common in previous research surrounding diet and health behaviors conducted in the college setting. A similarity between this study and previous studies exploring college health behaviors of study subjects is that they have been generally limited to the perspectives of white and female college students. More diverse samples are necessary in order to assess HRQOL and diet quality of college students of all ethnicities, especially those facing racial disparities which have been found greatly impact health outcomes, such as BMI. In the present study, there was a large standard deviation for participants’ answers concerning the healthy days module which indicated some variability within the sample. Additionally, data collection occurred in September 2020, which was in the midst of the COVID-19 pandemic and may have impacted survey responses. The freshman in this study were entering an unexplored territory, with heightened levels of stress compared to the incoming classes before them. These taxing environmental conditions could have altered survey results.

5.7 CONCLUSION

In conclusion, this cross-sectional study provides justification for wellness interventions for college students that incorporate nutrition education, access to mental health resources, and that
provide education focused on stress coping strategies in order to improve HRQOL. These recommendations are pivotal components in improving health behaviors and HRQOL in future leaders, leading to a reduced rate of chronic illness in the United States and an overall healthier nation.\textsuperscript{5, 20, 21}
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APPENDIX A: CONSENT FORM

You are invited to participate in a research project being conducted by Jade McNamara, a faculty member in the Department of Food Science and Human Nutrition at the University of Maine. The purpose of the research is to understand your point of view about health resources and current health behavior. You must be between the ages of 18 and 24 years old to participate.

What Will You Be Asked to Do? If you decide to participate, you will be asked to complete the online survey which asks questions about your current health behaviors and question related to COVID-19. It may take approximately 30 minutes to participate.

Risks: Risk of participating may include responding to sensitive questions on the online survey. Mental and physical health, as well as health behaviors (i.e.: drug use, sleeping patterns) will be addressed in this survey. Information about how to contact the Counseling Center for services will be provided for everyone. Students may skip questions at any time.

Benefits: While this study will have no direct benefit to you, this research may help us learn more about current health behaviors of college students at the University of Maine. This project will investigate the factors that influence health related quality of life (HRQOL), healthy eating, and mental health behaviors of college students. By better understanding factors that influence HRQOL of college students, intervention methods can be developed that aim to improve health behaviors and prevent chronic disease.

Compensation: You will be able to enter a raffle for $25 Amazon gift card. Twenty Amazon gift cards will be given out. You will be contacted through an email you provide through a link at the end of the survey after you answer all questions. Your email will not be connected to your responses.

Confidentiality: In the survey, your name will not be on any of the data. You will be asked to provide your student ID number, which will be kept confidential. Your student ID will be deleted from the electronic file by January 20, 2021 and replaced with a random number. All data will be kept on a password protected computer and kept until February 2031.

Voluntary: Participation is voluntary. If you choose to take part in this study, you may stop at any time. If you stop the survey, then you will not be entered into the raffle to receive $25 Amazon gift cards. You may skip any questions you do not wish to answer.

Contact Information If you have any questions about this study, please contact me at 207-581-4895 or jade.mcnamara@maine.edu. If you have any questions about your rights as a research
participant, please contact the Office of Research Compliance, University of Maine, 207/581-2657 (or e-mail umric@maine.edu).

**Resources:** If you want to speak with someone please contact the Counseling Center or visit Cutler Health Center.

**Here is information for the Counseling Center at the University of Maine.**
Hours of Operation: Monday through Friday, 8 AM – Noon and 1-4:30 PM.
Phone Number: 207-581-4975  Location: 5721 Cutler Health Center, Room 125
Cutler Health Center: Provide primary care services to the students and faculty of the University of Maine as well as their dependents.
Hours of Operation: Monday through Friday, 8 AM - 5 PM. Phone Number: 207-581-4000 Location: 5721 Long Road University of Maine in Orono, Orono ME, 04469
APPENDIX B: SURVEY QUESTIONS

Are you 18 years old or older?

○ Yes, I am 18 years old or older.

○ No, I am younger than 18 years old.

How old are you?

▼ 18 ... Older than 30

What is your gender identity?

○ Male

○ Female

○ Trans-male/Trans-man

○ Trans-female/Trans-woman

○ Gender non-conforming

○ Different identity—please state:

________________________________________________

○ Choose not to answer
What is your ethnicity?

- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian or Asian/Pacific Islander
- Other ________________________________
- Choose not to answer

What year in college are you?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate Student

Do you have a dining meal plan?

- Yes
- No
- Choose not to answer
Do you live:

- On Campus
- Off Campus
- Choose not to answer

Who are you currently living with?

- Friends/roommates
- Family members
- No one
- Other __________________________________________________________

Do you think of yourself as..

- Heterosexual, or straight
- Homosexual, or gay or lesbian
- Bisexual
- Queer
- Questioning/Unsure
- Something else – Specify: __________________________________________
What is your height?

- O Feet _____________________________
- O Inches __________________________

What is your weight (in pounds)?

