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Associations between diet quality and intentions to lose weight in an adolescent sample

Morganne Belton
University of Tennessee, mbelton@vols.utk.edu

To the Graduate Council:

I am submitting herewith a thesis written by Morganne Belton entitled "Associations between diet quality and intentions to lose weight in an adolescent sample." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Nutrition.

Sarah Colby, Major Professor

We have read this thesis and recommend its acceptance:

Marsha Spence, Katie Kavanagh

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

Associations between Diet Quality and Intentions to Lose Weight in an Adolescent Sample

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Abstract

Background: Adolescents, specifically females, are at risk of body dissatisfaction. Body dissatisfaction can be a predictor of females having intentions to lose weight. Diet quality is often poor among adolescents; however, there is little research about how diet quality is related to weight and intent to lose weight.

Purpose: This study assessed the associations between diet quality, measured using the short Healthy Eating Index (sHEI), weight, and intentions to lose weight among adolescent females in one county in the Southeastern United States.

Methods: Secondary data collected originally for the Get Fruved high school intervention were used for analyses. Female participants, ages 13 to 19 years (n=242), were included in the sample. Linear regressions were used to assess the associations between BMI, intentions to lose weight and diet quality while controlling for age, and race. Post-regression confirmatory chi-square tests further assessed associations between intentions to lose weight and fruit, vegetables, dairy, added sugar, and saturated fat.

Results: No associations were found between intentions to lose weight and female respondents' diet quality. When stratified by BMI category, there were no significant differences between intentions to lose weight and fruit, vegetable, dairy, saturated fat, and added sugar intake among healthy weight females. However, overweight and obese females who had intentions to lose weight consumed more saturated fat compared to those in the overweight/obese category who did not have intentions to lose weight (p=0.002).

Conclusions: Due to the number of statistical tests used to analyze the data, the relationship detected between saturated fat intake and weight status and intention to lose weight should be viewed with caution. The lack of associations found between diet quality, weight and intention to lose weight may indicate that it is possible that adolescents are not changing their diet despite having intentions to change their weight. Adolescents may be engaging in other weight control behaviors other than diet, such as increasing physical activity, or intentions to lose weight may not result in any behavior changes.

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Chapter One: Literature Review

Body Image

Body image is a multi-dimensional construct that describes how an individual perceives one's own body. [1] One can perceive his/her whole body or only parts of his/her body as smaller or larger than it is in actuality. [1] According to Cash [2], body image is "one's body-related self-perceptions and self-attitudes, including thoughts, beliefs, feelings, and behaviors" (p 1-2). While body image is a multi-dimensional construct that can influence multiple parts of one's life, body dissatisfaction may only be influenced by how one perceives his/her body. When body image becomes increasingly important in one's life, a misperception can lead to body dissatisfaction. [1] Body dissatisfaction describes being dissatisfied with the way that one looks and, in Western culture, it may include being dissatisfied with one's weight. [3] According to the American Psychiatric Association [4], one of the diagnostic criteria for *anorexia nervosa* is body dissatisfaction, where the way one experiences himself/herself is so disturbed that it influences the individual's beliefs of self-worth.

Most individuals develop a body image of himself/herself between the ages of five and seven years. [5] Although body image is thought to initially develop by the age of seven years, it is not static throughout a lifetime. For example, adolescence is a time in which body image can become distorted, and body dissatisfaction often increases, likely related to the physical changes that adolescents undergo. [1, 6] Adolescence is characterized as the time spanning between 10 and 24 years of age; [7] this time is further categorized as early (11-14 years), middle (15-17 years), and late (18-21 years) adolescence. [8] Often during early or middle adolescence, females experience menarche, the onset of menstruation. In the United States,

although variable between race/ethnicities, the average age of menarche is 12.3 years. [9] The onset of menstruation has been found to be a predictor of an increase in body dissatisfaction among females; many pubescent females struggle with body image due to increases in adiposity [1, 6] and increasing size of certain body features (breasts, hips, feet, hands, and/or face) occurring as part of this normal developmental process. [1]

With increasing body dissatisfaction, adolescent health behaviors can be impacted. Body dissatisfaction may influence food consumption behaviors, [10-14] such as decreasing portion sizes. Some adolescents may use physical activity as a way to decrease body dissatisfaction. [15] Additionally, body dissatisfaction can influence one's mental health, as it has been associated with issues such as anxiety or depression. [13, 16, 17] Body dissatisfaction and negative body image are risk factors for disordered eating patterns and eating disorders. [6]

Association with food behavior. An adolescent female's weight control behaviors (WCB) are strongly correlated to her body mass index (BMI) and her body dissatisfaction. [10-13, 16] With increasing BMI, adolescents are more likely to engage in WCB. However, WCBs are not only common among adolescents with a higher BMI. For example, one study found that the prevalence of adolescents using WCB was very high, at 91.5%, but only 43.9% were engaging in unhealthy WCB. Further, females (54.2%) were more likely than males (32.1%) to engage in unhealthy weight control behaviors. [18] Therefore, WCBs are common among most adolescents, but females are more likely to engage in these behaviors.

Though there are healthy WCBs, such as creating an energy deficit leading to a weight loss of no more than 2 pounds per week (if weight loss is appropriate) [62], many WCBs are considered to be unhealthy. Unhealthy WCB includes skipping meals, using diet pills, and/or

fasting to control one's weight. [13] Additional categories of unhealthy WCB can include eating very small portions of food, which can become restrictive, smoking cigarettes, making oneself vomit after a meal, and using laxatives or diuretics for weight loss purposes. [10] Adolescent females who are overweight or obese are more likely to use more of the unhealthy WCBs to control their weight compared to adolescent females who are not overweight. [13] In addition to the more immediate risks of developing clinical eating disorders, eroding tooth enamel, and/or developing dependence on laxatives and/or cigarettes, [4] the consistent use of unhealthy WCB over 10 years may ultimately lead to an increased BMI; [10] therefore, unhealthy WCB should be discouraged.

Lampard and colleagues [13] examined specific healthy WCB among adolescents. Those included: exercise, increased fruit and vegetable intake, decreased soda consumption, decreased dessert consumption, decreased fat consumption, or being conscious of portion sizes to decrease over-eating. Physical activity was the most commonly used healthy WCB among the population. Adolescents who had a healthy weight were more likely to use healthy WCB to control their weight compared to overweight or obese adolescents; additionally, those that used healthy WCB were characterized as having lower body fat, higher self-esteem, or having lower depressive symptoms. [13] The study showed that approximately three in four female adolescents used a WCB. [13, 16] Those who engaged in more healthy WCBs were less likely to be overweight or obese while those who engaged in more unhealthy WCBs were likely to be overweight or obese and have low self-esteem. [13] Another study showed that overweight or obese adolescents were more likely to lose weight using unhealthy WCB, compared to healthy weight adolescents who were also using WCBs [19] While adolescents at a healthy weight may

also engage in unhealthy WCB, they are not as likely to engage in these compared to overweight or obese adolescents. However, it is important to emphasize that the relationships detected between the use of WCBs (healthy or unhealthy) and an adolescent's BMI category are merely associations; these do not represent causation.

Association with physical activity. Body dissatisfaction is associated with the amount of physical activity in which an adolescent engages. [20] According to Lampard et al, [13] increasing physical activity is a healthy WCB and physical activity can have a protective effect on body dissatisfaction. [21] However, other studies have shown that some adolescents used vigorous physical activity to cope with their body dissatisfaction [15, 20]. Therefore, physical activity may be used by adolescents to protect against body dissatisfaction or to reduce body dissatisfaction. When adolescents are exercising excessively to cope with their body dissatisfaction, this may be an unhealthy WCB.

A longitudinal study in China found children (ages 6 to 17) who were dissatisfied with their weight were more likely to increase their physical activity. [15] The researchers followed the children for 11 years with assessments in 2000, 2004, 2006, 2009, and 2011. Those who were overweight or obese at the beginning of the study remained overweight or obese after the 11 years. [15] While children may be engaging in physical activity to either protect against or treat body dissatisfaction, it may be unlikely for their weight status to change.

