2016

Unhealthy weight control behaviors in adolescents : are there classes of risk?

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ABSTRACT

This quantitative secondary analysis was undertaken to determine if classes of risk exist for the use of Unhealthy Weight Control Behaviors (UWCBs) in adolescents. Engagement in UWCBs increases the likelihood that an adolescent would develop a full-syndrome eating disorder, which are both difficult and expensive to treat. Using data previously collected as part of the 2013 Youth Risk Behavior Surveillance System, it was possible to conduct a Latent Class Analysis (LCA) using 8,885 responses which contained data about a number of potential risk factors that might influence a participant's likelihood to engage in UWCBs. Factors considered were gender, race/ethnicity, experiences of violence, cigarette use, alcohol use, drug use, suicidality, and Body Mass Index (BMI). The LCA showed that a model containing four classes of risk was the best fit for this data. Each class was defined by specific characteristics and varying levels of risk for engagement in UWCBs. This four class model can be used by clinicians working with adolescents to identify clients who might be at particularly high risk of using UWCBs and empower clinicians to intervene before a full syndrome eating disorder is developed.

UNHEALTHY WEIGHT CONTROL BEHAVIORS IN ADOLESCENTS:

ARE THERE CLASSES OF RISK?

A project based upon an independent investigation, submitted in partial fulfillment of the requirements for the degree of Master of Social Work.

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2016

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ACKNOWLEDGEMENTS

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CHAPTER I

Introduction

One significant issue in the field of eating disorder prevention and intervention is identification of subclinical unhealthy weight control behaviors in youth, and subsequent intervention. The use of unhealthy weight control behaviors even at a subclinical level is predictive of later diagnosis of a full syndrome eating disorder (Stice, Marti, & Durant, 2011). Eating disorders are difficult and costly to treat, and the best time to intervene is before the presence of a full syndrome eating disorder.

A gap exists in the existing research around subclinical eating disorders and use of unhealthy weight control behaviors in youth. Currently, research around disordered eating is mostly focused on clinical populations or populations who self-identify as struggling with eating. This undoubtedly leaves many people out of the research, likely because they don't have the resources to seek treatment and thus a diagnosis. There is one dataset that collected data about weight control and eating behaviors in youth in the general population: The Youth Risk Behavior Surveillance System.

The Youth Risk Behavior Surveillance System consists of a survey that has been administered every other year since 1989 in the public high schools of the United States. Its purpose is to gather data around what types of risk behaviors high school age youth are engaged (see for example, Eichen, Conner, Daly, & Fauber, 2010; Forman-Hoffman 2004; Keel & Forney 2013; Stice et al., 2011). No literature to date examines whether classes of risk exist in relation

to the use of UWCBs.

Eating disorders are best treated with the earliest intervention possible, preferably before they become full-syndrome disorders, and use of UWCBs or dieting is a significant risk factor for later development of an eating disorder (Stice et al., 2011). Therefore, using the YRBS data to evaluate if there are certain classes of risk for use of UWCBs allows prevention and intervention efforts to be targeted towards those most in need.

This study is significant for social work practice on multiple levels. First, greater awareness of the prevalence of use of UWCBs and the risks involved with these behaviors helps social workers to be better informed about eating pathology and thus possess sounder clinical judgment with clients who use UWCBs. Second, awareness of the different patterns of risk factors that exist for use of UWCBs allows for earlier identification, prevention, and intervention in young people at high risk. This enables social workers to begin treatment of these behaviors earlier, which alleviates suffering and gives clients a better chance of full recovery. Third, social workers often encounter situations in which a client may not be able to access the needed level of care (for a multitude of issues, not just eating pathology), such as insurance nonpayment, which can be detrimental to a person's quality of life and the course of treatment. As eating disorders are expensive to treat at even an outpatient level, social workers need to be prepared to file appeals on behalf of clients for insurance coverage; and as insurance companies are driven by data, being informed about different classes of risk that a particular person might fit into allows us to better advocate for our clients.

CHAPTER II

Literature Review

In this section, the current literature on risk factors for using Unhealthy Weight Control Behaviors (UWCBs), risk factors for eating disorders, and use of latent class analysis with YRBS data and eating disorder research is reviewed. This will provide a framework for the author's analyses and give context that informs the author's understanding of the significance of the results.

Unhealthy Weight Control Behaviors and the Youth Risk Behavior Survey

The Youth Risk Behavior Surveillance System provides data on a variety of health risk factors that can be used in a number of ways to better inform interventions and monitoring for today's youth. One section of the Youth Risk Behavior Survey (YRBS) that is well researched is the realm of weight control behaviors. This section of the YRBS is made up of five questions, which ask about self-perception of weight, intentions around weight change, fasting, taking diet pills, and purging using vomiting or laxatives (Centers for Disease Control and Prevention, 2013). Also in the YRBS are questions about demographics, nutrition, physical activity, sexual behavior, substance use, suicidality, bullying, violence-related behaviors and experiences, and general safety. It is important to note that the phrasing of the questions about weight, weight control, and body image are phrased in such a way that eating disorders are not mentioned.

Focusing on the risks associated with unhealthy weight control behaviors, we know that these behaviors can lead to a clinically diagnosable eating disorder (Neumark-Sztainer et al., 2006). We also know that perceiving oneself as overweight or engaging in unhealthy weight

control behaviors such as fasting or taking diet pills is correlated with decreased life satisfaction for youth (Esch & Zullig, 2008). It is therefore understandable that a significant amount of research has been conducted to examine what factors may be involved when youth use unhealthy weight control behaviors, particularly using YRBS data (Edwards & Magel, 2007; Forman-Hoffman, 2004; Forman-Hoffman & Cunningham, 2008; Ho, Kingree, & Thompson, 2006; Lowry, Galuska, Fulton, Weschler, & Kann, 2002; Middleman, Vazquez, & Durant, 1998).

