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**HEALTH-RELATED QUALITY OF LIFE (HRQOL) IN SEXUAL MINORITY (SM) COLLEGE
UNDERGRADUATE STUDENTS**

By

Leigh Neptune

B.S. University of Maine, 2017

B.S. University of Maine, 2020

A Thesis

Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in Food Science and Human Nutrition

The Graduate School

The University of Maine

December 2021

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HEALTH-RELATED QUALITY OF LIFE (HRQOL) IN SEXUAL MINORITY (SM) COLLEGE UNDERGRADUATE STUDENTS

By Leigh Neptune

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

It is well documented that disparities exist in health-related quality of life (HRQOL) among sexual minority (SM) youth and adults compared to their heterosexual peers, and among college undergraduate students compared to all young adults. Yet, no studies have been conducted to date examining HRQOL, diet quality, or weight dissatisfaction at the intersection of SM and college undergraduate student status. In 2020, a cross-sectional convenience sample of college undergraduate students (N=690) from the University of Maine and Rutgers University completed an online survey consisting of items assessing demographic variables, HRQOL, diet quality, and weight dissatisfaction. Of this sample, 23.9% (n=165) of students identified as SM. Compared to their heterosexual peers, SM students experienced more days per month having poor mental health (14.5 ± 9.8 vs. 8.5 ± 8.7 days, $p < 0.001$); feeling sad, blue, or depressed (12.0 ± 9.7 vs. 6.3 ± 7.8 days, $p < 0.001$); feeling worried, tense, or anxious (18.1 ± 10.2 vs. 10.9 ± 9.8 days, $p < 0.001$); feeling they did not get enough sleep (13.8 ± 9.6 vs. 11.1 ± 9.0 days, $p = 0.012$); fewer days per month feeling very healthy and full of energy (6.8 ± 6.5 vs. 11.4 ± 8.7 days, $p < 0.001$), and had significantly higher BMIs (25.8 ± 6.1 vs. 24.4 ± 4.8 , $p = 0.005$). No significant differences were found in days per month having poor physical health. While no significant differences were reported in healthy eating index (HEI) scores or fruit or vegetable consumption, SM students consumed significantly more grams of added sugars per day than their heterosexual peers (14.4 ± 7.9 vs. 10.2 ± 7.1 , $p = 0.020$). Additionally, SM students were significantly less happy with their weight (30.7% vs 44.0%, $p = 0.001$) and

more likely to want to lose weight (47.9% vs. 46.8%, $p=0.005$) than heterosexual students. No significant differences were found within the SM sample regarding gender, race/ethnicity, or sexual orientation, though this may be a result of a largely homogenous sample (85% white, 70% female, and 60% bisexual). Consistent with the literature, SM students had worse overall HRQOL compared to heterosexual students, with the largest disparities seen in mental health variables. While no significant differences were found in perceived physical health, fruit, or vegetable intake, SM students consumed more added sugar, were more likely to be overweight, and less likely to be satisfied with their current weight than their heterosexual peers. These findings highlight the presence of health disparities in the LGBTQ+ community across the lifespan and underscore the importance of developing relevant support and programming to mitigate poor health outcomes. Further research is needed with a larger, more diverse sample to determine if there are significant differences in variables that are approaching significance.

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List of Abbreviations

HRQOL: Health-Related Quality of Life

LGBTQ: Lesbian, Gay, Bisexual Transgender, and Queer

SM: Sexual Minority

SGM: Sexual and Gender Minority

BMI: Body Mass Index

WBV: Weight-Based Victimization

CVD: Cardiovascular Disease

SBP: Systolic Blood Pressure

DBP: Diastolic Blood Pressure

HbA1c: Hemoglobin A1c

TC: Total Cholesterol

HEI: Healthy Eating Index

INTRODUCTION

Health-Related Quality of Life (HRQOL) is a measure of an individual's or group's perceived physical, mental, emotional, and social health.¹ HRQOL is important to examine because it can provide a more comprehensive look at health and quality of life by going beyond a direct measurement of mortality to assess the burden of diseases and conditions and overall life satisfaction.² It is well documented that disparities in HRQOL exist in minority groups including racial and ethnic minorities and individuals belonging to the lesbian, gay, bisexual, transgender, and queer (LGBTQ+) community.³⁻¹⁰ Additionally, college undergraduate students have been previously identified as a group experiencing poor HRQOL due to high levels of stress and poor food-related behaviors, with students belonging to minority groups being particularly vulnerable.¹¹ To date, no studies have been conducted to examine HRQOL at the intersection of sexual orientation and college undergraduate student status.

Many of the studies on LGBTQ+ health have been focused on specific risky health behaviors such as substance use,⁵ depression, anxiety, and suicidal ideation.^{6,12} Other studies have examined specific health outcomes such as prevalence of cardiovascular disease (CVD) risk factors,¹³⁻¹⁵ but few have studied differences in physical health factors. There is a marked gap in the literature in investigating differences in diet quality in gender and sexual minorities. It has also been noted that sexual minorities may have a higher prevalence of weight dissatisfaction,^{7,9,16} which can lead to the development of poor dietary behaviors such as binge eating and eating to cope with stress,¹⁷ as well as eating disorders.^{16,18} Additionally, several studies have indicated that those belonging to multiple minority groups (i.e. racial or ethnic minorities who are also sexual minorities) are at risk for further compounded health risks.^{10,19}

The primary objective of the current research is to identify differences in overall HRQOL between sexual minority (SM) and heterosexual college undergraduate students. The secondary objectives are to investigate any differences in diet quality and weight dissatisfaction between SM and heterosexual students, and to examine how intersectionality may play a role in overall HRQOL.

REVIEW OF THE LITERATURE

It is well-documented that LGBTQ+ individuals experience numerous health disparities in comparison to their heterosexual counterparts.³⁻⁹ Most research within this community has been focused on the domain of mental health,^{3,4} with many studies looking at specific risky health behaviors and conditions such as substance use,⁵ depression, anxiety, and suicidal ideation.^{6,12} However, overall health encompasses more than just the presence or absence of illnesses or conditions. Health-related quality of life (HRQOL) is a measure of an individual's or group's perceived physical, mental, emotional, and social health.¹ HRQOL is important to examine because it can provide a more comprehensive look at health and quality of life by going beyond a direct measurement of mortality to assess the burden of diseases and conditions and overall life satisfaction.² The purpose of this review is to provide insight into which aspects of HRQOL have been examined within the LGBTQ+ community, to summarize the important discoveries related to sexual minority HRQOL, and to identify any gaps in the research. The studies reviewed focus on various aspects of HRQOL in sexual minority adolescents and adults, and HRQOL in the college setting. This work will focus specifically on sexual minorities (SM), as gender minorities have vastly different lived experiences from other members of the LGBTQ+ community.