____________________________________

What is your GPA?

____________________________________

I trust my body to tell me how much to eat.

- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree
I stop eating when I am full.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

End of Block: Demographics and Consent Form

Start of Block: Other Nutrition-Related Questions

Do you have any allergies?

- Yes
- No

Do you have any food sensitivities?

- Yes
- No
Where do you first look for nutrition information?

- Internet
- Peers
- Friends and Family
- Government Programs and Websites
- Healthcare Professionals
- Other

How often do you seek out nutrition advice or information?

- Never or almost never
- Sometimes
- Often
- Daily or almost Daily

Have you taken a college course in nutrition?

- Yes
- No
Once I leave college, I will prioritize my health more.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

---

Do you plan out your meals in advance?

- Yes
- No
- Sometimes

---

How often do you eat on campus?

- Never or Almost Never
- 1 or 2 meals per week
- 3-6 meals per week
- 7+ meals per week

End of Block: Other Nutrition-Related Questions

Start of Block: Food Insecurity
Within the past 12 months, I worried whether my food would run out before I got money to buy more.

- Often true
- Sometimes true
- Never true
- Don’t know/refused

Within the past 12 months, the food I bought just didn’t last and I didn’t have money to get more.

- Often true
- Sometimes true
- Never true
- Don’t know/refused

End of Block: Food Insecurity

Start of Block: NCI F/V Screener

Instructions  Think about what you usually ate in the last month. Please think about all the fruits and vegetables that you ate last month.
  Include those that were: raw and cooked, eaten as snacks and at meals, eaten at home and away from home (restaurants, friends, take-out), and eaten alone and mixed with other foods.
  Report how many times per month, week, or day you ate each food, and if you ate it, how much you usually had.
Over the last month, how many times per month, week, or day did you drink 100% fruit juice such as orange, apple, grape, or grapefruit juice? Do not count fruit drinks like Kool-Aid, lemonade, Hi-C, cranberry juice drink, Tang, and Twister. Include juice you drank at all mealtimes and between meals.

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times a day
- 3 Times a day
- 4 times a day
- 5 or more times per day

Each time you drank 100% juice, how much did you usually drink?

- Less than 6 ounces: Less than 3/4 cup
- 6 to 10 ounces: 3/4 to 1 1/4 cup
- 10 to 16 ounces: 1 1/4 cup to 2 cups
- 16 ounces or more: Over 2 cups
Over the last month, how many times per month, week, or day did you eat fruit? Count any type of fruit—fresh, canned, and frozen. Do not count juices. Include fruit you ate at all mealtimes and snacks.

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Each time you ate fruit, how much did you usually eat?

- Less than 1 medium sized fruit
- 1 medium fruit
- 2 medium fruits
- More than 2 medium fruits
Over the last month, how often did you eat lettuce salad (with or without vegetables)?

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Each time you ate lettuce salad, how much did you usually eat?

- About 1/2 cup
- About 1 cup
- About 2 cups
- Over 2 cups
Over the last month, how often did you eat French fries or fried potatoes?

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Each time you ate French fries or fried potatoes, how much did you usually eat?

- Small Order or Less (About 1 cup or less)
- Medium Order (About 1 1/2 cups)
- Large Order (About 2 cups)
- More than a large order (2 cups or more)
Over the last month, how often did you eat other white potatoes? Count baked, boiled, mashed potatoes, potato salad, and white potatoes that were not fried.

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Each time you ate these potatoes, how much did you usually eat?

- 1 small potato or less
- 1 medium potato
- 1 large potato
- 2 medium potatoes or more
Over the last month, how often did you eat cooked dried beans? Count baked beans, beans soup, refried beans, pork beans, and other bean dishes.

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Each time you ate these beans, how much did you usually eat?

- Less than 1/2 cup
- 1/2 cup to 1 cup
- 1 to 1 1/2 cups
- More than 1 1/2 cups
Over the last month, how often did you eat other vegetables? Do not include: lettuce salads, white potatoes, cooked dried beans, vegetable mixtures, Mexican dishes, stir-fry, stews, soups or rice. Include: all other vegetables (canned, cooked, raw and frozen).

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Each of these times that you ate other vegetables, how much did you usually eat?

- Less than 1/2 cup
- 1/2 to 1 cup
- 1 to 2 cups
- Over 2 cups
Over the last month, how often did you consume tomato sauce? Include tomato sauce on pasta, macaroni, rice, pizza, and other dishes.

- Never
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Each time you ate tomato sauce, how much did you usually eat?

- About 1/4 cup
- About 1 cup
- More than 1 cup

---

Over the last month, how often did you eat vegetable soup? Include tomato soup, gazpacho, beef with vegetable soup, minestrone soup, and other soups made with vegetables.
Each time you ate vegetable soup, how much did you usually eat?