Lowry, Galuska, Fulton, Weschler, and Kann (2002), who studied this phenomenon around the turn of the 21st century, found that 32% of female students and 17% of male students use unhealthy weight control methods when analyzing the 1999 national YRBS dataset. Another study examining the same set of data found that the following risk factors were associated with engagement in abnormal weight control behaviors: ethnicity, geographic location, gender, being underweight, exercising to control weight, and dieting to control weight (Forman-Hoffman, 2004). In this study, 26% of female students and 10% of male students reported some form of abnormal weight control behaviors in the previous month. Only students who reported using abnormal weight control behaviors were analyzed for associated risk factors. Both of these studies found significant percentages of youth engaging in unhealthy weight control behaviors. Middleman, Vazquez, and Durant (1998), who examined the Massachusetts YRBS, found that 61.5% of females and 21.5% of males reported trying to lose weight. This finding suggests that a very large number of adolescents who took the YRBS are at risk for a full-syndrome eating disorder.

Social and Demographic Factors

The data from the YRBS has also been used to evaluate whether social contagion theory can be applied to adolescent eating disorders with positive results in favor of social contagion when evaluating clustering of certain behaviors by county. Analysis indicates that using diet products, fasting, exercising, and dieting showed geographical clustering, while analysis of purging did not show any clustering (Forman-Hoffman & Cunningham, 2006). Data from the YRBS has also been used to examine whether trends exist in regard to nutrition and physical activity: Edwards and Magel (2007) used the YRBS data to evaluate trends in nutrition and physical activity in an urban school district in the upper Midwest over the course of three completed YRBS cycles, which is six years. Another way that the YRBS data has been used is to evaluate associations between UWCBs and juvenile delinquency. Using the 2003 YRBS dataset, Ho, Kingree, and Thompson (2006) investigated associations between unhealthy weight control behaviors and juvenile delinquency, finding that minority youth are more likely than white youth to be overweight, white youth are more likely than minority youth to take diet pills, and youth who were classified as juvenile delinquents were more likely than non-delinquent youth to engage in unhealthy weight related behaviors. This suggests that there is another factor that plays into an adolescent's vulnerability for both UWCBs and delinquent behaviors, a factor that was not quantified in that study.

When the 2009 YRBS was evaluated for associated factors, UWCBs were found to be associated with experiences of physical violence, sexual violence, and bullying (Weng, 2011). This study also found that adolescents who reported the highest rate of UWCB also reported abusing substances and characteristics of suicidality (Weng, 2011). For females, risk factors for using UWCB were suicidality, drug use, smoking cigarettes, drinking alcohol, and being bullied.

For males, risk factors for using UWCB were suicidality, drinking alcohol, having sex, smoking cigarettes, and being violently victimized (Weng, 2011). These results suggest that use of UWCBs may be an indicator of students at great risk in multiple areas, or that using UWCBs is a common form of coping for youth who experience multiple stressors.

There has also been much research on UWCB outside of the analyses of the YRBS, and multiple studies, for example, have shown that overweight status is highly correlated with the use of UWCBs (Boutelle, 2002; Goldschmidt, Aspen, Sinton, Tanofsky-Kraff, & Wilfley, 2008). In particular, adolescent females who are overweight or obese are at this highest risk for engaging in UWCBs (Goldschmidt et al., 2008; Neumark-Sztainer, Story, Falkner, Beuhring, & Resnick, 1999).

Discordant Weight Perception

According to multiple recently published studies, self-perception of being overweight, regardless of actual overweight status, along with depressive symptoms, increased the likelihood of an adolescent using UWCB (Gonsalves, Hawk, & Goodenow, 2014; Stephen, Rose, Kenney, Rosselli-Navarra, &Weissman, 2014). In a recent analysis conducted by Eunkyung Park, Ph.D. (2011), 27.6% of survey respondents were found to have discordant weight perception. Particularly vulnerable to discordant weight perception were males, minorities, and students from low socioeconomic status. This suggests that there are a significant number of adolescents at risk for engaging in UWCBs based on their own incorrect perception of their weight, and that those most vulnerable to dysmorphic perception of their body are not necessarily the students whom are commonly believed to be at greatest risk (white, female, middle or upper middle class) (National Eating Disorders Association, 2015).

Further, according to Park's 2011 analysis of data from surveys completed by public high school students in Minnesota, underestimation of weight is more prevalent than overestimation: females are more likely to overestimate; males are more likely to underestimate their weight. Of particular interest is the finding that Black and Hispanic females from low socioeconomic backgrounds were more likely to underestimate than overestimate; while Asian and Pacific Islander males were more likely to overestimate (Park, 2011). In accordance with the results from Ho et al. (2006), which examined YRBS data and found correlations between delinquent behavior and use of UWCB, this association was also found in Stephen, Rose, Kenney, Rosselli-Navarra, & Weissman, (2014), in data not included in the YRBS. This further indicates that more investigation into use of UWCBs is warranted.

When looking at associations with race or ethnicity, multiple studies found the relationship between race and/or ethnicity and use of UWCBs to be significant. For example, one study found that Hispanic and American Indian (study's designation) youth reported the highest levels of UWCB (Croll et al., 2002). The same study also found that using UWCBs was associated with lower GPA (Croll et al., 2002). In terms of race/ethnicity and gender, Hispanic and Asian females were found to be more likely than white females to use UWCB, and Hispanic, Asian, and American Indian males were more likely to engage in UWCB than white males (Croll et al., 2002). Associations between UWCB and ethnicity were also found in Calderon, Yu, & Jambazian (2004). These results suggest that, combined with other associations found in other research, that there is evidence for some other latent factor or factors influencing who engages in UWCBs. There are many risk factors that have been identified when the factors are parsed out individually. What we do not know is if and how these factors interact to create different classes

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of risk.