Further, physical activity may be a way in which one copes with her body dissatisfaction. [15,20] Zanon and colleagues [20] found (among non-athletes) that increased body dissatisfaction was positively correlated with time spent doing more vigorous physical activity than moderate physical activity or walking. In this study, those who participated in vigorous or

moderate physical activity reported not attending social events or not going to public spaces due to their body dissatisfaction compared to those who were not physically active. [20] While physical activity has many health benefits, excessive exercise as a WCB may be a predictor of body dissatisfaction. [20] Therefore, special consideration should be taken for female adolescents who may have body dissatisfaction and who exercise often.

Association with mental health. Anxiety and depression may be comorbidities with body dissatisfaction. [22, 23] For example, Vannucci and McCauley Ohannessian [23] showed that adolescents with higher rates of body dissatisfaction also experienced symptoms of generalized anxiety disorder, panic disorder, social anxiety disorder, and significant school avoidance. As body dissatisfaction increased, so did panic disorder symptoms. However, social anxiety disorder symptoms decreased as body dissatisfaction increased. [23] This relationship may exist through social comparison, which may lead to body dissatisfaction. [23] Another study indicated that body dissatisfaction can influence anxiety and depression through self-esteem. [22] Duchesne and colleagues [22] indicated that body dissatisfaction negatively influenced self-esteem and positively influenced anxiety and depression. However, their results suggested that self-esteem alone negatively predicted anxiety and depression. Therefore, self-esteem appeared to act as a mediator between body dissatisfaction and mental distress, such as anxiety and depression. [22]

Association with eating disorders. A major concern for individuals with body dissatisfaction is the potential onset of disordered eating or eating disorders. [6] As previously discussed, body dissatisfaction was positively correlated to dieting and controlling one's weight through non-dietary approaches among females. [14] Anorexia nervosa is just one of the eating

disorders that a patient may present with when he/she has a severe disturbance in his/her body image; anorexia nervosa is an appropriate diagnosis when a patient has a severely disturbed body image, is afraid of gaining weight, and is restricting his/her dietary intake. [4]

Body dissatisfaction can influence several other eating disorders as well. Bulimia nervosa (BN) is an appropriate eating disorder diagnosis when an individual uses compensatory behaviors, such as purging, to counteract food consumption. [24] Often BN can occur when one's physical appearance has increasing significance in one's life. Binge eating disorder (BED) is characterized by repeated episodes of binge eating without purging. BED is commonly associated with overweight and obesity. When body dissatisfaction and over-evaluation of one's self occurs, there can be additional psychological problems to be treated. [24]

Additionally, adolescents with a distorted body image are at an increased risk for developing an eating disorder since the onset of an eating disorder typically occurs during adolescence or young adulthood. [4] There is a greater prevalence of females having an eating disorder compared to males. [4] Additionally, there are differences in prevalence of eating disorders among ethnic and racial groups. For example, there is a greater prevalence of eating disorders among White women compared to Black and Latina women. [25] Emphasis on eating disorder prevention and body image positivity for females may decrease the risk of them developing an eating disorder.

Causes of Body Dissatisfaction

Since adolescents experience developmental changes with their bodies, they can become dissatisfied with themselves, thus having a distorted body image. [26, 27] However, the anatomical changes are likely to not be the only factor influencing body image. Since body

image is likely influenced by multiple and complex interacting factors, the social ecological model is a helpful model with which to consider body image and body dissatisfaction. [28] The multi-dimensional constructs of body image and body dissatisfaction are influenced by intra-personal, inter-personal, and environmental factors. Within the social ecological model for adolescent body image, the role of cultural, social and media, peer, and family are important to consider.

Cultural differences. Western culture promotes the slim figure. [25, 29] This is a typical ideal for White females. This cultural body ideal is the overwhelming norm portrayed in the media, and girls as young as eight years old believe that they need to look like this ideal. [29] The need to look like the cultural body ideal may follow the females through their entire lives. Black women tend to have a larger body ideal compared to White women, and they tend to be less dissatisfied with their bodies. [25] Latina women have a larger body ideal compared to White women, but have a smaller body ideal than Black women. [25] Furthermore, White women have the slimmest body ideal and tend to be more body dissatisfied where Black women have the largest body ideal and tend to be the least body dissatisfied.

Social and media influences. One review described the process of media influencing body image. [30] Individuals will spend time using social media, which may result in social comparison. When body dissatisfaction occurs, people may then seek out more comparisons through social media to try to decrease body dissatisfaction; however, these comparisons often results in even more dissastifaction. [30] Additionally, social comparison may have a role in the relationship between social anxiety disoder and body dissatisfaction. [23] Therefore, increased social comparison may increase body dissatisfaction. In recent years, social media sites have

grown in popularity and sites, such as Facebook, are often drivers of social comparison. [31] Research has found that femaies spend more time than males engaging with these social media sites. [32] Therefore, females may be at greater risk of becoming body dissatisfied as they seek out increasingly more social media because they will continue to engage in social comparison. [33]

Adolescents may change their body weight to try meet the unrealistic ideal that is suggested from media. For example, if media promotes weight loss, adolescents, according to one study, are more likely to adhere to that influence. [34] When looking at the effects of media on body image alone, media has little influence on an adolescent's body image according to a study by McCabe and Ricciardelli [34]. The influence of media on body image may differ when paired with the promotion of weight loss. Additionally, due to the Western body ideals, media may have a greater influence on females than males. A female adolescent's body image may change when she is influenced to change her weight from media. [34]

Peer influences. It is unlikely that an adolescent's body image is influenced by her peers, [34,36] but her weight-related behaviors may be. [36]] McCabe and Ricciardelli [34, 36] found that an adolescent's body image was not significantly influenced by peers. However in contrast to MaCabe's findings, Carey et al, found that having a body image concern among adolescent females who attended an all-girls schools was positively correlated to their friend's concern with thinness and positively correlated to comparing oneself to peers and that having a body image concern was positively correlated to peer influence and comparison with peers. [33]

In addition to body dissatisfaction, research has shown that an adolescent's weight-related behaviors can be influenced by their peers. [36] Adolescents may influence their peers

to engage in specific weight-related behaviors. Although females can be influenced by their female friends, there tends to be more influence from friends of the opposite sex compared to same-sex friends. [34]

Body Image and Weight Intentions

When one's body image becomes distorted, it can control every part of one's life. Body image encompasses one's whole body, weight can be only a small part of one's body image. [1] Research has found that there is an inverse relationship between weight and body image. [37] Adolescents who are underweight or at a healthy weight tend to have a better body image than those that have overweight or obesity. Adolescents who have obesity tend to have a worse body image than those who have overweight. [37]

Researchers have created validated tools to assess body image. Visual tools, such as an array of figures of increasing size can be used, where individuals choose which is their current and which is their ideal shape. [1, 38] Body dissatisfaction, when one's ideal body shape does not align with his/her current body shape, is not predicted by intentions to lose weight. Rather, body dissatisfaction positively predicts having intentions to lose weight. [39] Therefore, intentions to lose weight alone cannot be used as a tool to assess body dissatisfaction. Figure 1 describes this association between BMI, body dissatisfaction, and weight intentions.