HRQOL AMONG COLLEGE STUDENTS

College students have been previously identified as a population having low HRQOL. Pelletier et al examined the relationship between stress, weight-related health risk behaviors, and weight status in 441 community college students who were between the ages of 18-35 years old.¹¹ Body mass index (BMI), eating and activity patterns, tobacco and alcohol use, sleep, and stress were examined. Mean stress levels were higher among community college students compared to the national average for 18-29-year-olds. Higher stress levels were associated with students who were overweight and obese ($p = 0.036$), non-white ($p = 0.032$), and experienced financial strain ($p = 0.001$). Additionally, higher perceived stress was associated with poorer eating behaviors, with each additional point on the perceived stress scale being

associated with an 8%, 10% and 11% higher incidence of breakfast, lunch, and dinner skipping, respectively. The findings of this study suggest that college students have higher perceived stress levels than non-student young adults, which are associated with increased weight and poorer food-related behaviors, especially among students with overweight and obesity, students of color, and students facing financial burden. This underscores a need to examine HRQOL in other marginalized communities within the college or university setting. One of these communities yet to be assessed is sexual minorities. Research has previously shown that SM youth and adults have poorer overall HRQOL than their straight peers.

HRQOL AMONG SEXUAL MINORITY ADOLESCENTS

Sexual minority adolescents in the United States and other developed countries have consistently demonstrated higher incidence of risky health-related behaviors including self-harm,⁷ substance use,⁵ and suicidal ideation,¹² indicating that young people in this community have consistently poorer mental health compared to heterosexual adolescents. Perales and Campbell examined health disparities and their potential mediators among 3,204 SM adolescents from the Longitudinal Study of Australian Children (LSAC) collected in 2014.⁸ The factors investigated included: (1) HRQOL, (2) depression, (3) social, behavioral, and emotional functioning, and (4) overall life satisfaction. Additionally, the roles of social support from parents, social support from friends, and school belonging were examined as potential mediators to any health disparities that were found. Sexual minorities scored an average of 6.35% lower in HRQOL, 11.63% lower in social/behavioral/emotional functioning, 14.31% higher in symptoms of depression, and 8.80% lower in overall life satisfaction when compared to their heterosexual peers. Sexual minority status was negatively associated with each of the three tested mediators: social support from parents, social support from friends, and school belonging ($p < 0.01$). Additionally, higher scores for each of these three mediators were positively associated with greater health and well-being across all four instruments ($p < 0.01$). Sexual minority adolescents scored lower than heterosexual adolescents on all measures of HRQOL and well-being with the greatest discrepancy seen in symptoms of depression.

Additionally, positive health outcomes were significantly associated with increased support and belonging, all of which were significantly lower in SM adolescents. Like many other studies within this population, the focus was largely on mental, social, and emotional health, with little emphasis placed on physical health. Components of physical health (i.e., physical activity, food-related behaviors, and obesity) are important to examine because they are equally meaningful aspects of overall HRQOL.

Himmelstein et al investigated the link between weight-based victimization (WBV) and eating- and weight-related health disparities among 9,838 sexual and gender minority (SGM) adolescents aged 13-17.¹⁷ Factors assessed included: BMI, WBV, dieting, binge eating, healthy and unhealthy weight-control behaviors, and the use of food to cope with stress. Most participants were of a healthy BMI (58.5%), yet 50.4% reported incidence of WBV from peers and 55.4% reported incidence of WBV from family. More frequent WBV at school and from family members was associated with more dieting, severe binge eating, healthy and unhealthy weight control strategies, and eating to cope with stress (school: $p < 0.001$; family: $p < 0.001$). These findings illustrate the relationship between WBV and weight-related health behaviors in SGM adolescents. Sexual and gender minority adolescents are at a higher risk of rejection from family at baseline,²⁰ compounding their risk for experiencing adverse health outcomes. This study demonstrated that WBV can lead to participation in unhealthy eating behaviors and weight control strategies in SGM adolescents, which may in turn lead to poorer body image and eating disorders.

McClain and Peebles conducted a review examining body image and eating disorders among LGBTQ+ youth.¹⁸ It is particularly important to investigate the role of eating disorders within the LGBTQ+ community, because eating disorders in adolescence have been linked to the future development of anxiety disorders, depression, substance use, and self-harm behaviors;⁷ all of which LGBTQ+ youth are at an increased risk for at baseline.^{3,5,6,12} A study conducted by Wichstrøm et al found that adolescent boys reporting same-sex attraction were seven times more likely to develop bulimic behaviors than their heterosexual peers five years later, even when controlling for other risk factors, and that adolescent girls reporting same-sex attraction were three times more likely to develop bulimic

behaviors.²¹ Similar findings were demonstrated by the Youth Risk Behavioral System Survey in 2005 and 2007, which showed SM youth were more likely than their straight peers to develop purging and diet pill use in young adulthood.¹⁹ Another study conducted by Austin et al found that gay and bisexual boys put more value on their appearance and had increased bingeing behaviors compared to heterosexual boys, but conversely, lesbian and bisexual girls were happier with their bodies and participated in less dieting than heterosexual girls.¹⁶ It is consistent within the literature that SM youth, are more likely to partake in dangerous weight-related behaviors^{22,23} such as bingeing and purging,¹⁶ with youth reporting both-sex attraction being significantly more likely to engage in purging and laxative use for weight loss.²³ Prevalence of eating disorders is estimated at 8.8% in sexual minority youth²⁴ compared to 2.8% of all youth.²⁵ These findings suggest that SM adolescents, specifically bisexual adolescents and SM males, are at a greater risk of experiencing body dissatisfaction and participating in unhealthy weight control behaviors.

LGBTQ+ youth are at increased risk of developing psychiatric disorders, which underscores the need for healthcare practitioners to pay close attention to disordered eating behaviors within this population to prevent further health-related complications in the future. The results from the studies reviewed above provide insight into various aspects of HRQOL in LGBTQ+ adolescents, however, one common limitation is that they are cross sectional in nature, therefore it is difficult to draw meaning from associations among variables without longitudinal evidence.

Bullying and victimization of LGBTQ+ identifying youth has been a long-standing public health issue and LGBTQ+ youth are often presented with the mantra “It gets better”. Yet, prior to 2015, no empirical evidence had been gathered to demonstrate that quality of life increases over time. Birkett et al conducted a longitudinal cohort study which investigated the possible developmental trajectory in LGBTQ+ psychological distress over time in relation to victimization and mental health.⁴ Data was collected at 6 waves over 3.5 years in a diverse group of 231 LGBTQ+ adolescents. The factors examined included psychological distress, social support, and incidents of victimization within the past six months.

Sexual minority males and transgender youth reported having less total support and significantly more incidents of victimization within the past six months than did females ($p < 0.001$). Additionally, LGBTQ+ African Americans experienced significantly more incidents of victimization in the past six months than white LGBTQ+ youth ($p = 0.05$). More experiences of victimization and lower social support at a single timepoint were both significantly associated with more depressive symptoms at that timepoint (victimization: $p < 0.001$, social support: $p < 0.001$ respectively). Age was a significant negative predictor of both psychological distress and victimization ($p < 0.001$) but not social support. Results supported that victimization mediated the relationship between age and psychological distress. Reduction in psychological distress is not related to social support but is mediated by reduction in experiences of victimization as this population ages. Additionally, age was negatively associated with depressive symptoms ($p < 0.001$) indicating that prevalence of depression decreases with age in this community. Males, specifically African American males, and transgender individuals reported significantly more homophobic victimization than other groups, indicating that these groups may be particularly vulnerable to increased psychological distress and the associated negative health implications. This study provides a unique look into the transitional period between adolescence and young adulthood, but it is equally important to understand HRQOL throughout adulthood in this population.