Motivation for use of Unhealthy Weight Control Behaviors

Motivation for use of UWCB was also investigated in several studies. One study found that 54.7% of adolescents who diet, do so often to control their weight, and 44% of them who diet reported skipping meals to control weight (Calderon et al., 2004). A number of personal and socioenvironmental factors were found to be associated with UWCB by Gonsalves in 2013: lack of accuracy of body weight perception, experiencing bullying, and depressive symptoms were all associated with use of UWCB. Kenny and Hicks (2015) found that perfectionism was a risk factor for UWCB, but that perfectionism can be moderated by psychological well-being. For example, Linde, Wall, Haines, and Neumark-Sztainer (2009) found that weight concerns of students, weight concerns of parents, negative peer influence, low self-esteem, and exposure to weight loss magazines were all associated with use of UWCB. In a review of the literature on UWCB, Weng (2011) found the following shortcomings: no study examined the impact of behavioral settings such as school or friends, no study examined sectors of influence other than mass media, and no studies used multilevel methods to tease apart the impact of environmental influences on UWCB. This indicates that despite the amount of research previously conducted on UWCBs, there are significant gaps in our knowledge and understanding of potentially significant factors and opportunities for intervention.

Risk Factors for Eating Disorders

There has been significant and extensive research on eating disorder risk factors, ranging from biological factors to personal characteristics. Biologically, being born prematurely

increases the risk of developing Anorexia Nervosa (Raevuori, Linna, & Keski-Rahkonen, 2014). Hafstad, von Soest, & Torgerson (2013) found that early childhood sleep problems predicted eating problems in adolescence. Jacobi, Hayward, de Zwaan, Kraemer, and Agras (2004) found that early childhood eating and gastrointestinal problems were associated with later eating disorder development. This was contradicted by the findings in Hafstad et al. (2013) where no association between early childhood eating problems and later eating problems was found. Multiple studies agree that the following are risk factors for development of an eating disorder: idealization of thinness, weight concerns, negative emotionality and depressive symptoms, perfectionism, negative self-evaluation, body dissatisfaction, dieting, and teasing about eating patterns and body shape (Fairburn et al., 1999; Haines et al., 2007; Jacobi et al., 2004; Keel & Forney 2013; Krug et al., 2012, Stice et al., 2011). Further, one study found mental illness in parents to be a risk factor for female offspring to develop an eating disorder (Bould, 2015). This risk increased with a parental diagnosis of Bipolar Disorder, personality disorder, or anxiety/depression, but there was no significant effect of parental substance misuse (Bould, 2015). Although not designated specifically as a risk factor, two studies found significant comorbidity between eating disorders and substance use disorders, with percentages of comorbidity ranging from 17-46% (Harrop & Marlett, 2010; Mann et al., 2014).

Latent Class Analysis

In terms of eating disorder and obesity research, Latent Class Analysis (LCA) has been used to identify distinct diagnostic categories of eating disorders and classes of risk for childhood obesity. For example, Peterson, Crow, Swanson, Crosby, Wonderlich, and Mitchell (2014) used latent class analysis to determine the stability of eating disorder diagnoses over time, finding that

there are three main subtypes of eating disorders, consisting of bingeing and purging subtype, binge eating disorder subtype, and low BMI subtype. This is important because diagnostic criteria are written in such a way that patients often transition between diagnoses over the course of treatment, and this analysis suggests that some of the diagnostic indicators currently in use are not as highly relevant as they are thought to be. Further, Swanson, Lindenberg, Bauer, and Crosby (2011) used LCA to determine classes of eating disorder behavior, where they found six classes, one largely asymptomatic, one characterized by shape and weight concerns, one characterized by overeating without loss of control, and three classes identifying full syndrome and subthreshold binge eating disorder, purging disorder, and bulimia nervosa. Finally, Crow, Swanson, Peterson, Crosby, Wonderlich, and Mitchell (2011) used LCA to derive diagnostic categories by risk of mortality, also finding a six class model to fit better than current diagnostic criteria. When considering obesity research, Huh, Riggs, Sprujit-Meitz, Chou, Huang, and Pentz (2009) used LCA to determine obesity risk in fourth graders. This study found five classes of children, which suggests subtype groups of children in regards to obesity related behavior, with ethnicity, gender, and socioeconomic status as significant predictors (Huh et al., 2009).

When looking at the use of latent class analysis with YRBS data, there is only one study, conducted by Jiang, Perry, and Hesser (2010). Jiang and colleagues used the 2007 Rhode Island YRBS to look for suicide risk classes. The study found four classes of risk for suicidal behavior: the first group being emotionally healthy (74% of students), the second group having considered and planned suicide (14%), the third group having attempted suicide (6%), and the fourth group having planned and attempted suicide (6%). Belonging to any class besides the first was correlated with the following risk factors: being female, having low grades, being LGBTQ, feeling unsafe at school, forced sexual intercourse, and self-perceived overweight. An additional

risk factor for the third class was speaking a language other than English at home. Additional risk factors for membership in the fourth class included being in the 9th or 10th grade and currently reporting smoking cigarettes (Jiang et al., 2010).