Body Image Summary

Every person has a body image, and it describes how an individual perceives one's own body [1]. However, when one becomes dissatisfied with a part of his/her body, she may become body dissatisfied. [3] Body dissatisfaction can additionally begin to influence other parts

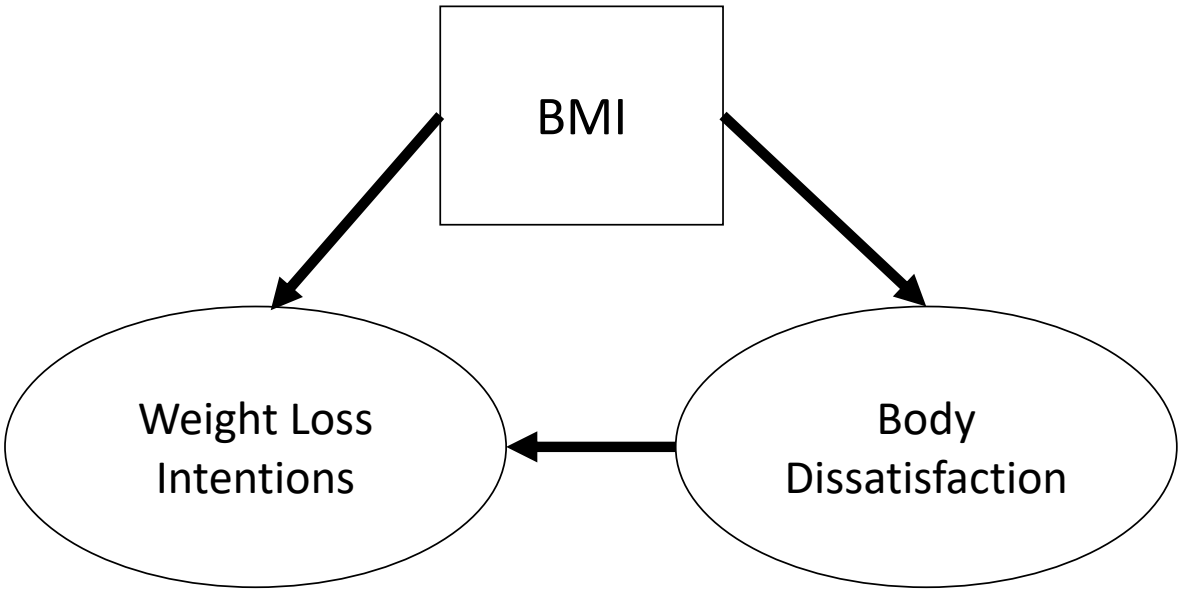

Figure 1. Relationship between Body Mass Index (BMI) and weight loss intentions and body dissatisfaction [37, 39]

of a person's life. Adolescence is a pivotal time in which physical changes can negatively influence one's body image. [1, 6] Therefore, adolescents are at risk of becoming body dissatisfied. [6]

Furthermore, there are a variety of health behaviors that can surface in attempt to decrease body dissatisfaction. Diet [10-14], physical activity [15, 20], and mental health [22, 23] can all be impacted due to body dissatisfaction. Body dissatisfaction can be associated with the use of unhealthy weight control behaviors that have an adverse effect on one's health. [10, 11, 16] Some may use physical activity as a healthy way to control their weight;[11, 15, 16] however, when done in excess or when done to decrease body dissatisfaction, it can become problematic. [20] Furthermore, adolescents with body dissatisfaction may be more likely to

have negative mental health. [22, 23] For example, they may have an increased risk of having anxiety, depression, or developing an eating disorder. [4, 22, 23] The outcomes of body dissatisfaction can have a negative impact on an adolescent's health.

There are several factors that may increase body dissatisfaction among adolescents. Some of the factors may include culture, [25, 28, 29] social and media influences, [30-34, 36] and peer influences. Western culture promotes a thin body ideal; this tends to be the cultural preference among White females. [25, 28, 29] However, Black females have a slightly larger ideal due to their own culture. Latina women have a body ideal that is slightly larger than White females yet smaller than Black females. Therefore, due to the larger body ideal, Black women are less likely to become body dissatisfied. [25] Media has become increasingly popular in recent years. Media can influence an adolescent's body dissatisfaction and influence her weight intentions. [30-34, 36] Similarly, due to social comparison, peers can have an influence on how adolescents perceive their body dissatisfaction. [33-35]

Weight Statistics in the United States

The prevalence of overweight and obesity among adolescents has increased from 14.1% to 15.6% and 10.6% to 14.8%, respectively, since 1999. [40] The prevalence of overweight is higher among females (16.8%), but the prevalence of obesity among females is lower (12.1%). [40] More females (37.5%) described themselves as slightly overweight or very overweight compared to males. [40] Research has shown that adolescents who are aware of their weight status or are dissatisfied with their weight are more likely to try to lose weight. [19] Adolescents who are overweight or obese are more likely to be body dissatisfied. [16] With the increase in

prevalence of overweight and obesity among adolescents, there may also be an increase in adolescents who are body dissatisfied and have intentions to lose weight.

Treatment for Overweight and Obesity in Adolescents

Children who have obesity may be more likely to have high blood pressure, high cholesterol, type 2 diabetes, breathing problems, musculoskeletal discomfort, and gastrointestinal issues during childhood, and many of these issues continue into adulthood. [41, 42] Individuals who were overweight or obese in childhood are more likely to become adults with obesity and have an increased risk of heart disease, type 2 diabetes, and cancer. [41, 42] Therefore, there are benefits to losing weight as an adolescent.

Interventions to treat obesity include diet interventions. [42-46] For obese adolescents without comorbidities, an appropriate strategy to achieving a heathy weight is following a structured eating plan. [42] The Academy of Nutrition and Dietetics recommends that treatment of childhood obesity happens under the supervision of a physician and a multi-disciplinary medical team. [42] These diet intervention may include caloric restriction, [43, 44] the Stoplight Diet for Children, [42] low carbohydrate diets, [45] and reduced glycemic-load diets. [46] Non-diet approaches can be more sustainable for children and adolescents when trying to achieve a healthy weight. This approach does not prescribe a calorie goal, but encourages children and adolescents to choose moderate portion sizes and consume low-fat, nutrient-dense foods. [42] Diet changes are recommended for adolescents who have obesity; however, it is important that they are pursuing these changes with medical supervision. If an adolescent has obesity with comorbidities, the interventions are more intense. Diet changes are still recommended for this population, but additional interventions may be necessary. These

may include a very-low-calorie diet, meal replacements, pharmacotherapy, and even weight loss surgery. These recommendations should be done under the supervision of a medical team. [42]

There are medical reasons why adolescents who are overweight or obese should achieve a healthy weight. [42] However, recommendations demonstrate that weight loss should be achieved with the supervision of a multi-disciplinary medical team. [42] Due to the increasing independence in adolescence, some may choose to pursue weight loss without the supervision of a medical team. [42] Research has shown the obese adolescents are more likely to be body dissatisfied [10-12, 16] and to have intentions to lose weight. [40, 47, 48] Therefore, prevalence of weight loss intentions for this population should not be surprising.

Weight Loss Intentions

Weight loss intentions are often assessed using the question 'Which of the following are you trying to do about your weight?' The response options may be 1) lose weight, 2) gain weight, 3) stay the same weight, 4) I am not trying to do anything about my weight, or 5) choose not to answer. This does not assess body dissatisfaction, nor does it assess if the adolescent is currently engaging in weight loss behavior. Therefore, this question can only be used to assess what the adolescent intends to do about their weight at the time of the survey.

According to the 2017 Youth Risk Behavior Survey (YRBS), 59.9% of female adolescents were trying to lose weight, where only 34% of males were trying to lose weight. There has been a significant increase in the prevalence of adolescents who want to lose weight since 1991. [40] Among females, the prevalence of wanting to lose weight was highest among Hispanics

(65.6%), followed by Whites (58.6%) and Blacks (55.3%). [40] Previously, White females were found to be more dissatisfied with their weight compared to Hispanic and black females. [25]

Research has shown differences in intentions to change weight between adolescents at a healthy weight and overweight and obese adolescents. [48] Overweight and obese adolescents are more likely to have intentions to lose weight, [48] similarly to how overweight or obese adolescents are more likely to be body dissatisfied. There is a greater prevalence of obese adolescents having intentions to lose weight compared to overweight adolescents. [48]

Misperceiving one's weight status (i.e. a healthy weight person perceiving him/herself as overweight) is associated with a BMI change. However, when adding intention to change weight, the relation is no longer significant. [19] Therefore, the intention to change weight alone is not a predictor of BMI change. However, weight loss intentions can be correlated to behavior through self-schema, internal motivation to follow through with a thought. [49] This phenomenon describes a cognitive structure that motivates a person to do something, i.e., change diet for weight loss, even when the benefits are not immediate. In many studies, it is assumed that when someone has intentions to do something, self-schema is already present. [49] It is possible that behavior change can only be seen among schematics, those who have intrinsic motivation to make behavior changes. [49] Researchers make the assumption that if the adolescent intends to do something with their weight, that they will act on it.

While there is a high prevalence of adolescents with intentions to lose weight, [40] previous studies have demonstrated that overweight and obese adolescent females are unlikely to change their diet [16] or continue exercise [15]. Therefore, overweight and obese adolescent females may have intentions to lose weight, but they do not change their behavior in a way

that is favorable of weight loss. Healthy weight adolescents are more likely to engage in healthy weight control behaviors. [16] Since they are more likely to already engage in these behaviors, they may also be more likely to attempt to lose weight with a weight loss intention.