HRQOL AMONG SEXUAL MINORITY ADULTS

Most research on health disparities among LGBTQ+ adults has focused on the presence of specific illnesses and conditions such as depression, anxiety, and suicidal ideation,⁶ however, these studies do not provide insight into the burden these illnesses and conditions may pose² or a person's perceived physical, mental, emotional, and social health.¹ Potter and Patterson conducted a secondary analysis of the 2016 Behavioral Risk Factor Surveillance System (BRFSS) Data with the purpose of examining disparities in HRQOL among adults ($n=196,378$) from 25 states.³ Of this sample, 189,020 (96.8%) identified as exclusively heterosexual and 6,358 (3.2%) identified as lesbian, gay, or bisexual. HRQOL, health status, frequent mental distress, frequent physical distress, frequent activity limitation,

and lifetime depression were examined. The results showed that SM men and women experienced significantly more days per month with poor mental health compared to heterosexual men and women ($p < 0.01$). Lesbian and bisexual women reported more days per month in which their physical or mental health kept them from doing their usual activities compared to heterosexual women ($p < 0.01$).

Furthermore, there was a significantly higher prevalence of depression diagnoses among gay (23.7%) and bisexual (32.0%) men and lesbian (33.4%) and bisexual (45.6%) women when compared to heterosexual men (11.1%) and women (19.0%) ($p < 0.01$). These results indicate significant disparities in HRQOL among SM adults, with bisexual women emerging as the most vulnerable group. Many of these health outcomes, such as poor mental health and depression, may lead to poor body image, body dissatisfaction, and eating disorders.²⁶ In a 2016 review of the literature on body image and eating disorders in the LGBTQ+ population, McClain and Peebles found that homosexual men are especially vulnerable to suffering from body image dissatisfaction and eating disorders.²⁶⁻³⁰ One study reported that 42% of men diagnosed with eating disorders identified as homosexual or bisexual,²⁶ despite these groups making up only 5.4% of the total population.³¹ Other studies have found that lesbian and bisexual women are more likely to participate in unhealthy weight control behaviors than straight women⁹ and SM adults are significantly more likely to engage in dieting to lose weight than heterosexual adults.²⁹ It is clearly demonstrated that SM adults suffer from disparities in mental and emotional health, but it is also important to investigate disparities in physical health.

In 2018, Caceres et al. investigated the differences in modifiable risk factors for cardiovascular disease (CVD) and CVD diagnoses in 7,731 men across sexual orientations via data from the National Health and Nutrition Examination Survey (NHANES, 2001-2012).¹³ Many health disparities have been recognized among sexual minorities compared to their heterosexual counterparts, including: worse mental health,³ higher rates of depression,³ increased substance use,⁵ and higher rates of psychological distress and victimization⁴. These disparities are significant regarding CVD risk, as increased social stress and substance use^{5,14,32} are among the most notable modifiable CVD risk factors^{5,14,32,33}. The survey included

items regarding sexual orientation, HRQOL, CVD diagnoses, family history of CVD, modifiable risk factors for CVD such as perceived mental distress, health behaviors (i.e., physical activity, tobacco, and alcohol use), obesity, hypertension, diabetes, and high total cholesterol. Gay men reported less binge drinking (48.3% vs. 54.5%, $p < 0.05$), but otherwise had similar health behaviors to heterosexual men. Bisexual men were more likely to experience frequent mental distress (22.6% vs. 10.1%, $p < 0.05$), and showed a higher prevalence of obesity (42.0% vs. 33.1%, $p < 0.05$), diabetes (12.4% vs. 4.9%, $p < 0.05$), and hypertension (23.7% vs. 11.7%, $p < 0.05$) than exclusively heterosexual men. One possible explanation for these increased risks among bisexual men in particular is that they may have higher levels of stress due to hiding different aspects of their lives from both heterosexual and SM peers.³⁴ These results corroborate other findings in the literature which consistently highlight bisexual individuals as an expressly vulnerable population.^{3,17} The studies reviewed clearly demonstrate the discrepancies of HRQOL in SM adults compared to heterosexual adults, but many neglect to take into account other aspects of a person's life such as race and ethnicity and subsequent experiences of racism and discrimination.

INTERSECTIONALITY AND HRQOL

In 2019, Caceres et al. examined the intersection of sexual identity, race and ethnicity on physiological risk factors for CVD including; body mass index (BMI), systolic blood pressure (SBP), diastolic blood pressure (DBP), hemoglobin A1c (HbA1c), and total cholesterol (TC) in U.S. adults (N=22,305) via data from NHANES (2001-2016).¹⁰ Black lesbian women had higher BMIs compared to straight White women ($p < 0.05$). Black and Latina bisexual women had higher BMIs compared to straight White women ($p < 0.001$; $p < 0.01$, respectively). Black bisexual women had significantly higher SBP and HbA1c than White heterosexual women ($p < 0.05$; $p < 0.001$, respectively). Latina “not sure” women had higher HbA1c and lower DBP than White heterosexual women ($p < 0.01$; $p < 0.05$, respectively). Black and Latino “not sure” men had higher SBP than straight White men ($p < 0.05$; $p < 0.01$, respectively). Black bisexual men had higher DBP than straight White men ($p < 0.05$). Black gay,

bisexual, and “not sure” men, and Latino “not sure” men had higher HbA1c than heterosexual White men ($p < 0.01$; $p < 0.05$; $p < 0.05$; $p < 0.01$, respectively). Latino “not sure” men also had higher TC than straight White men ($p < 0.05$). Consistent with the literature, minority women experienced greater health disparities than men. Bisexual women, specifically Black bisexual women, had several increased CVD risk factors (BMI, SBP, TC, and HbA1c). Black and White lesbian women, and all bisexual women had higher BMIs compared to straight White women. All Black SM men had higher HbA1c, and Latino “not sure” men had higher SBP, HbA1c, and TC. The intersection of race/ethnicity and sexual orientation is important to consider because this population reports higher rates of multifactorial discrimination,³⁵ stressful life events,³⁵ and discrimination from both heterosexual family members³⁶ and White sexual minorities³⁷.

SUMMARY OF THE PROBLEM

The literature consistently demonstrates physical and mental health disparities within the LGBTQ+ community. These disparities not only affect adults but have also been found in early adolescence. Sexual minority adolescents experience poorer overall HRQOL, poorer social, behavioral, and emotional functioning, higher prevalence of depressive symptoms,⁸ WBV,¹⁷ eating disorders,²⁴ and lower overall life satisfaction⁸ than their heterosexual peers. These risk factors need to be closely monitored, because LGBTQ+ youth are already at a higher risk of rejection from their families at baseline²⁰ and an increased risk of developing psychiatric disorders,¹⁸ compounding their risk for experiencing adverse health outcomes in adulthood.