Summary

The variety of different topics and issues that have been investigated in relation to unhealthy weight control behaviors shows the versatility and richness of the data encompassed in the YRBS. Interestingly, the data have not been used to evaluate unhealthy weight control behaviors for subgroups that engage in those behaviors more or less than average. This analysis would be beneficial because it would allow one to evaluate for youth fitting particular profiles that may be especially high risk for unhealthy weight control behaviors, which can advance to a clinically diagnosable eating disorder. Eating disorder research has used latent class analysis to gain information about different symptom constellations and the stability of those constellations over time (Peterson et al., 2011; Swanson et al., 2012). This has significant implications for eating disorder prevention in that the YRBS is likely to capture a broader sample than research aimed specifically at clinically diagnosable, participant-identified eating disorders because of the sampling method. The ability to observe trends in behavior, along with a variety of other risk factors and demographics, will allow for creation of a model that could lead to youth who are using unhealthy weight control behaviors receiving an intervention before they progress to a full syndrome eating disorder. Not only are subclinical eating issues more easily addressed in the community, it would prevent suffering of those individuals struggling with these issues.

The purpose of this study was to utilize the YRBS data to determine which groups of youth are most likely to engage in UWCBs. This was accomplished by using latent class analysis to

tease out classes of risk for engaging in UWCBs/subclinical eating disorders. As found by

Wang, Peterson, McCormick, and Austin (2013), there are not any studies published that have

used multilevel methods to examine environmental influences on UWCB. We know a great deal

about risk factors for eating disorders and the amplified risk experienced by adolescents who use

UWCB, but we are missing research that gives us concrete data about the impact of

environmental factors on likelihood to engage in UWCB. There are connections around UWCB

that are mitigated by multiple risk factors, such as gender, race or ethnicity, socioeconomic

status, and exposure to violence that we do not have enough information about to effectively

design prevention and intervention programs. By clarifying who is at greatest risk, prevention

and intervention efforts can be tailored to reach those most vulnerable. This serves to determine

what factors in combination might make some youth more vulnerable to using UWCBs.

CHAPTER III

Methodology

The purpose of this study was to determine whether certain groups of youth are more likely than others to use Unhealthy Weight Control Behaviors (UWCBs). The data set utilized was the national data for the Youth Risk Behavior Surveillance System (often called YRBS or YRBSS) (Centers for Disease Control and Prevention, 2013). This is a survey given in public schools to students every other year that asks about many health risk factors. The purpose of the YRBS is multifaceted: to provide data that can be analyzed by interested parties to determine the prevalence of health risk behaviors, trends in risk behaviors over time, and to better target prevention and intervention efforts around health risk behaviors (CDC, 2013). The YRBS survey was developed to address health risk behavior categories that contributed to significant morbidity and mortality (CDC, 2013). Those categories include 1) behaviors that contribute to unintentional injury and violence; 2) sexual behaviors that contribute to HIV infection; 3) tobacco use; 4) alcohol and other drug use; 5) unhealthy dietary behaviors; and 6) physical inactivity (CDC, 2013). Further information about the methodology of the YRBs can be found in CDC 2013 as well as on the CDC's website for the YRBS. The data collected from this survey are quantitative, and thus the study design was quantitative in nature. A quantitative design allows for analysis of data collected on a large scale at a complex level (Guo, 2015).

Sample

The data used in this project is from the YRBS conducted in 2013, which is the most recent data available. The YRBS is conducted on a bi-yearly basis by the Centers for Disease Control and Prevention to assess different health risk behaviors in which youth engage. Thus, the focus of the study reported in this document is a secondary analysis of this data set, which is publicly available at http://www.cdc.gov/healthyyouth/data/yrbs/index.htm.

The national YRBS uses a three-stage cluster sample design in order to achieve a nationally representative sample (CDC, 2013). The schools that collect YRBS data are first arranged into primary sampling units (PSUs) and designated as urban if they are part of the 54 largest PSUs and otherwise classified as rural. The schools are also divided into large schools (greater than or equal to 25 students per class) and small schools (less than 25 students per class). When selecting schools for the national sample, it is required that 1/4 of the schools selected be considered small schools. Schools with high minority enrollment have adjusted requirements to be selected as a PSU school in order to promote analysis of students of color. Most recently, this sampling change has only been to select two grades instead of one for such schools. The final step in sampling is to randomly select one or two entire classes in the whole school to be used in the national sample. These data are then weighted based on sex, race/ethnicity, and grade level in order to adjust for nonresponse and oversampling of minority students. The result is data that are representative of the students in grades 9-12 across the United States.

The CDC has investigated the reliability of self-report measures for the YRBS twice, once in 1992 and once in 2000. These studies were focused on test-retest reliability: both studies used convenience samples to administer the YRBS questionnaire twice, approximately two weeks apart (CDC, 2013). Statistical analyses indicated that approximately three fourths of

the questions had good or better reliability in the 1992 study, and there were no statistically

significant differences in prevalence rates from the first time of data collection to the second time

of data collection (CDC, 2013). The 1999 study found that 22% of the questions on the YRBS

elicited significantly different prevalence rates from the first administration to the second

administration, and ten of those questions also had kappas of less than 61%. Thus, those ten

questions were either reworded or deleted from the survey (CDC, 2013).

The YRBS consists of 92 questions about a number of different risk behaviors. The three

questions that were investigated in detail are:

Q68. During the past 30 days, did you go without eating for 24 hours or more (also called

fasting) to lose weight or to keep from gaining weight?

A.   Yes

B.   No

Q69. During the past 30 days, did you take any diet pills, powders, or liquids without a doctor's

advice to lose weight or to keep from gaining weight? (Do not include meal replacement

products such as Slim Fast.)

A.   Yes

B.   No

Q70. During the past 30 days, did you vomit or take laxatives to lose weight or to keep from

        gaining weight?