- Less than 1 cup
- 1 to 2 cups
- 2-3 cups
- More than 3 cups

Over the last month, how often did you eat mixtures that included vegetables? Count such foods as sandwiches, casseroles, stews, stir-fry, omelets, and tacos.
In answering the following questions:

**Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.

**Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

During the last 7 days, on how many days (0-7) did you do **vigorous** physical activities like:
- Heavy lifting
- Digging
- Aerobics
- Fast bicycling

▼ 0 ... 7

How much total time (in minutes) did you usually spend on one of those vigorous activities?

________________________________________________________________

Page Break

During the last 7 days, on how many days (0-7) did you do moderate physical activities like:
- Carrying light loads
- Bicycling at a regular pace
- Double’s tennis

Do not include walking

▼ 0 ... 7

How much time (in minutes) did you usually spend on one of those days doing moderate physical activities?

________________________________________________________________

Page Break

During the last 7 days, on how many days (0-7) did you walk for at least 10 minutes at a time?

This includes:
- Walking at work and at home
- Walking to travel from place to place
- Any other walking that you did solely for recreation, sport, exercise or leisure

▼ 0 ... 7

How much time (in minutes) in total did you usually spend walking on one of those days?

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

During the last 7 days, how much time in total (in hours) did you usually spend sitting on a weekday?

End of Block: IPAQ Survey

Start of Block: Perceived Stress Survey
In the last month, how often have you felt that you were unable to control the important things in your life?

- Never
- Almost Never
- Sometimes
- Fairly Often
- Very Often

In the last month, how often have you felt nervous and “stressed”?

- Never
- Almost Never
- Sometimes
- Fairly Often
- Very Often

In the last month, how often have you felt confident about your ability to handle your personal problems?

- Never
- Almost Never
- Sometimes
- Fairly Often
- Very Often
In the last month, how often have you felt that things were going your way?

- Never
- Almost Never
- Sometimes
- Fairly Often
- Very Often

In the last month, how often have you found that you could not cope with all the things that you had to do?

- Never
- Almost Never
- Sometimes
- Fairly Often
- Very Often
In the last month, how often have you felt that you were on top of things?

- Never
- Almost Never
- Sometimes
- Fairly Often
- Very Often

In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

- Never
- Almost Never
- Sometimes
- Fairly Often
- Very Often

End of Block: Perceived Stress Survey

Start of Block: Health Related Quality of Life Instrument
Would you say that in general your health is:

- Excellent
- Very good
- Good
- Fair
- Poor

Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?

▼ 0 ... Don't know

During the past 30 days, for about how many days did poor physical health, including any injury or illness, keep you from doing your usual activities, such as self-care, work, or recreation?

▼ 0 ... Don't know

Now 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 ... Don't know
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 ... Don't know

During the past 30 days, how many days have you felt SAD, BLUE, or DEPRESSED?

▼ 0 ... Don't Know

During the past 30 days, for about how many days have you felt WORRIED, TENSE, or ANXIOUS?

▼ 0 ... Don't Know

During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP?

▼ 0 ... Don't Know

How many days did poor mental health keep you from doing your usual activities, such as self-care, work, or recreation?

▼ 0 ... Don't Know
During the past 30 days, for about how many days have you felt VERY HEALTHY AND FULL OF ENERGY?

▼ 0 ... Don't Know

End of Block: Health Related Quality of Life Instrument

Start of Block: Sleep Behavior Questions

During the past 7 days, how many hours of sleep did you get on average per night?

________________________________________________________________

In the past 7 days, how would you rate your sleep quality overall?

○ Very Good

○ Fairly Good

○ Fairly Bad

○ Very Bad

End of Block: Sleep Behavior Questions

Start of Block: Block 15

If you want to speak with someone please contact the Counseling Center or visit Cutler Health Center. Here is information for the Counseling Center at the University of Maine. Hours of Operation: Monday through Friday, 8 AM – Noon and 1-4:30 PM. Phone Number: 207-581-4975

Location: 5721 Cutler Health Center, Room 125  Cutler Health Center: Provide primary care services to the students and faculty of the University of Maine as well as their dependents.

Hours of Operation: Monday through Friday, 8 AM - 5 PM.
Phone Number: 207-581-4000
Location: 5721 Long Road University of Maine in Orono, Orono ME, 04469

End of Block: Block 15
BIOGRAPHY OF THE AUTHOR

Kayla LaShelle Parsons was born in Greenville, Maine. She graduated from Erskine Academy in 2015. Kayla received a bachelor’s in Food Science and Human Nutrition with a minor in psychology in December 2019. Kayla has worked as a graduate research assistant in Dr. McNamara’s Nutrition Education and Eating Decisions lab on campus since 2020 and was a student researcher the year prior. Kayla is a member of the Academy of Nutrition and Dietetics, Maine Academy of Nutrition Dietetics, and a student member of the American Public Health Association. Her recent publications include:


She is a candidate for the master’s degree in Food Science and Human Nutrition from the University of Maine in December 2021.