Physical and mental health disparities continue into adulthood. Compared to straight women, SM women have higher rates of frequent daily activity limitations, which indicate a large burden posed by chronic conditions, and thus lower overall quality of life.³ Sexual minority men experience higher rates of frequent mental distress, and worse overall mental health than straight men.³ Additionally, while gay men

typically self-rate their physical health better than other groups,³ overall SM men are much more likely to experience body dissatisfaction and develop eating disorders.¹⁸

Bisexual individuals are consistently found to be the most vulnerable community when it comes to experiencing poor health outcomes. Bisexual men demonstrated significantly higher CVD risk factors (e.g. frequent mental distress, obesity, hypertension, and diabetes) compared to straight men.¹³ Compared to straight women, bisexual women have higher BMI's and increased risk factors for CVD (SBP, TC, and HbA1c).¹⁰ Bisexual women are more likely to self-report poor or fair health, frequent mental distress, frequent physical distress, frequent activity limitations, more unhealthy days per month, and higher rates of depression than any other group.³ Bisexual individuals may have even further increased health risks due to the “double closet phenomenon,” which refers to high levels of stress resulting from hiding parts of their identity from both their heterosexual and SM peers.³⁴

Additionally, those at the intersection of sexual minority and racial or ethnic minority status experience the lowest HRQOL. African American SM men experienced the most homophobic victimization of any race or sexual orientation,⁴ while Black bisexual women had the most risk factors for CVD compared to any other group (BMI, SBP, TC, and HbA1c).¹⁰ Additionally, Black and Latino SM men had increased CVD risk factors.¹⁰ One proposed mechanism for these disparities in health outcomes is the minority stress model. The minority stress model postulates that members of stigmatized communities are exposed to stressors related to their minority status such as prejudice, discrimination, and rejection, which can negatively impact their health.³³ The intersection of race/ethnicity and sexual orientation is important to consider because this population reports higher rates of multifactorial discrimination,³⁵ stressful life events,³⁵ and discrimination from both heterosexual family members³⁶ and White sexual minorities.³⁷ The minority stress model recognizes that those belonging to multiple stigmatized communities (e.g. sexual minorities of color), are at an even greater risk for developing negative health outcomes.³³

Finally, college undergraduate students have been identified as a population with low overall HRQOL, with overweight and obese students, students of color, students facing financial burden, and students with high levels of stress observing compounded health risks.¹¹ The minority stress model indicates that those belonging to minority groups are exposed to stressors that can lead to poorer health outcomes.^{4,8,10} Minority college students and SM adults are both groups of concern; thus, research on health disparities in those residing at the intersection of these two groups is needed. There is a significant lack of existing interventions for sexual minorities,³⁸ and to date, there are no studies available that specifically examine HRQOL in SM undergraduate students. Research in this area can lead to the development and implementation of preventative programming that can improve health outcomes for this at-risk population.

METHODOLOGY

RECRUITMENT

In September of 2020, an online survey was distributed via email to undergraduate students at the University of Maine and Rutgers University to assess health-related quality of life (HRQOL). Student emails were provided by the Office of Student Records. Students were eligible to participate if they were between 18 and 24 years old and enrolled as an undergraduate student. Participants were given the option to provide their email in a separate survey upon completion to be entered into a raffle to win one of twenty \$25 Amazon gift cards. Participants were also given the option to submit their email in a separate survey upon completion to indicate they were interested in participating in a 3-day ASA-24 diet recall, of which 100 participants from this subsample were randomly chosen. Students received a \$5 Amazon gift card for each ASA-24 diet recall completed, for a maximum of \$15 per participant.

STUDY DESIGN

In this descriptive cohort study, participants were asked to answer demographic questions including their age, gender identity, sexual orientation, height, and weight which were used to calculate BMI (appendix A). Sexual minorities were defined as any participant identifying as not exclusively heterosexual (lesbian, gay, bisexual, or “other”). HRQOL was assessed using the Center for Disease Control and Prevention’s Healthy Days Core Module (appendix B), a valid and reliable 9-item survey which asks participants to assess how many days in the past 30 days they have experienced poor physical or mental health and how their health status has affected their daily activities. To measure diet quality, the National Cancer Institute's Fruit and Vegetable Screener (appendix C) was used to measure fruit and vegetable intake within the past month. Additionally, a subsample of respondents was asked to complete the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA-24) to provide a more comprehensive assessment of diet quality which assessed total Healthy Eating Index (HEI) scores. Healthy Eating Index scores consider various aspects of the diet including consumption of fruits,

vegetables, beans, greens, whole grains, dairy, protein foods, fatty acids, refined grains, sodium, added sugars, and saturated fats (appendix D). Added sugar intake and total fruit and vegetable intake were also calculated using the ASA-24 diet recall data. Self-reported items such as “How do you feel about your current weight?” and “Which of the following are you trying to do about your weight?”, as well as discrepancies between actual and desired weight in pounds were used to assess weight dissatisfaction (appendix E).

DATA PROTECTION AND CODING

This study was approved by the University of Maine Institutional Review Board (IRB). Survey data was deidentified and stored securely on a password protected computer in Microsoft excel and later uploaded to SPSS. Students reported their student ID numbers when signing up to participate in the ASA-24 diet recalls. Student ID numbers were used to match ASA-24 data to survey data. Once data sets were matched, student ID numbers were replaced with random deidentified numbers for data analysis. All categorical variables were coded numerically for data analysis.

DATA ANALYSIS

Results were analyzed using SPSS statistical software (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp.). A one-way multivariate analysis of covariance (MANCOVA) was used to determine differences in HRQOL variables between SM and heterosexual participants while controlling for BMI and gender. A one-way multivariate analysis of variance (MANOVA) was used to assess differences in HRQOL variables between groups (gender, sexual orientation, and race/ethnicity) within the subsample of SM students. Chi-square tests were used to assess differences in feelings of weight dissatisfaction between heterosexual and SM students, and an independent t-test was used to assess differences between current weight and desired weight across sexual orientations. Independent t-tests were used to assess differences in ASA-24 variables (total HEI, servings of fruit and vegetables, and grams of added sugars consumed) between SM and heterosexual students.

RESULTS

HRQOL

The survey link was distributed to 8,933 undergraduate students. A total of 807 students completed the survey, of which 690 had complete data sets. Participants were an average of 19.9 ± 1.8 years old, 63% female ($n=434$), and 83% white ($n=567$). Of this sample, 76.1% ($n = 525$) were heterosexual and 23.9% ($n = 165$) identified as sexual minorities (SM) (Demographic variables shown in Table 1.1). There were statistically significant differences in HRQOL between SM and heterosexual students, $F(6, 584) = 8.89$, $p < 0.001$; Wilk's $\Lambda = 0.916$, partial $\eta^2 = 0.084$, even after controlling for gender and BMI (Table 2.1). Compared to their heterosexual peers, SM students experienced more days per month having poor mental health (14.5 ± 9.8 vs. 8.5 ± 8.7 days, $p < 0.001$); more days per month feeling sad, blue, or depressed (12.0 ± 9.7 vs. 6.3 ± 7.8 days, $p < 0.001$); more days per month feeling worried, tense, or anxious (18.1 ± 10.2 vs. 10.9 ± 9.8 days, $p < 0.001$); more days per month feeling they did not get enough sleep (13.8 ± 9.6 vs. 11.1 ± 9.0 days, $p = 0.012$); and fewer days per month feeling very healthy and full of energy (6.8 ± 6.5 vs. 11.4 ± 8.7 days, $p < 0.001$). SM students reported slightly more days per month having poor physical health, however this finding was not significant (3.7 ± 5.9 vs. 3.2 ± 6.0 , $p = 0.964$). Additionally, SM students had significantly higher BMIs than their heterosexual peers (25.8 ± 6.1 vs. 24.4 ± 4.8 , $p = 0.005$). SM students also consumed fewer servings of fruits and vegetables per day, though this finding was not significant (1.4 ± 0.9 vs. 1.5 ± 1.0 , $p = 0.083$).