A. Yes

B. No

The data available from the CDC website are available in two file formats, as .dat and as an

Access database. The CDC website allows free access to the national data set to anyone who

knows where to look. The data were converted to .csv using StatTransfer 13, and then imported

into R, where the poLCA software package was used to conduct latent class analyses around

these variables with and without covariates. The covariates examined were (1) gender, (2) BMI,

(3) substance use, (4) sexual violence, (5) suicidality, and (6) interpersonal violence. These

variables were selected for analysis of covariance because they are likely risk factors for use of

UWCBs and/or full syndrome eating disorders. Unhealthy weight control behaviors were

defined as a composite score ranging from three to six, with students getting two points for

answering no to each question about fasting, using diet products, and purging, and one point for

answering yes to each question. Thus, a lower score on this composite indicated greater use of

UWCBs. The individual UWCBs were also analyzed with LCA independently to rule out

specific individual differences in latent classes between the types of behavior used. There were

no significant differences when comparing the number or composition of the best fitting latent

class model between individual UWCBs.

Ethics and Safeguards

The data utilized in this analysis are secondary and publicly available. The author has

reviewed the ethical protocols and safeguards as reported by the CDC, which conducted the data-

collection procedures. For further information on ethical protocol in regards to the YRBS, there

is a report issued by the CDC that outlines their process in detail (CDC, 2013).

Data Analysis

YRBS data is available to the public from the CDC's website. It is provided in both

Access database format as well as a .dat file. StatTransfer was utilized to convert the .dat file to

a .csv file, which was then read into R for analysis. The specific software package utilized was

poLCA, which is an R package designed to estimate latent class models for polytomous outcome variables (Linzer & Lewis, 2011). Latent class analysis is a statistical technique that allows researchers to investigate categorical data for sources of confounds, identify clusters of similar cases, and fit a model that eliminates the sources of confounding data based on the idea that there is another "latent" variable that explains the clustering and apparent confounds (Collins & Lanza, 2010). LCA has the capacity to identify subgroups of similar cases and use those subgroups to fit a model with multiple classes to the data, which often gives the researcher more information about what type of case is likely to fit in which class. This is a finite mixture model, because the latent or unobserved variable is classified as unordered categorical. Covariates can be included to create a latent class regression model, where certain responses in a case will increase the likelihood that it will belong to one class or another (Collins & Lanza, 2010).

Measures

Twelve factors were included as indicators of membership to a given latent class. Gender was taken directly from the YRBS data, which allows for two exclusive responses, male and female. Race and ethnicity was calculated using the YRBS measure for race, and the YRBS measure for identifying as Hispanic, where the aggregate data from these two questions were combined to create three categories: (1) white, (2) non-white and identifying as a single race, and (3) a multiracial category. Having experienced sexual violence was taken directly from the YRBS, with participants reporting whether they (1) had or (2) had not experienced forced intercourse. The measure for intimate partner violence (IPV) was calculated from the YRBS data so that there were five categories: (1) never having experienced IPV, (2) a single experience of IPV, (3) two or three experiences of IPV, (4) four or five experiences of IPV, and (5) six or

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more experiences of IPV. The measure for having been bullied at school was copied directly

from the YRBS data, response options being "yes" and "no." Cigarette smoking was measured

by calculating three categories of responses: (1)non-smokers (zero cigarettes within the previous

30 days), (2) casual smokers (one to 19 cigarettes smoked total within the previous 30 days) and

(3) regular smokers (20 to 30 cigarettes smoked total within the previous 30 days). Alcohol use

was measured by calculating three categories of responses: (1) abstainers (no alcohol use in the

previous 30 days), (2) casual drinkers (no more than five drinks at any one time within the

previous 30 days), and (3) binge drinkers (five or more drinks at one time at least once within the

previous 30 days).

Drug use was measured using three variables: one consisting of (1) marijuana uses within

the past 30 days, one consisting of (2) lifetime drug use of any kind, and one consisting of (3)

lifetime "hard" drug use. As alcohol use was considered separately, use of alcohol only would

not create a positive answer for the variable addressing any lifetime drug use. Responses from

the YRBS question addressing the number of times the student had used marijuana in the

previous 30 days were coded into three patterns of use: (1) abstainers, who had not used

marijuana in the past 30 days, (2) casual users, who had used marijuana from one to 19 times in

the past 30 days, and (3) habitual users, who had used marijuana 20 or more times in the past 30

days.   For the variable measuring lifetime drug use, there were two possibilities: (1) no drug use:

never having used any drugs, and (2) drug use: having used one or more of the following drugs

at some point during their lifetime: marijuana, cocaine, inhalants, heroin, methamphetamine, and

ecstasy. Steroid use was not considered because the aim of this variable was to measure

recreational drug use. The variable considering lifetime use of hard drugs was codified similarly

to the first lifetime drug use question, except that only cocaine, heroin, methamphetamine, and ecstasy were considered.

The variable measuring suicidality was calculated using the responses from the YRBS questions 27 and 29, which ask about whether the student has seriously considered suicide, and whether they have actually attempted suicide. By combining the responses to these two questions, participants were identified as either not suicidal, reporting suicidal ideation, or reporting suicide attempt(s). Body Mass Index (BMI) was calculated using the participant's reported height and weight. The BMI variable was then categorized into one of four categories as defined by the CDC: underweight (BMI of less than 18.5), healthy weight (18.51 – 24.99), overweight (25 – 29.99), and obese (BMI of 30 or greater). Then, the questions concerning UWCBs were combined to create a composite variable measuring the total level of risk behaviors, with lower scores being at higher risk.