Dietary Quality Measurements

Common tools to evaluate diet quality among the adolescent population are the 24-hour recall to assess individual nutrients [50,51] and the Healthy Eating Index (HEI). [52] These methods are common methods for reported nutrition data in research. Each tool serves a different purpose. The strengths and weaknesses of these tools are detailed below.

24-hour recall. A dietary recall is an interview style assessment of an individual's diet. It is intended to capture as much detail as possible about the person's meals. [50] A trained professional typically completes a multiple pass method, where each time the interviewer asks for more detail. This a strength of the 24-hour recall. The 24-hour dietary recall should be completed on three non-consecutive days with at least one of the days being a weekend day. This provides greater detail about the individual's dietary patterns. Average intakes can be calculated. A limitation of the 24-hour recall is that it only accounts for one days of food intake. Additionally, it captures an individual's short-term diet. [50] Another limitation of the tool is that the interviewees are providing self-reported data, which can be biased. Males and females may under- or overreport their dietary intake when completing a 24-hour dietary recall. [51]

Healthy eating index (HEI). The HEI provides a score of 0 to 100 of overall diet quality. The HEI-2015 compares an individual's diet to the 2015 Dietary Guidelines for Americans. [52] The tool includes 13 components: total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy, total protein, seafood and plant protein, fatty acids, refined grains, sodium,

added sugar, and saturated fats. Each component is given a score based on the intake for most groups, a higher score indicates higher intake. However, a higher score of refined grains, sodium, added sugar, and saturated fats is representative of lower consumption. This tool can be used for individual dietary intake or community food environments. [52] It can be adapted and validated for a variety of populations, including Canadians [47] and children. [53] The HEI is beneficial because it provides an estimate of how close a person's dietary intake is to the Dietary Guidelines. However, it does not provide caloric information.

Short healthy eating index (sHEI). A short tool was developed and validated for the Get Fruved study. [54] The sHEI assesses average intake of fruit, vegetables, grains, dairy, protein, sugar sweetened beverages, saturated fat, salt, and water per day. This tool is also scored on a 0 to 100 scale, with a higher score indicating better diet quality. The sHEI is a new tool that can be used to assess diet quality of college students and adolescents.

Diet Quality among Adolescents

The CDC conducts the Youth Behavior Risk Survey (YRBS) to assess health behaviors among adolescents in the United States. [40, 63] In recent years, there has not be a significant change in the number of times that adolescents consume fruits per day. [40] Although significant changes have not been seen, there has been a decrease in the number of adolescents who consumed fruit one or more times per day and two or more times per day. [40] Fewer adolescents are consuming fruit per day, which can be reflected in poor diet quality. Similar to fruits, there has been an increase the number of adolescents that do not consume vegetables, and there has been a decrease in the number of vegetables that adolescents consume. [40]. Since 1999, there has been a significant increase in the number of adolescents

who do not drink milk. [40] These are not significant changes, but over time, adolescents' diet quality may become significantly worse.

While the YRBS demonstrates how the adolescent population's diet has changed over the years, it does not provide a comprehensive representation of the overall diet quality of the adolescents in the United States. [40] Therefore, it is important to assess data from additional sources. One study published by Thomson et al [55] examined diet quality in children and adolescents using the HEI-2015. Data from NHANES was used to assess diet quality. The average HEI-2015 score for children aged 2 to 18 was 54.9. This score was below the HEI score of all Americans at 59. [56] Diet quality of the youngest children (aged 2 to 5) was significantly higher than that of the adolescents (aged 12 to 18). The diet quality of the youngest population and the oldest population was 57.8 and 51.1, respectively. [55] According to the component scores, there is low consumption of greens and beans, whole grains, and fatty acids in all population groups. However, whole fruit, total protein, and dairy had the highest scores, indicating compliance with the 2015 Dietary Guidelines among adolescents. [55]

Adolescents consumed less fruit than the rest of the population. [55] However, adolescents consumed more vegetables compared to the other two age groups. In general, adolescents consumed less added sugar, less dairy, more fatty acids, more greens and beans, less saturated fat, and less sodium compared to the rest of the population. [55] Compared to youth aged 2 to 17, adolescents have the worst dietary intake.

There may be diet differences between genders and by BMI category among the adolescent population. [47,55,57] Research is still inconsistent as to whether or not females have better diet quality than males. [47,55,57] For example, according to Thomson et al, [55]

diet quality was the same between males and females. Males may rely on ready-to-eat foods from fast food or restaurants more than females and are less likely to purchase their food from the grocery store. [57] Despite the differences in where males and females purchase their food, their diet quality remains similar. While diet quality among males and females is similar, there may be different factors that influence diet quality among males and females. Overall, it is believed that adolescents' diet falls into the 'needs improvement' category. [47]

Additionally, a lower BMI is associated with better diet quality. [63] However, adolescents with obesity have higher odds of increasing fruit and vegetable intake to more than five times a day when trying to lose weight. [58] Fruit and vegetable intake alone does not predict diet quality; fruit and vegetable intake is only two out of thirteen categories in the HEI. Therefore, those who increase fruit and vegetable intake may not have good diet quality. Those who are not concerned about their weight and not dieting are more likely to have better diet quality compared to individuals who are concerned about their weight and dieting. [47]

As children become adolescents, their diet quality decreases. [40, 55] Due to the poor diet quality scores, there is the opportunity to improve adolescent diet quality through replacing the moderation foods of their diet, like saturated fat, with adequacy foods, like fruits, vegetables, and non-fat dairy. According to the Academy of Nutrition and Dietetics recommendations for adolescent weight loss, using a non-diet approach of emphasizing more nutrient-dense foods may help achieve weight loss. [42] Additionally, this non-diet approach of choosing more nutrient-dense foods may increase diet quality at the same time.

Overweight adolescents with intentions to lose weight are not likely to eat more fruits and vegetables as a weight loss strategy. [58] In a systematic review, females with higher scores

on a food variety and frequency index or on fruit and vegetables variety and frequency gained less weight over the consecutive years. [59] Eating more fruits and vegetables may prevent weight gain, [59] but only eating more fruits and vegetables (without other behavior changes) may not promote weight loss. However, it is a step to adding more nutrient-dense foods into one's diet.

Diet quality was compared to weight concerns, dieting, and meal skipping by Woodruff and colleagues. [47] The study recruited 2,616 students between the ages of 13 and 17 to complete surveys. The participants completed 24-hour dietary recalls. The data were collected electronically by the students. The researchers analyzed the recalls using the HEI that was adapted for the Canadian population. Each student received a diet quality score between 0 and 100. Additional classifications were "weight concerned" and" dieting". Based on the responses, the participants were separated into four groups. Group 1 was not weight concerned and not dieting, Group 2 was not weight concerned but dieting, Group 3 was weight concerned and not dieting, and Group 4 was weight concerned and dieting. The researchers calculated BMI using self-reported height and weight. Overall, the average diet quality score was in the "needs improvement" category. [47] Adolescents did not have good or poor diet quality. Group 1, those that were not weight concerned or dieting, had better diet quality than those in Group 4, weight concerned and dieting ($p<0.001$). [47] Those that were weight concerned and dieting were more likely to have worse diet quality compared to those in Group 1 ($p = 0.001$). [47] Adolescents, in general, need improvement in diet quality; however, those that are concerned about their weight and are dieting have worse diet quality.