Table 1.1 Demographic Variables of College Undergraduate Students Completing an Online Survey assessing Health-Related Quality of Life (n=690)

Demographic Variable	Mean	Standard Deviation	
Age (years)	19.9	1.8	
	Category	Percent	n
Race/Ethnicity	White	82.7	567
	Black	2.8	19
	Hispanic	5.1	35
	Native American	5.2	36
	Other	4.2	29
Gender Identity	Male	33.6	231
	Female	63.1	434
	Other	3.3	23
Sexual Orientation	Heterosexual	76.1	525
	Homosexual/Gay/Lesbian	2.8	19
	Bisexual	11.2	77
	Queer	3.0	21
	Questioning/Unsure	2.6	18
	Something Else	2.3	16
	Total Sexual Minority	23.9	165

Table 2.1 Health-Related Quality of Life Variables Among College Undergraduate Students Completing an Online Survey by Sexual Orientation (N=690)

HRQOL Variable	Sexual Minority	Heterosexual	P value
Mean (days per month ± std)			
Poor physical health	3.7 (± 5.9)	3.2 (± 6.0)	0.964
Poor mental health	14.5 (± 9.8)	8.5 (± 8.7)	<0.001*
Feeling sad, blue, or depressed	12.0 (± 9.7)	6.3 (± 7.8)	<0.001*
Feeling worried, tense, or anxious	18.1 (± 10.2)	10.9 (± 9.8)	<0.001*
Feeling they did not get enough sleep	13.8 (± 9.6)	11.1 (± 9.0)	0.012*
Feeling healthy and full of energy	6.8 (± 6.5)	11.4 (± 8.7)	<0.001*
Other Health Factors			
Sexual Minority Heterosexual P value			
Mean BMI (kg/m ²)	25.8 (± 6.1)	24.4 (± 4.8)	0.005*
Sexual Minority Heterosexual P value			
Mean fruit and vegetable consumption (servings per day ± std)	1.4 (± 0.9)	1.5 (± 1.0)	0.083

*P values ≤ 0.05 considered statistically significant.

DIET QUALITY

Of the final subsample of participants who completed the ASA-24 diet recall (n=72), 45 identified as heterosexual (62.5%) and 27 identified as SM (37.5%) (Table 3.1). Sexual minority students had slightly lower total HEI scores than heterosexual students, though this finding was not significant (51.3 ± 17.1 vs. 54.8 ± 14.5 , out of a possible 100 points with higher scores indicating more healthful eating habits, $p=0.385$). No significant differences were seen in cups of fruit consumed per day (SM: 1.2 ± 1.4 , Heterosexual: 1.0 ± 1.3 , $p=0.454$) or cups of vegetables consumed per day (SM: 1.2 ± 0.9 , Heterosexual: 1.7 ± 1.2 , $p=0.057$). SM students did consume significantly more grams of added sugars per day than their heterosexual peers (14.4 ± 7.9 vs. 10.2 ± 7.1 , $p=0.020$).

Table 3.1 ASA-24 Diet Recall Results from College Undergraduate Students by Sexual Orientation

(n=72)

Demographics			
Sexual Orientation	Percent	n	
Heterosexual	62.5	45	
Sexual Minority	37.5	27	
Results			
Variables	Sexual Minority	Heterosexual	P value
Mean Healthy Eating Index (HEI) Score (\pm std)	51.3 (\pm 17.1)	54.8 (\pm 14.5)	0.358
	Sexual Minority	Heterosexual	P value
Mean Fruit Consumption cups per day (\pm std)	1.2 (\pm 1.4)	1.0 (\pm 1.3)	0.454
Mean Vegetable Consumption cups per day (\pm std)	1.2 (\pm 0.9)	1.7 (\pm 1.2)	0.057
	Sexual Minority	Heterosexual	P value
Mean Added Sugar Consumption grams per day (\pm std)	14.4 (\pm 7.9)	10.2 (\pm 7.1)	0.020*

*P values \leq 0.05 considered statistically significant.

WEIGHT DISSATISFACTION

A significant difference was found between groups regarding “How do you feel about your current weight?”. A greater percentage of SM students reported being less happy with their weight (30.7% vs 44.0%) and being upset about their current weight (43.0% vs. 39.4%) than heterosexual students (p=0.001). When asked, “Which of the following are you trying to do about your weight?”, SM students were more likely to want to lose weight (47.9 vs. 46.8%) or do nothing about their weight (28.4% vs. 19.1%), and less likely to want to gain weight (6.3% vs. 13.4%) or maintain their current weight (17.4% vs. 20.7%) than their heterosexual peers (p=0.005). When examining differences between current weight and desired weight, SM students wanted to change their weight by about 4.2 pounds more than heterosexual students, though this finding was only approaching significance (18.8 vs. 14.6 pounds, p=0.073). Weight dissatisfaction results are shown in tables 4.1 and 4.2.

Table 4.1 Weight Dissatisfaction Results from College Undergraduate Students Taking an Online Survey Assessing Health-Related Quality of Life by Sexual Orientation (N=690)

Weight Dissatisfaction Variable	Sexual Minority Percent	Sexual Minority N	Heterosexual Percent	Heterosexual n	Pearson Chi-Square	P value
“How do you feel about your current weight?”						
Happy	30.7	55	44.0	240	13.044 ^a	0.001*
Don't Care	26.3	47	16.5	90		
Upset	43.0	77	39.4	215		
“Which of the following are you trying to do about your weight?”						
Lose	47.9	91	46.8	269	12.729 ^a	0.005*
Gain	6.3	12	13.4	77		
Maintain	17.4	33	20.7	119		
Nothing	28.4	54	19.1	110		

*P values ≤ 0.05 considered statistically significant.

Table 4.2 Desired Weight Change Results from College Undergraduate Students Taking an Online Survey Assessing Health-Related Quality of Life by Sexual Orientation (N=690)

Desired Weight Change Variable	Sexual Minority	Heterosexual Mean	P value
Desired Weight Change*	18.8 (± 20.1)	14.6 (± 24.2)	0.073
Mean (absolute value in pounds ± std)			

*Desired weight change calculated as: |current weight – desired weight|

*P values ≤ 0.05 considered statistically significant.

GROUP DIFFERENCES WITHIN THE SEXUAL MINORITY SAMPLE

Of participants within the SM subsample with complete data sets (n=151): 129 were White (85.4%) and 22 were non-White (14.6%; Black, Hispanic, Native American, or “other”); 24 were male (16.0%), 106 were female (70.6%), and 20 were another gender (13.3%; trans-male, trans-female, gender-nonconforming, or “other”); 19 were exclusively homosexual (12.6%; gay or lesbian), 77 were bisexual (60.0%), 21 were queer (13.9%), 18 were questioning or unsure (11.9%), and 16 were something else (10.6%). No significant differences were seen between groups based on race/ethnicity (Table 5.1), gender (Table 5.2), or sexual orientation (Table 5.3) for HRQOL variables, BMI, or servings of fruit and vegetables per day within the SM subsample.