CHAPTER IV

Results

The goal of this study was to examine a large data set for the existence or non-existence of classes of youth at risk for using UWCBs. UWCBs were defined as fasting (going more than 24 hours without eating), purging (either by self-induced vomiting or by laxative use), and taking diet pills or powders not prescribed by a doctor. A secondary goal was to examine if risk factors differed across the three behaviors examined. Engagement in any of these behaviors are a risk factor for the development of a full-syndrome eating disorder, which has significant mental and physical health implications for an individual in addition to large-scale public health implications for society (NEDA, 2015). As most of the research around eating-disordered behavior has been conducted with clinical samples, the breadth of the YRBS data is an advantage because it captures a greater number of adolescents who might not be evaluated for eating disorders but may be engaging in UWCBs.

The major findings of this study are that there are classes of risk for use of UWCBs and that the classes of risk do not appear to be significantly different between behaviors. The model that fits the data best based on AIC, BIC, and Chi-squared goodness of fit was the four-class model (see Table 1 below, which shows the goodness of fit information for models with two to eight classes).

Table 1: Measures of model fit, n = 8885

Number of Classes	df	$\chi 2$	AIC	BIC
2	8839	951484.7	118430.8	118757.1
3	8815	186610.8	116915.1	117411.5
4	8791	126597.8	115802.9	116469.6
5	8767	408174.5	117702.3	118539.2
6	8743	1751357	118486.8	119493.9
7	8719	119571.1	117238	118415.3
8	8695	277491.5	117455.3	118802.8

df = degrees of freedom, $\chi 2$ = Chi-squared goodness of fit, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion (for AIC and BIC, smaller values indicate greater parsimony)

The first class, with 59.2% of the population share, was least likely to have used UWCBs, and thus is at the lowest risk of developing an eating disorder. Characteristics of this class include a balanced spread across female and male identified adolescents, the lowest rates of substance use of any of the classes, and the lowest rates of suicidal thoughts or behavior. This class will be referred to as *Straight-Laced Teens* in further writing, because they were the least likely to engage in substance use of any kind.

The second class, with 10.7% of the population share, were at the greatest risk of developing an eating disorder based on their reporting of UWCBs use. Characteristics of this class include self-identifying as female, having experienced sexual violence, and having either thought about or attempted suicide. This class will be referred to as *Female-Sexual Violence Teens* in further writing due to low levels of substance use and comparatively much higher probability of being female, having experienced sexual violence, and having either thought about or attempted suicide.

The third class, with 7.9% of the population share, was more likely than both classes of *Normal-Experimentation Teens* (see below) and *Straight-Laced Teens* to use UWCBs. The only class that had a higher probability of UWCB use was the *Female-Sexual Violence Teens*.

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However, the difference between the *Female-Sexual Violence Teens* and this class (*Rebellious Teens*) with regard to the use of UWCBs was not found to be statistically significant, and this class is at significant risk of developing an eating disorder. Characteristics of this class include even gender distribution, greater likelihood of having experienced violence (interpersonal, sexual, or bullying), higher rates of use of all substances, and higher rates of suicidal thoughts or behavior. In further writing, this class will be called *Rebellious Teens* due to the level of substance use exhibited.

The fourth class (referred to from now on herein as the *Normal-Experimental Teens*), with 22.3% of the population share, were less likely to use UWCBs than either the *Female – Sexual Violence Teens* or *Rebellious Teens*, but more likely to use UWCBs than the *Straight-Laced Teens*. Compared to the *Female – Sexual Violence Teens* and *Rebellious Teens*, this class has less risk of developing an eating disorder, but a greater risk of developing a disorder than the *Straight-Laced Teens*. Characteristics of this class included low levels of violence (interpersonal, sexual, and bullying) but greater use of alcohol and marijuana than either of the classes previously discussed. In further writing, this class will be referred to as the *Normal-Experimentation Teens* due to reasonably expectable levels of using illicit drugs, alcohol, and cigarettes in an adolescent population.

Figure 1:

Risk of disordered eating behavior as a predictor of class
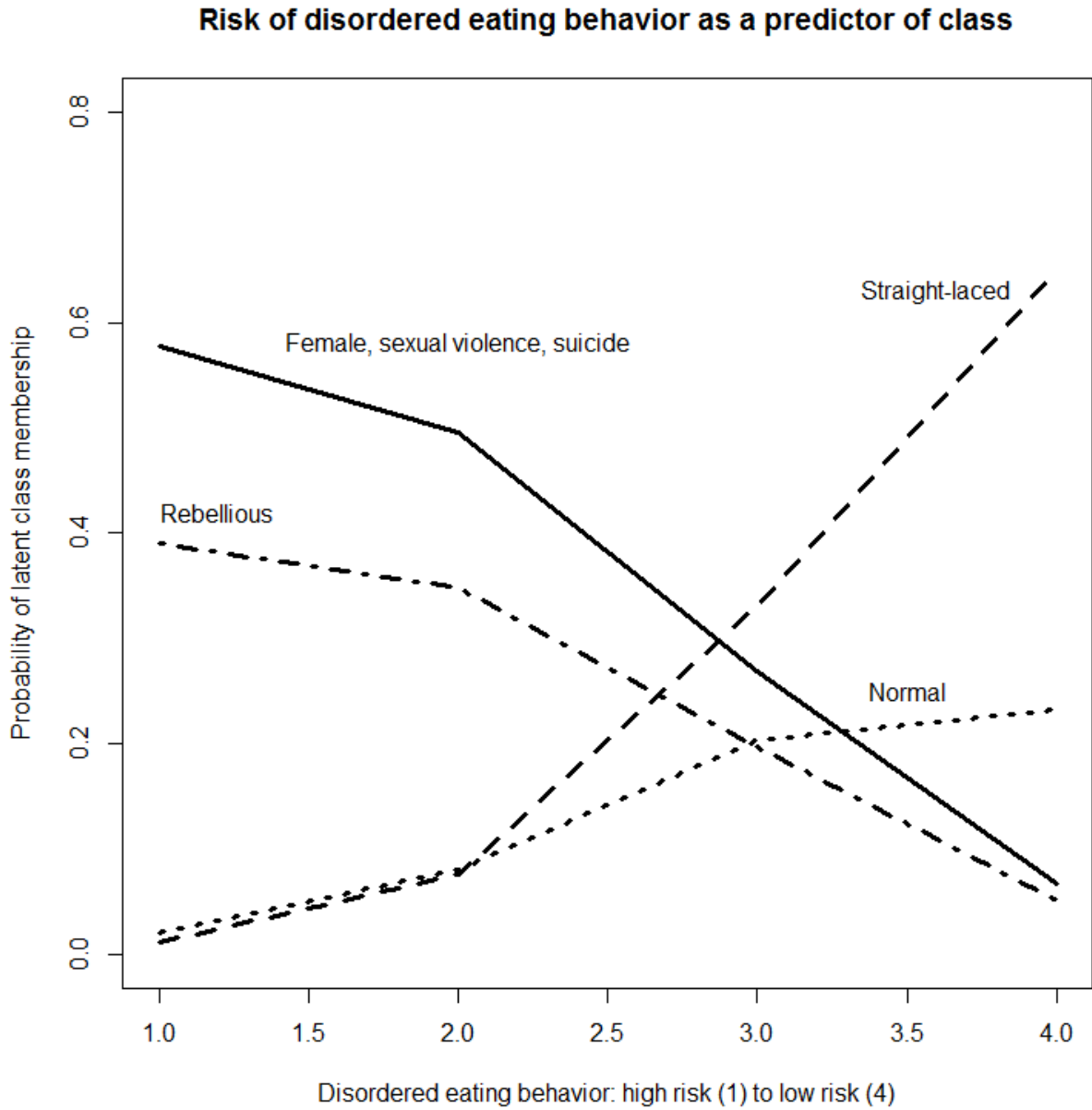
Table 2 (Appendix A, p. 35) shows the conditional item response probabilities by