A study using the National Health and Nutrition Examination Surveys (NHANES), 2005-2014 data examined the associations between weight perceptions, weight control intentions, and dietary intake among adolescents. [48] The sample included 4,940 adolescents ages 10 to 15 years. The study excluded adolescents who were missing BMI data or were underweight, missing diet data, and/or reported improbable dietary intake. Height and weight were measured by trained healthcare professionals, and the researchers calculated their BMI and plotted their BMI percentile. [48] Responses from 'How do you consider your weight?" were used to assess weight status perception. Responses from "Are you trying to do anything about your weight" and "In the past year, how often have you tried to lose weight" were used to assess weight loss intentions. [48]

Dietary intake was assessed using two 24 hour recalls that were 3 to 10 days apart. From the dietary recalls an average of calorie consumption and percent of calories from protein, fat, and carbohydrate were used for analysis. [48] Also, the researchers calculated the percent of calories from saturated fat, grams of sugar, and grams of fiber. [48] Linear regression models and chi-square tests were used to analyze the data. The data were stratified by gender. All models were adjusted for BMI percentile, age, and poverty-to-income ratio. Among the females, 71% perceived their weight as being "about right" and 23% perceived themselves as overweight. Forty-one percent of the females wanted to lose weight; there was a higher prevalence of females who had overweight (57%) and obesity (84%) who wanted to lose weight compared to those who were at a healthy weight (21%). [48] Dietary quality was not associated with weight control intentions in females. However, weight control intentions were associated

with total calories, percent of calories from protein, and percent of calories from fat in males. [48]

Secondary Analysis

Secondary analysis is an appropriate type of research analysis when collecting independent data is not feasible. [60] It is the process of analyzing previously collected data to study a new research question. [61] The process includes identifying a research question, a dataset, and choosing the ways in which to evaluate the data. Researchers should choose a research question after conducting a literature review to identify gaps in the data. [61]

Benefits of secondary analysis. There are many benefits of conducting a secondary analysis study. The flexibility of secondary analysis is beneficial; a researcher can choose a research question of interest to him or her and an appropriate dataset based on the research question. [61] Fewer resources are required to complete the study, including time, financial, and researchers. [60] Secondary analysis is appropriate for an area of research that has little to no data; therefore, the study can uncover research problems that need further evaluation. A researcher may choose to analyze a specific group within the dataset; it is possible that the sample size for that group is small. The secondary analysis of the dataset may show a need for oversampling of that group for future studies. [60] Additionally, secondary analysis may show a need for the hypothesis to be revised or to improve existing measures.

Limitations of secondary analysis. The benefits may outweigh the limitations of secondary analysis, but there are still limitations to choosing this method. The sample sizes can be a disadvantage of secondary analysis, especially if the research assesses a specific group. A researcher's creativity can be hindered by choosing this method for research. The researcher is

not participating in creating a research question and designing a study based on the question. [60] The researcher choosing to use secondary analysis does not know how the data were collected or how the research was conducted without documentation from the original study. Additionally, secondary analysis is conducted with de-identified data; therefore, if the researcher has additional questions for the participants, they often cannot contact the participants.

Study Aims

This study aims to:

1. Assess differences in diet quality among adolescent females who have intentions to lose weight and those that do not want to lose weight by body mass index (BMI) category.

Chapter Two: Manuscript

Implication & Contribution

There is a high prevalence of adolescent females, who have intentions to lose weight, yet their diet quality remains poor. This secondary analysis study suggests that adolescent females who have intentions to lose weight may not have better diet quality than those who do not have intentions to lose weight.

Introduction & Background

Increased adiposity related to puberty during adolescence (ages 11-21 years) [1] is often associated with increases in body dissatisfaction[2, 3] and weight dissatisfaction, which is in turn associated with increases in intention to change weight. [4-6] Female adolescents are more likely to describe themselves as overweight than males regardless of their actual weight status, and about 60% of adolescent females have reported trying to lose weight in the United States. [7] Since there is a high prevalence of adolescent females reporting trying to lose weight, it could be anticipated that they may be engaging in weight loss behaviors. However, adolescents may not be engaging in healthy weight control behaviors, such as achieving weight loss through diet and exercise. Unhealthy weight control behaviors (i.e. laxatives, diuretics, consumption of meal replacements) may have adverse effects on the adolescents health. [13]

Childhood overweight and obesity has several short-term and long-term risks. Those who are overweight and obese as children have a greater risk of having high blood pressure, high cholesterol, Type 2 Diabetes, or asthma. [8] Further, overweight or obese children are more likely to be overweight or obese adults and have a greater risk of having heart disease, Type 2 Diabetes, and cancer, compared to their peers who were normal weight as children. [8,

9] There are health benefits to overweight and obese children attempting to lose weight, though weight loss efforts in this age group should be monitored by a medical professional, given the specific needs of the developing body. [9] In addition, it may be problematic for a healthy weight adolescent to attempt to lose weight or to restrict their dietary intake, and this is generally discouraged. [9] Regardless of whether or not weight loss is truly needed, intention to lose weight is common among the U.S. adolescent female population. However, previous studies have found that intention to lose weight alone has no effect on actual change in BMI. [10, 11] While the intention to lose weight is not directly or indirectly associated with changes in weight status, adolescents could still be engaging in behaviors they think will promote weight loss.

To achieve weight loss, some adolescents have reported engaging in unhealthy weight-related behaviors. [12, 13] Female adolescents who are overweight or obese are more likely to use unhealthy weight control behaviors compared to their normal weight peers. These behaviors can have adverse effects on their health. One study defines these unhealthy weight control behaviors as skipping meals or fasting. [12, 13] Even though adolescents at a healthy weight are more likely to use healthy weight control behaviors (e.g, consuming more fruits and vegetables and/or engaging in appropriate levels of exercise) to control their weight, [12] one study found that dieting is more common among adolescents at a healthy weight compared to adolescents who are overweight or obese. [14] Little research has been done on whether having intentions to lose weight has any influence on adolescent's diet quality.

Having intentions to lose weight may influence the types of food that one is consuming. A study by Deierlein et al [15] found that males who had intentions to lose weight were more

likely to consume fewer calories. Intentions to lose weight also altered the macronutrient composition of their diet; a higher percent of their calories came from protein and a lower percent of their calories came from fat. [15] While males changed their diet when having intentions to lose weight, females did not. Having intentions to lose weight did not contribute to different dietary patterns among females for total calories, percent calories from protein, and percent calories from fat. [15] While, among females, the calories and diet composition may not change with intention to lose weight, it is unclear how this might impact diet quality.

Diet quality is the how well one's dietary intake aligns with the *Dietary Guidelines for Americans*. [30] The most common tool for assessing diet quality in research is the Healthy Eating Index (HEI). [20] This tool assesses one's diet on 13 food components: total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods seafood and plant proteins, fatty acids, refined grains, sodium, added sugars, and saturated fats. [20] In this study, the short Healthy Eating Index was used; this tool was developed and validated for a large, multi-state study, "Get Fruved". [16] Diet quality assesses the density of foods in one's diet; therefore, it assesses quality, not quantity.

Research has not specifically investigated the relationship between intention to lose weight and overall diet quality. Specifically, it is unclear whether female adolescents who have intentions to lose weight have different quality of diets than female adolescents who do not have intentions to lose weight. Additionally, it has been found that adolescents who are overweight or obese have poorer diet quality compared to adolescents at a healthy weight. [33] However, it is unclear whether these differences in diet quality could be somewhat explained by body dissatisfaction (e.g., the desire to lose weight). Therefore, the aim of this study was to

assess for potential differences in diet quality between adolescent females who wanted to lose weight and those who did not want to lose weight.

Methods

Participants. The participants for this analysis were recruited as a part of a larger randomized control trial project, Get Fruved. [16] In the larger Get Fruved project, all high school students from 17 high schools in one county (grades 9 through 12) were invited to take baseline surveys in Fall 2018. Students were invited to participate through flyers, announcements made at each of the high schools, and tabling by research assistants. Of the 18,396 high school students in the county, [17] 422 completed baseline surveys, assented to have their data used, and had parental consent participation. Of these, all females (n=273) were included for this secondary analysis.

Survey components. As previously indicated, the sHEI was used to assess student's overall diet quality. [18] The responses to each diet component are used to calculate an overall score for dietary quality (on a scale of 0 to 100) with a higher score indicating better diet quality. [18] The sHEI questions, food categories, and scoring algorithm were based on the USDA's Healthy Eating Index (HEI) that can be calculated based on averages calculated from responses to multiple 24-hour food recalls. [19, 20] The sHEI can be used to assess intake of fruit, vegetables, grains, dairy, protein, sugar sweetened beverages, saturated fat, salt, and water per day.

Demographic data and self-reported heights and weights were also collected. A subsample of high school students (n=412) had their heights and weights measured in previous

work through the larger Get Fruved project, and there was adequate agreement with the self-reported heights and weights (K=0.632, p<0.001). [21] The self-reported heights and weights were then used to calculate body mass index (BMI).