Table 5.1 Health-Related Quality of Life Variables Among Sexual Minority College Undergraduate Students by Race/Ethnicity (n=151)

Demographics			
Racial/Ethnic Minority Status	Percent	N	
White	85.4	129	
Non-White	14.6	22	
Results			
HRQOL Variable	Non-White	White	P value
Mean (days per month)			
Poor physical health	5.0 (± 7.8)	3.1 (± 4.6)	0.100
Poor mental health	14.2 (± 10.6)	14.7 (± 9.5)	0.825
Feeling sad, blue, or depressed	11.5 (± 9.9)	12.3 (± 9.7)	0.743
Feeling worried, tense, or anxious	17.2 (± 9.2)	18.2 (± 10.3)	0.684
Feeling they did not get enough sleep	13.0 (± 8.8)	13.9 (± 9.9)	0.691
Feeling healthy and full of energy	7.6 (± 6.7)	6.8 (± 6.7)	0.563
Other Health Factors			
Mean BMI (kg/m ²)	27.2 (± 6.3)	25.1 (± 5.4)	0.109
Non-White White P value			
Mean fruit and vegetable consumption (servings per day ± std)	2.2 (± 1.5)	2.1 (± 1.1)	0.713

*P values ≤ 0.05 considered statistically significant.

Table 5.2 Health-Related Quality of Life Variables Among Sexual Minority College Undergraduate Students by Gender Identity (n=151)

Demographics			
Gender Identity	Percent	N	
Male	16.0	24	
Female	70.6	106	
Other	13.3	20	
Results			
HRQOL Variable	Male	Female	P value
Mean (days per month)			
Poor physical health	2.3 (± 5.7)	3.6 (± 5.5)	0.844
Poor mental health	10.9 (± 9.7)	14.9 (± 9.6)	0.085
Feeling sad, blue, or depressed	8.8 (± 9.9)	12.4 (± 9.7)	0.140
Feeling worried, tense, or anxious	14.4 (± 11.1)	18.9 (± 9.9)	0.223
Feeling they did not get enough sleep	12.1 (± 10.2)	14.4 (± 9.4)	0.784
Feeling healthy and full of energy	8.0 (± 8.8)	6.7 (± 6.1)	0.710
Other Health Factors			
	Male	Female	P value
Mean BMI (kg/m ²)	24.4 (± 6.3)	25.4 (± 5.1)	0.190
	Male	Female	P value
Mean fruit and vegetable consumption (servings per day ± std)	1.8 (± 1.1)	2.2 (± 1.3)	0.437

*P values ≤ 0.05 considered statistically significant.

Table 5.3 Health-Related Quality of Life Variables Among Sexual Minority College Undergraduate Students by Sexual Orientation (n=151)

Demographics						
Sexual Orientation	Percent	n				
Homosexual/Gay/Lesbian	12.6	19				
Bisexual	60.0	77				
Queer	13.9	21				
Questioning/Unsure	11.9	18				
Something Else	10.6	16				
Results						
HRQOL Variable	Homosexual/ Gay/Lesbian	Bisexual	Queer	Questioning/ Unsure	Something Else	P value
Mean (days per month ± std)						
Poor physical health	2.6 (± 5.1)	3.8 (± 5.6)	3.1 (± 3.7)	3.4 (± 7.1)	2.2 (± 2.9)	0.776
Poor mental health	12.8 (± 9.3)	14.5 (± 8.8)	14.9 (± 10.9)	13.0 (± 10.8)	18.6 (± 10.5)	0.414
Feeling sad, blue, or depressed	10.7 (± 9.8)	12.4 (± 9.5)	11.6 (± 9.7)	10.6 (± 9.2)	15.6 (± 11.1)	0.554
Feeling worried, tense, or anxious	16.3 (± 9.7)	18.6 (± 10.2)	18.2 (± 10.0)	15.9 (± 10.8)	19.7 (± 11.0)	0.741
Feeling they did not get enough sleep	15.3 (± 9.7)	14.4 (± 8.9)	12.0 (± 9.3)	11.8 (± 13.0)	13.2 (± 10.1)	0.673
Feeling healthy and full of energy	6.8 (± 7.9)	6.5 (± 5.9)	10.0 (± 8.0)	6.3 (± 6.6)	5.6 (± 4.7)	0.198
Other Health Factors	Homosexual/ Gay/Lesbian	Bisexual	Queer	Questioning/ Unsure	Something Else	P value
Mean BMI (kg/m ²)	26.8 (± 7.8)	25.1 (± 5.0)	24.3 (± 4.4)	24.5 (± 4.9)	28.2 (± 7.0)	0.173
	Homosexual/ Gay/Lesbian	Bisexual	Queer Mean	Questioning/ Unsure	Something Else	P value
Mean Fruit and vegetable consumption (servings per day ± std)	2.2 (± 1.2)	2.2 (± 1.2)	2.2 (± 0.8)	2.0 (± 1.3)	1.6 (± 1.1)	0.377

*P values ≤ 0.05 considered statistically significant.

DISCUSSION OF RESULTS

The findings from the present study demonstrate that similar disparities in HRQOL exist in SM college students as have been observed in SM adolescent and adult populations. Similar to the findings of Perales and Campbell studying SM adolescents⁸ and Potter and Patterson studying SM adults,³ SM college undergraduate students reported significantly worse overall HRQOL, with mental health variables showing the largest disparities. Sexual minority students experienced more days feeling sad, blue, or depressed; worried, tense, or anxious; feeling they did not get enough sleep; and feeling they had poor mental health; and fewer days feeling healthy and full of energy compared to heterosexual students, even when controlling for gender and BMI. Similar to the findings of Potter and Patterson³ on HRQOL in LGBTQ+ adults, mental health variables affected SM students at about twice the rate of heterosexual students. This indicates that, independent of other factors, SM students are uniquely vulnerable to experiencing reduced HRQOL, especially poor mental health. These findings underscore the importance of developing and providing support and resources specifically aimed at promoting LGBTQ+ health, especially mental health, across the lifespan from adolescence throughout adulthood. In addition to the findings related to HRQOL, this study uncovers novel discrepancies in diet quality and weight dissatisfaction between SM and heterosexual students.

Some notable differences were found in diet quality between heterosexual and SM students. Fruit and vegetable intake, as measured by the NCI Fruit and Vegetable Screener and HEI sub scores, was not significantly different; however, these variables were approaching significance and significant differences may be seen with a larger sample size. SM students did however consume an average of 4.2 grams (1 tsp) more added sugar per day than their heterosexual peers, or an average 112 additional calories from added sugar each week. This difference in added sugar consumption may be a contributing factor in the observed differences in BMI. Sexual minority students had higher BMIs than heterosexual students by an average of 1.4 kg/m², a difference between a BMI classification of “overweight” (SM students at 25.8)

versus “normal weight” (heterosexual students at 24.4). Young adults with overweight and obesity are more likely to experience adverse health outcomes later in life including increased rates of cardiovascular disease, dyslipidemia, insulin resistance, type 2 diabetes mellitus, non-alcoholic fatty liver disease, obstructive sleep apnea, osteoarthritis, depression, and even mortality.³⁹ Additionally, an elevated BMI may lead to increased weight dissatisfaction, which is associated with its own set of psychological and physiological health complications.