outcome variable for each class. Figure 1 shows the relationship between the predicted prior

probability of level of eating disorder behavior/use of UWCBs and membership in a given latent

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class. For example, someone exhibiting a high level of eating-disordered behavior measured by answering "yes" to all three questions about UWCBs (coded as 1.0 on the x-axis of figure 1) has a nearly 60% probability of belonging to the *Female-Sexual Violence Teens* class and a nearly 40% probability of belonging to the *Rebellious Teens* class, with almost zero probability of belonging to either of the other classes. Further, someone who exhibits no eating disordered behavior as measured by answering "no" to all three questions about UWCBs (coded as a 4.0 on the x-axis of figure 1) has a greater than 60% probability of belonging to the *Straight-Laced Teens* class and greater than 20% probability of belonging to the *Normal-Experimentation Teens* class.

It is important to highlight a number of characteristics about the data analyzed. As the YRBS is conducted only in public high schools, the data do not represent adolescents who are either enrolled in private or alternative schools, have left school, or those in therapeutic environments, such as hospitals or treatment centers. The data are also western-centric in that the YRBS is conducted only in the United States and thus not generalizable on a greater scale. Further, the risk factors chosen for analysis in this study consist of a small sample of the data available in the YRBS.

One variable that was fairly consistent in distribution across all classes is BMI, included in this study because of its historical role in diagnosing full-syndrome eating disorders. The fact that BMI did not appear to be a significant factor in the probability that a young person would belong to a lower or higher risk class calls into question the historical reliance on BMI and on its weight as an objective measure of physical health and also on its relationship to any eating-disorder status.

In summary, the results of this study indicate that there are four latent classes of eating-disorder behavior risk. The latent class with the greatest eating disorder risk as measured by UWCB use tends to consist of females who report having experienced sexual violence and some degree of suicidality (*Female – Sexual Violence Teens*). The latent class at the next greatest eating-disorder risk tends to be adolescents who report engaging in substantial substance use and experiencing violence (*Rebellious Teens*). The latent class at the next greatest risk of eating disorders tends to be adolescents who engage in some limited substance use and report fairly low levels of violence (*Normal – Experimentation Teens*). Finally, the latent class with the least eating-disorder risk tends to be adolescents who engage in very little substance abuse and report experiencing very little violence (*Straight – Laced Teens*). These findings provide beneficial information for eating disorder prevention and early intervention work, as well as further questions to explore at a later time. Social workers who work with adolescents can use the results of this study to better understand those who are at risk of developing eating disorders and who might need specific and early interventions to prevent clients from developing full-syndrome eating disorders.

CHAPTER V

Discussion

The purpose of this study was to investigate whether certain groups of youth are more likely than others to engage in unhealthy weight control behaviors (UWCBs) and if so, what risk factors are associated with a greater likelihood of use of UWCBs. Using latent class analysis (LCA), it was determined that there are certain groups, or classes, of youth that are in fact more likely to engage in UWCBs than other groups. The latent class model that best fit this data offers four classes with varying levels of UWCB use. Knowing the different classes of risk for use of UWCBs increases our knowledge around eating-disorder risk as well, because previous to this study there have not been any inquiries into eating-disorder risk (operationalized here by use of UWCBs) using non-clinical populations. This study is also significant because there are no published studies that examine UWCBs using multilevel methods (Wang et al., 2013). Also important is that Body Mass Index (BMI) was found to not be a significant predictor of membership in any of the four classes regardless of the class' overall risk for eating disorders.