Intention to lose weight was assessed with the question 'Which of the following are you trying to do about your weight?' The response options were 1) lose weight, 2) gain weight, 3) stay the same weight, 4) I am not trying to do anything about my weight, or 5) Choose not to answer. Respondents who expressed wanting to gain weight (n=21) and those choosing not to respond (n=11) were excluded from analysis. Those wanting to gain weight were excluded as this study was only looking at differences in diet quality between those who had intentions to lose weight and those having intentions to maintain their weight.

Data analysis. SPSS version 25 (Armonk, NY, 2017) was used for analysis. Descriptive statistics were calculated for age, race, and BMI categories. Since the respondents were under the age of 20 years, the CDC BMI-for-age female growth chart was used to determine the BMI percentile. [22] Respondents with a 4.99% percentile for BMI-for-age or less were included in the underweight category, those with a 5% to 84.99% percentile were included in the healthy weight category, those with a 85% to 94.99% percentile were included in the overweight category, and those in the 95th percentile or greater were included in the obese category. [22, 34] Multivariable regression models were used to assess the association between diet quality (a score calculated from the sHEI) and having intentions to lose weight and BMI category while adjusting for age and race. In the model, the outcome variable was diet quality, and the predictor variables were having intentions to lose weight and BMI category.

Results

The sample size was 242 females aged 13 to 19 years. The average age of the sample was 16.1 years (S.D. = 1.3). Most of the sample was Non-Hispanic White (66.9%) followed by Other (11.6%), Hispanic (8.7%), and Non-Hispanic Black (5.8%). The average BMI was 23.4 kg/m^2 (SD = 5.0 kg/m^2). Table 1 describes the demographic information of the sample and compares the sHEI scores between ethnic/racial groups and BMI groups. Based on the CDC BMI percentiles for females age 2 to 20 years, 64.3% were at a healthy weight and 31.6% of participants had overweight or obesity. Only 4 (1.7%) females in the sample reported being underweight. Those who reported being underweight were used in the regression models, but

Table 1. Characteristics of Sample of Female Adolescents: short Healthy Eating Index Score (sHEI) and Average Body Mass Index (BMI) by Race/Ethnicity, and sHEI by Body Mass Index Category (n=241)

	Total Sample (n=241)	**sHEI (0 to 100)**	**BMI (kg/m^2)**
	M (SD)	**M (SD)**	**M (SD)**
Total Sample		63.1 (13.88)	23.35 (5.04)
	n (%)		
Race/ethnicity			
Non-Hispanic White	162 (66.9)	62.22 (13.3)	23.19 kg/m^2 (4.9)
Non-Hispanic Black	14 (5.8)	56.81 (21.4)	27.13 kg/m^2 (7.1)
Hispanic	21 (8.7)	68.08 (12.6)	22.80 kg/m^2 (3.2)
Other	28 (11.6)	67.17 (14.6)	22.02 kg/m^2 (4.6)
BMI Category			
Underweight	4 (1.7%)	61.75 (19.0)	
Healthy Weight	155 (64.0%)	62.25 (13.8)	
Overweight	44 (18.2%)	65.46 (11.9)	
Obese	32 (13.2%)	63.10 (16.4)	

they were excluded for post-regression confirmatory analysis due to the small cell sizes in the chi-square analysis.

Figure 2 compares the sHEI scores of this sample to the HEI scores of the general population of Americans and to a sample of U.S. adolescents. The study sample reported having a sHEI score of 63.1, though no statistical analysis was conducted. This is higher than the average HEI scores of all Americans and youth aged 12 to 17 of 58.7 and 51.8, respectively.

Figure 3 describes the prevalence of weight change intentions by BMI category (calculated using self-reported height and weight). Six participants were not included due to

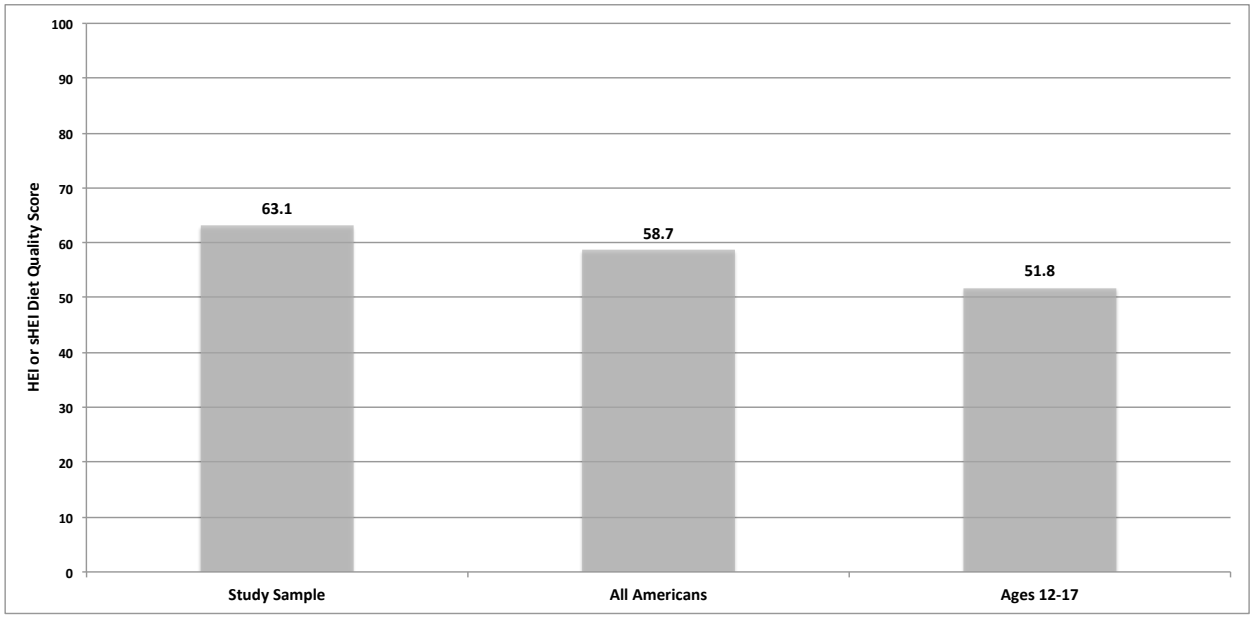

Figure 2. Study Sample sHEI scores compared to HEI scores of all Americans [19] and HEI Scores of U.S. adolescents, aged 12 to 17 years [23] in 2015

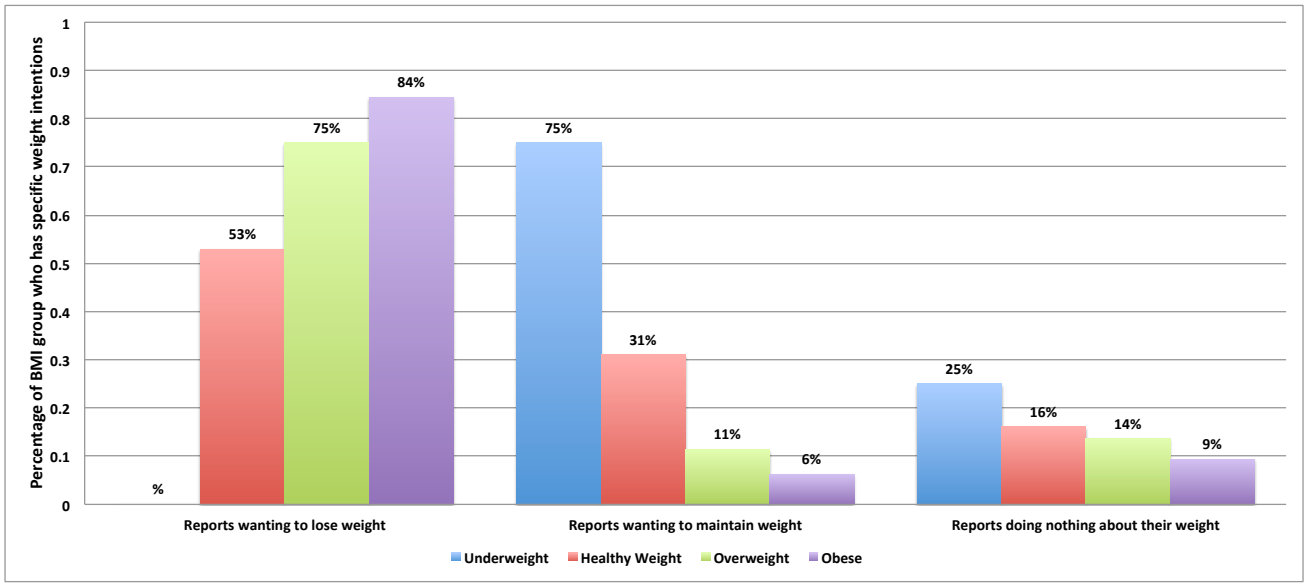

Figure 3. Percentage of Female Adolescents in each BMI Category by Response to the Weight Change Intention Question (n=241)