Similar to the findings from the systematic review examining body image dissatisfaction and eating disorder prevalence among LGBTQ+ adults conducted by McClain and Peebles,¹⁸ SM students were significantly less happy with their current weight and more likely to want to lose weight compared to heterosexual students. Sexual minority students wanted to change their weight by an average of 4.2 pounds more than straight students, a finding that was approaching significance and may be found to be significant in a larger sample size. This increased prevalence of weight dissatisfaction may be a contributing factor to the discrepancies seen in mental health variables such as anxiety, and depression.⁴⁰

Contrary to the findings of other studies which highlight compounded health disparities in individuals belonging to multiple minority groups,^{10,19} no significant differences were found between groups within the SM sample in regard to race/ethnicity, gender, or sexual orientation. This is likely due to the homogeneity of the SM sample; significant differences may be found with a more diverse sample.

Finally, it is worth noting that college students may be a particular group of interest for future studies within the LGBTQ+ community. A staggering 23.9% of participating students identified as SM, compared to an estimated 5.6% of the total adult population of the U.S.⁴¹ This is likely not due to an increase in LGBTQ+ individuals, but rather due to an increase in adoption of LGBTQ+ labels in younger generations as a result of increasing societal acceptance. While only 1 to 4% of Traditionalists, Baby Boomers, and Generation X identify as LGBTQ+, it is estimated that 9.1% of Millennials, and 15.9% of Generation Z identifies as such.⁴¹ This large subset of LGBTQ+ college students is not unique to this

sample. The CDC estimates that 15.6% of college students in the U.S. identify as SM, ranging from 11.9% in Utah to 20.6% in New York, making this an ideal sample of recruitment to study LGBTQ+ health.⁴²

This study has many strengths including its relatively large sample size and large subsample of SM students. Within the SM sample, 60.0% were bisexual, a number that is consistent with global estimates of the LGBTQ+ community.⁴³ This study was not without limitations. This sample was largely White (82.7% compared to the national average for college students of 54.8%)⁴⁴ and female (63.1% compared to the national average for college students of 56.6%)⁴⁵ and therefore may not be representative of all college undergraduate students. Additionally, the subsample of students completing the ASA-24 diet recall was very small (n=72), limiting the generalizability of the HEI data. Finally, this data was collected during the COVID-19 pandemic, thus HRQOL variables may have been affected in this sample.

SUMMARY AND CONCLUSIONS

Due to the large percentage of students who identify as SM, college may be a particular setting of interest for studying LGBTQ+ health in the future. Consistent with other findings within this community, SM college undergraduate students had worse overall HRQOL than heterosexual students, with the largest disparities seen in mental health variables. While no significant differences were found in perceived physical health, fruit, or vegetable intake, SM students consumed 1 tsp/day more added sugar, were more likely to be overweight, and less likely to be satisfied with their current weight than their heterosexual peers. This study corroborates similar findings in LGBTQ+ adolescents and adults and uncovers novel discrepancies in diet quality and weight dissatisfaction in this population. These findings highlight the presence of both physical and mental health disparities in the LGBTQ+ community across the lifespan and underscore the importance of developing relevant support and programing to mitigate poor health outcomes. Further research is needed with a larger, more diverse sample to determine if there are significant differences in variables that are approaching significance (vegetable consumption, desired weight change, some HRQOL variables between groups) and to determine if these findings are consistent outside of the environment of a global pandemic.

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Appendix A: Demographic Questions

Q5 How old are you?

▼ 18 (1) ... Older than 30 (8)

Q2 What is your gender identity?

- Male (1)
 - Female (2)
 - Trans-male/Trans-man (3)
 - Trans-female/Trans-woman (4)
 - Gender non-conforming (5)
 - Different identity—please state: (6)

 - Choose not to answer (7)
-

Q3 What is your ethnicity?

- White (1)
 - Hispanic or Latino (2)
 - Black or African American (3)
 - Native American or American Indian or Asian/Pacific Islander (4)
 - Other (5) _____
 - Choose not to answer (6)
-

Q4 What year in college are you?

- Freshman (1)
 - Sophomore (2)
 - Junior (3)
 - Senior (4)
 - Graduate Student (5)
-

Q6 Do you have a dining meal plan?

- Yes (1)
 - No (2)
 - Choose not to answer (3)
-

Q7 Do you live:

- On Campus (1)
 - Off Campus (2)
 - Choose not to answer (3)
-

Q425 Who are you currently living with?

- Friends/roommates (1)
 - Family members (2)
 - No one (3)
 - Other (4) _____
-

Q8 Do you think of yourself as..

- Heterosexual, or straight (1)
 - Homosexual, or gay or lesbian (2)
 - Bisexual (3)
 - Queer (4)
 - Questioning/Unsure (5)
 - Something else – Specify: (6)

-

Q9 What is your height?

Feet (3) _____

Inches (4) _____

Q11 What is your weight (in pounds)?

Q10 What is your GPA?

Appendix B: HRQOL Items

Q288 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 (1) ... Don't know (32)

Q289 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 (1) ... Don't know (32)

Q290 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 (1) ... Don't know (32)

Q291 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 (1) ... Don't know (32)

Q292 During the past 30 days, how many days have you felt SAD, BLUE, or DEPRESSED?

▼ 0 (1) ... Don't Know (32)

Q293 During the past 30 days, for about how many days have you felt WORRIED, TENSE, or ANXIOUS?

▼ 0 (1) ... Don't Know (32)

Q294 During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP?

▼ 0 (1) ... Don't Know (32)

Q295 How many days did poor mental health keep you from doing your usual activities, such as self-care, work, or recreation?

▼ 0 (1) ... Don't Know (32)

Q296 During the past 30 days, for about how many days have you felt VERY HEALTHY AND FULL OF ENERGY?

▼ 0 (1) ... Don't Know (32)

End of Block: Health Related Quality of Life Instrument

Appendix C: NCI Fruit and Vegetable Screener

Start of Block: NCI F/V Screener

Q261 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.

Page Break

Q242 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)
 - 1-3 times last month (2)
 - 1-2 times per week (3)
 - 3-4 times per week (4)
 - 5-6 times per week (5)
 - 1 time per day (6)
 - 2 times a day (7)
 - 3 Times a day (8)
 - 4 times a day (9)
 - 5 or more times per day (10)
-

Display This Question:

*If Over the last month, how many times per month, week, or day did you drink 100% fruit juice such a... !=
Never*

Q243 Each time you drank 100% juice, how much did you usually drink?

- Less than 6 ounces: Less than 3/4 cup (1)
- 6 to 10 ounces: 3/4 to 1 1/4 cup (2)
- 10 to 16 ounces: 1 1/4 cup to 2 cups (3)
- 16 ounces or more: Over 2 cups (4)

Page Break

Q244 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)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

If Over the last month, how many times per month, week, or day did you eat fruit? Count any type of... != Never

Q245 Each time you ate fruit, how much did you usually eat?