We do know from the literature that risk factors for engagement in UWCBs have been identified. These include the odds of an adolescent engaging in UWCBs increasing anywhere from two to 10 times in most ethnic groups, even when controlling for multiple individual and school level factors (Austin et al., 2011). However, Chao, Pisetsky, Dierker, Dohm, Rosselli, May, and Striegel-Moore (2008) found that white females appear to be the most likely to use UWCBs when compared to Black and Hispanic females and that Hispanic males seem to be the

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most likely to use UWCBs followed by Black males. None of these patterns were reproduced in this study, however; race and ethnicity was not found to be a strong predictor of latent class membership in any direction. This is likely a factor related to the methods used: LCA treats all variables as independent from one another, which was not the case in either previous investigation (Austin et al., 2011; Chao et al., 2008).

The literature on this subject also indicates that UWCBs are related to substance use. For example, Eichen, Conner, Daly, and Fauber (2010) found that use of diet pills and purgatory behavior are both predicted by any substance use. Further, fasting seems to be predicted by binge drinking and tobacco use (Eichen et al., 2010). In this study, UWCBs (encompassing fasting, purging, and diet pill use) were found along with significant substance use in the *Rebellious Teens* (latent class 3), confirming that there is an association between the use of UWCBs and substance use.

Further, Weng (2011) documented a number of associated risk factors for use of UWCBs in 2011. Use of UWCBs was associated with experiencing physical violence, sexual violence, and bullying (Weng, 2011). Specifically, the highest rates of UWCB use were found in adolescents who abused substances or exhibited suicidal behavior, and the findings of the current study agree with these previous results.

One risk factor found to be associated positively with use of UWCBs was perceiving oneself as overweight (Boutelle 2002; Eichen et al. 2010; Goldschmidt et al., 2008). The current study did not examine the adolescents' perception of or satisfaction with their weight. Given the breadth of the YRBS, it would be interesting to include as many variables as possible in a LCA considering the same outcome variables. It was not possible in the course of this study to include every possible risk factor that warranted inclusion, but based on the results achieved here, it

seems that doing so would likely be a highly fruitful endeavor. Much of the previous research using YRBS data concerning UWCBs did not use a statistical model as strong as LCA, which would have introduced the possibility of confounds and questions of reliability and validity. LCA is able to consider each variable as independent of each other initially, as opposed to controlling for possible dependencies after analyzing the data.

It is notable that BMI was not a predicting factor of membership in any of the four latent classes. This is important for social work practice in as much as traditional ways of diagnosing an eating disorder rely heavily on BMI as a diagnostic indicator, and without knowing that BMI does not affect someone's likelihood to engage in UWCBs, clinicians could miss significant, treatment-worthy issues. This calls into question the validity of BMI as a diagnostic indicator for eating disorders, and having this knowledge allows clinicians to be less likely to miss the earlier signs and symptoms of an eating disorder. Further, knowing the likely comorbidities for use of UWCBs as documented in this study would allow clinicians to know which clients are at particularly high risk and enable a more proactive approach to practice with these types of clients. In fact, knowing this information could save lives that would have been ended prematurely by eating disorders if not for a "UWCB – savvy" clinician who intervened early.

In conclusion, the current study found a number of interesting and worthwhile phenomena that are highly applicable to clinical social work with youth. Further analysis of YRBS data concerning UWCBs is warranted, particularly with inclusion of a greater number of possible contributing factors, and for more specific groups of adolescents as well. This would likely provide results that would further clarify which adolescents are at risk for using UWCBs and contribute to interventions that are both appropriate and relevant.

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APPENDIX A

Table 2: Probability of class membership by risk factor

	Class 1 – Straight-Laced Teens (59.2% population share)	Class 2 – Female, Sexual Violence Teens (10.7% population share)	Class 3 – Rebellious Teens (7.9 % population share)	Class 4 – Normal – Experimentation Teens (22.3% population share)
Gender				
Female	.4758	.8648	.5479	.3689
Male	.5242	.1352	.4521	.6311
Race/Ethnicity				
White	.5973	.5732	.7271	.5239
Non-white	.3351	.3132	.1707	.4011
Multiracial	.0676	.1136	.1022	.075
IPV				
None	.9831	.7773	.69	.9431
1-2 experiences	.0078	.0904	.0709	.019
3-4 experiences	.0054	.0842	.1146	.022
5-6 experiences	.0006	.0241	.0325	.0047
7 or greater experiences	.003	.024	.0919	.0122
Sexual Violence				
Yes	.0148	.2806	.3119	.0324
No	.9852	.7194	.6881	.9676
Been Bullied				
Yes	.1405	.5191	.3516	.0997
No	.8595	.4809	.6484	.9003
Cigarette Smoking, past 30 days				
Nonsmoker	.9818	.9207	.2186	.7205
Occasional Smoker (1-19 days)	.0145	.0687	.3571	.2094
Frequent Smoker (20-30 days)	.0037	.0106	.4243	.0702
Alcohol Use				
No use	.8608	.6152	.0768	.3232
Casual drinking	.0847	.2403	.1069	.2519
Binge drinking	.0546	.1444	.8163	.4249
Marijuana use, past 30 days				
No use	1.0	.885	.1623	.3045
Occasional use (1-19 days)	0	.115	.392	.5264
Frequent use (20-30 days)	0	0	.4456	.1691
Lifetime hard drug use				
No hard drug use	1.0	.9553	.4294	.8713
Hard drug use	0	.0447	.5706	.1287
Lifetime drug use				
No drug use	.8741	.47	0	0
Drug use	.1259	.53	1.0	1.0
BMI				
Underweight (<19)	.1095	.0997	.0726	.0742
Normal weight (19 – 24.9)	.6352	.5244	.6072	.638
Overweight (25 – 29.9)	.1667	.2362	.1976	.1892
Obese (≥30)	.0866	.1397	.1227	.0985
Suicidality				
None	.9383	.4232	.4808	.8822
Ideation	.0509	.3188	.2314	.0881
Attempts	.0107	.258	.2879	.0297