missing weight intention or BMI data. None of those categorized as being underweight desired to lose weight, with three of the four wanting to stay the same and the fourth reporting doing nothing to change their weight. More than half (52.9%) of the females categorized as being at a healthy weight reported wanting to lose weight. Seventy-five percent of those categorized as being overweight and more than 84% of obese adolescents reported having intentions to lose weight. Less than half (47%) of those categorized as being at a healthy weight reported either wanting to stay the same weight (31%) or that they were doing nothing to change their weight

Table 2. Multiple linear regression models estimating associations of intentions to lose weight and body mass index (BMI) with short Healthy Eating Index (sHEI) diet quality scores among female adolescents ages 13 to 19 years participating in the Get Fruved study in Fall 2018

	Unstandardized Coefficients		Standardized Coefficients	p
Variables	**B**	**SE**	**B**	
(Constant)	48.3	12.8		<0.001
Intentions to Lose Weight	1.5	2.2	0.05	0.490
BMI	-0.01	0.2	-0.01	0.946
R^2		0.046		
F		1.614		0.145
Model was adjusted for age and Race/Ethnicity				

(16%). Eleven percent of overweight and 6% of obese females, respectively, reported wanting to stay the same weight or that they were not trying to change their weight.

A multiple regression was conducted to predict the sHEI scores from intentions to lose weight (categorized as 'yes' or 'no', with 'no' including those wanting to maintain current weight and those reporting doing nothing to maintain their current weight) and BMI category, while adjusting for age and race. These variables did not significantly predict the sHEI score; $F(6,199) = 1.614$, $p=0.145$, $R^2= 0.46$. The β coefficients are further outlined in Table 2.

To confirm the null result of the regression model, additional chi-square tests were conducted. The sHEI was categorized into four groups: $\leq$25, 26 to 50, 51 to 75, and $\geq$100. Quartiles were formed to have equal ranges of sHEI scores. A chi-square comparing the sHEI categories and BMI categories was completed. Due to small cell sizes, the underweight category

Table 3. sHEI Scores by Body Mass Index (BMI) Category, from a Sample of Female Adolescents (n=212): Results of a Chi-Square Analysis

	Healthy Weight		Overweight		Obese		
sHEI	**n**	**%**	**n**	**%**	**n**	**%**	**p-value**
26-50	27	18.8%	7	18.9%	7	22.6%	0.901
51-75	91	63.2%	21	56.8%	18	58.1%	
76-100	26	18.1%	9	24.3%	6	19.4%	

(n=4) and the ≤25 sHEI category (n=1) were excluded from analysis, the overweight and obese categories were collapsed into one group for a larger sample size (n=76), and the same analysis was repeated (Table 3). Despite these modifications, there were no significant differences detected between the sHEI categories and BMI categories ($p = 0.901$).

Further, a chi-square was calculated to assess any differences in intention to lose weight by BMI category. Females at a healthy weight are more likely to not intend to lose weight as compared to their peers who are overweight or obese ($p<0.001$). The chi-square test is shown in Table 4.

Finally, to further investigate the relationship between BMI category, intention to lose weight, and sHEI food group scores, the data were stratified into the healthy weight and overweight /obese categories and additional chi-square test were conducted to determine if there were any differences between intentions to lose weight and specific food groups (i.e., fruit, vegetables, dairy, added sugar, and saturated fat).

Table 4. Intentions to Lose Weight by Healthy Weight or Overweight/Obese

Variable		Intentions to Lose Weight		No Intentions to Lose Weight		
		N	%	N	%	p-value
BMI	Healthy Weight	82	57.7%	73	82.0%	<0.001
	Overweight/Obese	60	42.3%	11	18.0%	

In Table 5, differences between sHEI food group scores were compared to having intentions to lose weight or not having intentions to lose weight within the healthy weight group and the overweight/obese weight group.

The fruit and vegetable variables were scored on a scale of 0 to 5. However, due to small cell sizes in the chi-square, the food groups were re-coded based on the reference intakes from the HEI. Specifically, the HEI reference was used to divide each food group into two categories. Since the food group were already scored using categorical values, the closest categorical value to the HEI reference was chosen. For example, fruit was re-categorized into “0 to 2.5” or “3 to 5” (HEI = 2.9). [19] Vegetable was re-categorized into “0 to 2” or “3 to 5” (HEI = 3.3). [19] Similarly, dairy was re-categorized into “0 to 5” and “8 to 10” (HEI = 6), added sugar into 0 and 6 to 10 (HEI = 6.8), and saturated fat into 0 to 5 and 10 (HEI = 5.1). [19] Only the p-values of the chi-square analysis are shown in Table 4. Underweight participants (n=4) were not included in the post-regression analysis for a sample of 231 in the chi-square analysis.

There were no significant differences between the fruit, vegetables, dairy, added sugar, or saturated fat and having intentions to lose weight within the healthy weight group. No

Table 5. Chi-Square Results of Food Group Scores by Intention to Lose Weight within each BMI Status of Adolescent Females (n=231)

	Healthy Weight		Overweight/Obese	
Variable	n = 155	χ^2	n = 76	χ^2
Fruit		0.302		0.143
Vegetable		0.314		0.194
Dairy		0.479		0.606
Added Sugar		0.514		0.553
Saturated Fat		0.664		0.002*
*Signifies statistically significant result				

statistically significant results for fruit, vegetables, dairy, or added sugar were seen within the overweight/obese group either. There were statistically significant results for saturated fat within the overweight and obese group, however. Those who had intentions to lose weight in the overweight/obese group were more likely to consume more saturated fat compared to those who did not have intentions to lose weight ($p<0.01$).

Discussion

To our knowledge, this is the first study to examine the association between having intentions to lose weight and diet quality, specifically using the sHEI. A previous study by Deierlein et al [15] examined the associations between having intentions to lose weight and dietary intake, specifically looking at calories, percent calories from protein, and percent calories from fat and did not find associations. While the current study did not assess calories, similar to the HEI, the sHEI examined overall diet quality. This study did find a significant

association between saturated fat and having intentions to lose weight among overweight/obese female adolescents. However, since this was the only significant association found and multiple statistical analyses had been run during the confirmatory phase of analyses, this association should be viewed with caution. Beyond the saturated fat component of the diet, more similarly to the study by Deierlein et al [15], this study found no associations between intentions to lose weight and diet among female adolescents.

In recent years, adolescents' diet quality has decreased, including decreases in milk, whole grains, and fruit and vegetable intake concurrent with increased intake of added sugar and saturated fat, [7] while adolescent obesity rates have risen. [7] When comparing the average sHEI score of this study population with the average HEI score of all Americans and adolescents aged 12 to 17 years, the sHEI score of this population is somewhat higher. While it is somewhat higher than national averages, the scores still indicate that none of the groups' diets align with the recommendations for Americans. [20]

Although analyses were not conducted to determine if there were statistically significant differences between the dietary quality scores observed in this study and previously documented scores in national data, a few things could possibly be contributing to the somewhat higher dietary quality scores seen in this study. For example, the distribution of race/ethnicity, [15, 24] age, [23, 25, 26] and gender [26, 27] of the study population were not the same as is found in the national data.