- Less than 1 medium sized fruit (1)
 - 1 medium fruit (2)
 - 2 medium fruits (3)
 - More than 2 medium fruits (4)
-

Q246 Over the last month, how often did you eat lettuce salad (with or without vegetables)?

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

If Over the last month, how often did you eat lettuce salad (with or without vegetables)? != Never

Q247 Each time you ate lettuce salad, how much did you usually eat?

- About 1/2 cup (1)
- About 1 cup (2)
- About 2 cups (3)
- Over 2 cups (4)

Q248 Over the last month, how often did you eat french fries or fried potatoes?

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

If Over the last month, how often did you eat french fries or fried potatoes? != Never

Q249 Each time you ate french fries or fried potatoes, how much did you usually eat?

- Small Order or Less (About 1 cup or less) (1)
- Medium Order (About 1 1/2 cups) (2)
- Large Order (About 2 cups) (3)
- More than a large order (2 cups or more) (4)

Page Break

Q250 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)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

*If Over the last month, how often did you eat other white potatoes? Count baked, boiled, mashed pota... !=
Never*

Q251 Each time you ate these potatoes, how much did you usually eat?

- 1 small potato or less (1)
- 1 medium potato (2)
- 1 large potato (3)
- 2 medium potatoes or more (4)

Page Break

Q252 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)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

*If Over the last month, how often did you eat cooked dried beans? Count baked beans, beans soup, ref... !=
Never*

Q253 Each time you ate these beans, how much did you usually eat?

- Less than 1/2 cup (1)
- 1/2 cup to 1 cup (2)
- 1 to 1 1/2 cups (3)
- More than 1 1/2 cups (4)

Page Break

Q254 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)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

*If Over the last month, how often did you eat other vegetables? Do not include: lettuce salads, whit... !=
Never*

Q255 Each of these times that you ate other vegetables, how much did you usually eat?

- Less than 1/2 cup (1)
- 1/2 to 1 cup (2)
- 1 to 2 cups (3)
- Over 2 cups (4)

Q256 Over the last month, how often did you consume tomato sauce? Include tomato sauce on pasta, macaroni, rice, pizza, and other dishes.

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

*If Over the last month, how often did you consume tomato sauce? Include tomato sauce on pasta, macar... !=
Never*

Q257 Each time you ate tomato sauce, how much did you usually eat?

- About 1/4 cup (1)
 - About 1 cup (2)
 - More than 1 cup (3)
-

Q258 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.

- Never (1)
- 1-3 times per month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

Display This Question:

*If Over the last month, how often did you eat vegetable soup? Include tomato soup, gazpacho, beef wi... !=
Never*

Q259 Each time you ate vegetable soup, how much did you usually eat?

- Less than 1 cup (1)
- 1 to 2 cups (2)
- 2-3 cups (3)
- More than 3 cups (4)

Page Break

Q260 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.

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

End of Block: NCI F/V Screener

Appendix D: HEI–2015¹ Components & Scoring Standards

Component	Maximum points	Standard for maximum score	Standard for minimum score of zero
Adequacy:			
Total Fruits²	5	≥0.8 cup equiv. per 1,000 kcal	No Fruit
Whole Fruits³	5	≥0.4 cup equiv. per 1,000 kcal	No Whole Fruit
Total Vegetables⁴	5	≥1.1 cup equiv. per 1,000 kcal	No Vegetables
Greens and Beans⁴	5	≥0.2 cup equiv. per 1,000 kcal	No Dark Green Vegetables or Legumes
Whole Grains	10	≥1.5 oz equiv. per 1,000 kcal	No Whole Grains
Dairy⁵	10	≥1.3 cup equiv. per 1,000 kcal	No Dairy
Total Protein Foods⁶	5	≥2.5 oz equiv. per 1,000 kcal	No Protein Foods
Seafood and Plant Proteins^{6,7}	5	≥0.8 oz equiv. per 1,000 kcal	No Seafood or Plant Proteins
Fatty Acids⁸	10	(PUFAs + MUFAs)/SFAs ≥2.5	(PUFAs + MUFAs)/SFAs ≤1.2
Moderation:			
Refined Grains	10	≤1.8 oz equiv. per 1,000 kcal	≥4.3 oz equiv. per 1,000 kcal
Sodium	10	≤1.1 gram per 1,000 kcal	≥2.0 grams per 1,000 kcal
Added Sugars	10	≤6.5% of energy	≥26% of energy
Saturated Fats	10	≤8% of energy	≥16% of energy

1: Intakes between the minimum and maximum standards are scored proportionately.

2: Includes 100% fruit juice.

3: Includes all forms except juice.

4: Includes legumes (beans and peas).

5: Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages.

6: Includes legumes (beans and peas).

7: Includes seafood, nuts, seeds, soy products (other than beverages), and legumes (beans and peas).

8: Ratio of poly- and monounsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs).

Appendix E: Weight Dissatisfaction Items

Start of Block: Weight Satisfaction

Q366 Which of the following are you trying to do about your weight?

- Lose Weight (1)
 - Gain Weight (2)
 - Stay at the Same Weight (3)
 - I am not trying to do anything about my weight. (4)
-

Q367 How do you feel about your current weight?

- I am happy with my weight. (1)
 - I don't care about my current weight. (2)
 - I am upset about my current weight. (3)
 - Choose not to answer (4)
-

Q368 What is your desired weight (in pounds)?

- Pounds (1) _____
- Choose not to answer (2)

End of Block: Weight Satisfaction

BIOGRAPHY OF THE AUTHOR

Leigh Neptune is a 27-year-old Mainer from Indian Island, Maine. She graduated from John Bapst Memorial High School in 2012. She earned a Bachelor of Science in Business Marketing from the University of Maine in 2017, and a Bachelor of Science in Food Science and Human Nutrition from the University of Maine in 2020. She is currently in pursuit of a Master of Science in Food Science and Human Nutrition and will be completing a dietetic internship in southern Maine from May to December of 2021. Her plan is to complete the Registered Dietitian Examination and become a Registered Dietitian Nutritionist (RDN) upon completion of her master's degree. Her long-term goal is to pursue a doctorate in Nutrition with a focus on public health nutrition, specifically investigating health disparities. She would like to work in a University setting as a professor and researcher of nutrition.

Leigh is a student member of the Academy of Nutrition and Dietetics (including the “Vegetarian Nutrition” and “Nutrition Education for the Public” dietetics practice groups) and the American Public Health Association. She has experience as a research assistant conducting studies on human subjects and experience as a teaching assistant. She has had the unique opportunities to attend national nutrition conferences both in-person and virtually. She created an academic poster presentation for the American Society of Nutrition conference in 2020 and will create another poster presentation for the same conference in 2021. She has authored two abstracts and one manuscript in peer-reviewed academic journals on the topics of health-related quality of life and nutrition literacy in college undergraduate students.

Leigh is recently engaged to Anjelica Davenport and a pet-mom to Reggie the golden retriever, and Clover the holland lop rabbit. In her free time, she loves cooking, singing, hiking, yoga, and gardening. Leigh is a candidate for the Master of Science degree in Food Science and Human Nutrition from the University of Maine in December 2021.