Although the participants in this study were mostly White (66.9%), this prevalence was less than the comparable prevalence of White (76.5%) in the United States in the national data set. [24] The percent of Non-Hispanic Black and Hispanic females in this population were also

less than the national average of 13.4% and 18.3%, respectively. [24] Additionally, those who reported being Hispanic or Other Race had a higher sHEI score compared to the Non- Hispanic White and Non-Hispanic Black groups. Other studies have used nationally representative data to examine these associations, [15] and this study population is not nationally representative. It is possible that the participants in this study had better-than-average diet quality, but since this relationship was not statistically assessed, further research would be needed to confirm this observation.

The participants of this study were between the ages of 13 and 19 years, with a mean age of 16 years. As adolescents age, they tend to have more independence. [25] The average age of this population is the age at which adolescents can legally drive a car in the United States; therefore, the population may choose more of their meals compared to their younger counterparts. According to national data with adolescents, diet quality typically decreases during adolescence. Therefore, it is surprising that this study population (ages 13-19) had diet quality scores that were greater than the national average (ages 12-17) since adolescents tend to have worse diet quality as they age. [23, 26] However, again, this relationship was not statistically assessed and further research would be needed to confirm this observation.

Another reason why the sHEI scores for this study population were somewhat higher compared to the national average could be because this study only analyzed data from females. Females are more likely to prepare their own food compared to males; thus, they are more likely to have better diet quality. [32] However, previous research has been inconsistent in whether there are significant differences in diet quality when comparing males and females.

[26, 27] Regardless, we cannot say that the sHEI score was higher because we only had females in the sample because we did not compare the females' scores to the males' scores.

Compared to overweight and obesity rates in the United States, this sample had a greater prevalence of overweight and obesity. In this study, 18.2% of the sample reported heights and weights that classified them as being overweight. This is higher than the 16.8% of high school females being overweight in the United States. [7] Additionally, there was a higher rate of obesity in this sample (13.2%) compared to the national average of high school females (12.1%). [7] There is no reason to believe that there is a discrepancy in the BMI rates of this study population given that self-reported heights and weights are associated with measured heights and weights. [21] In addition, the differences between the sample percentages and the national rates were not that great.

The prevalence of adolescents with intentions to lose weight (60.4%) was similar to the United States prevalence of females trying to lose weight (59.9%). [7] As BMI increased, the prevalence of those wanting to lose weight also increased. However, there was an inverse relationship between BMI and a lack of intention to lose weight. As BMI increased, the prevalence of participants who had those weight intentions decreased. This study reaffirmed previous work indicating that adolescents who had overweight or obesity had a higher prevalence of wanting to lose weight compared to healthy weight adolescents. [7, 15] Therefore, it is not uncommon for overweight or obese adolescents to want to lose weight, and if successfully achieved, this weight loss may provide health benefits. [8, 9]

Despite all the factors that may have contributed to the study population having a somewhat higher diet quality score, the sHEI measures diet quality on a scale of 0 to 100. The

average score was a 63.1. A score of 100 is the best possible score, and it indicates that the individual completely meets the Dietary Guidelines for Americans. [20] Therefore, the score of 63 indicates that the study population is only meeting about 63% of the Dietary Guidelines for Americans, which are diet guidelines for Americans to follow to help promote health. [30] Since the Dietary Guidelines are designed to help prevent chronic diet-related diseases among Americans, theoretically, the lower the diet quality score, the more likely the population may be at developing a diet-related disease. This research found that there was not a relationship between female adolescents' intention to lose weight and their overall dietary quality score, even when accounting for BMI status. It is also possible that a relationship was not found because the overall diet quality of this group was poor and/or due to the low variability of the diet quality scores. [19] According to this model, having intentions to lose weight was not associated with diet quality.

A study by Woodruff et al. examined the association between diet quality, body weight concerns, and dieting. [14] The study found that those who had body weight concerns and were actively dieting had worse diet quality than those who did not have body weight concerns and were not dieting. [14] It is possible that the current study did not find similar results because dieting behaviors were not assessed. We may have seen differences in the diet quality among those who had intentions to lose weight and were actively dieting. Future research should address this.

Diet quality has not been associated with intentions to lose weight among adolescents, in general, though an association between these variables has been identified among male adolescents [14, 15] This study confirms a lack of relationship between these variables, specific

to adolescent females, and adds the factor of BMI status to the literature. In addition, use of the sHEI to assess diet quality in this population is novel and adds to Dejerlein and colleagues work analyzing the relationship between specific dietary components (e.g. calories, percent of calories from protein, and percent of calories from fat) and weight loss intention. [15]

Not including males can be viewed as both a limitation and a strength of this study. It may be limitation because previous studies examined the diet quality of males, [15] and we are unable to directly compare our results with those of other researchers. However, this research confirms the results of Deierlein et al [15] because we also found that there was no significant association between overall diet quality and intentions to lose weight among adolescent females.

This study had a small sample of underweight adolescents based on BMI percentiles (n=4) and thus these responses were excluded from the Chi-Square analyses. Therefore, these results do not provide any additional understanding of the relationship between underweight female adolescents' weight change intentions and their diet quality. The studies by Deierlein et al [15] and Woodruff et al. [14] did not assess underweight adolescents either. Therefore, there is a gap in understanding of any relationship between diet quality and weight intentions among the underweight adolescent population.

The only difference in specific dietary intake found in this study was in saturated fat intake among those who had overweight and intention to lose weight; however, this p-value should be considered in light of the multiple statistical tests conducted. With a smaller p-value being needed to identify a significant statistical relationship, given the multiple tests performed, this relationship should be viewed with caution. Based on the data collected in this

study, there is still not enough evidence that adolescents who have intentions to lose weight are following diets that would support weight loss. It appears that adolescents who intend to lose weight may not be following diets that are any different than diets of adolescents who do not have intentions to lose weight. If this lack of difference in dietary pattern related to weight loss intention is confirmed in future research, efforts need to be made to understand if any other behaviors, for example physical activity, [12, 13] taking diet pills, [12, 13] or other methods to lose weight, do differ. If there are no differences, research is needed to determine if this cognitive dissonance causes any emotional negative outcomes for adolescents.

It is possible that diet quality was not the best diet assessment tool to use for this study. Diet quality measures quality, not quantity. [20] Therefore, one could have a high diet quality score, but could have also consumed excess calories. Diet quality uses the density approach to assessing dietary intake. [20] Since weight loss is achieved through energy deficit, [9] it is possible that assessing calories would have been a better dietary assessment. However, since this was secondary data and was cross-sectional, the researcher was unable to capture the calorie data or changes in dietary intake. In future studies, the research may be more robust if calorie data and diet quality scores are used in conjunction and participants are followed over some period of time.

Another limitation of this study is the secondary analysis approach. Since this was a secondary analysis study, the researcher was unable to choose the specific tools that were included in the survey for the study. [29] Additionally, the secondary analysis design prevented the researcher from contacting the participants to ask for additional information. [29] Finally, the secondary data used was from a cross-sectional survey. Therefore, the researcher could not

assess if there were any changes in BMI or changes in dietary patterns among those who had intentions to lose weight.

Another limitation was that the weight intention question only captured if the adolescents had intentions to lose weight. This was a one-item tool to assess what the adolescents intended to do with their weight and did not capture if adolescents were actually dieting at the time of the survey or had dieted in the past. Also, there may have been differences in how the respondents interpreted the question.

Diet quality was overall poor among this sample; therefore, nutrition professionals should continue to seek ways to promote healthy diets among adolescents. Nutrition interventions may be one way to improve health and reduce unwanted and unhealthy weight. If no diet quality differences are observed by intention to lose weight, future research is needed to better understand potential deficits in understanding the relationship between diet quality and weight status, especially among those adolescents expressing intention to lose weight.

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Vita

Morganne grew up in a Mooresville, Indiana. She went to Indiana University Bloomington to complete Bachelor's degrees in Dietetics and Spanish. After graduating from Indiana University in May 2018, she came to the University of Tennessee to pursue a Master's of Science in Nutrition with a concentration in Public Health Nutrition and complete the Dietetic Internship.

During her time at the University of Tennessee she worked as a Graduate Research Assistant in Dr. Colby's lab and as a Graduate Teaching Assistant for Nutrition 100. She taught Healthy Kids Club lessons in her free time. Following graduation, she plans to pursue a career in Knoxville as a Registered Dietitia