

Florida State University Libraries

Electronic Theses, Treatises and Dissertations

The Graduate School

2012

Body Mass Index Trajectories and Health-Risk Behaviors: Transition to Adulthood

Ursula Keller Weiss



FLORIDA STATE UNIVERSITY
COLLEGE OF SOCIAL SCIENCES AND PUBLIC POLICY

BODY MASS INDEX TRAJECTORIES AND HEALTH-RISK BEHAVIORS:
TRANSITION TO ADULTHOOD

By

URSULA KELLER WEISS

A Dissertation submitted to the
Department of Sociology
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Degree Awarded:
Summer Semester, 2012

The members of the Committee approve the dissertation of Ursula Keller Weiss defended on June 14, 2012.

Kathryn Harker Tillman
Professor Directing Dissertation

Rebecca Miles
University Representative

Isaac W. Eberstein
Committee Member

Koji Ueno
Committee Member

Miles Taylor
Committee Member

The Graduate School has verified and approved the above-named committee members, and certifies that the dissertation has been approved in accordance with university requirements.

I dedicate this dissertation to my mother and father.

ACKNOWLEDGEMENTS

This dissertation has been a long time coming... and there are many dear and special individuals to thank in getting this final product to the table. First and foremost, I would like to thank my advisor, mentor and friend, Kathi Tillman who has been a wonderful role model to me and to whom I owe much of my success. Particularly, I want to thank her for helping me keep my eyes focused on the prize, for always believing in me and my abilities to accomplish this and other goals, and never shying away from being frank when necessary. I also would like to thank Ike Eberstein, who from the onset of my graduate school career always has had an open door and ear to me as mentor and friend. In addition, I know that his expectations and often-stated vision of success for me has given me the necessary confidence and drive to take on new challenges and to be the best I can be.

Also, had it not been for mentor Miles Taylor, this dissertation would not be here today. I had this great idea for a dissertation topic, but I did not have the required methodological and statistical expertise to take on the complex subject on my own. I am extremely grateful to Miles for assisting me with Mplus, the different latent curve modeling techniques and their model interpretations, explaining the associated quirks of the models, etc. that only an expert in the field would know, and just being there whenever I needed methodological or other counsel. The effort, interest, guidance and criticism that these three individuals, along with committee members Rebecca Miles and Koji Ueno, brought to the project and my work as a graduate student in general were vital to me finishing the dissertation. Thank you.

As important as my academic family has been to the completion of this dissertation, so too has been my family. I first want to say how fortunate I am to have such a wonderful, loving, generous, and caring family who just mean the world to me. Many million thanks must be given to my dear mother, Pamela Keller, and father, Rolf Keller, who are the most generous people I know. Words cannot express how much I appreciate everything that they have done for me throughout my life. Although there are so many things about them that I am grateful for, I am particularly happy that they instilled a love for learning early on in life and were constant supporters in my endeavors as a youth and young adult. Even in completing this dissertation, their love, support and sacrifice have been unrelenting. My mother is a huge inspiration and I

can only hope to be as great of a mother to my girls as she has been to me. Thanks go to my brother, Rolf Keller Jr., as well, as he has taught me to appreciate everything I have and never give up.

I would also like to thank my grandparents, aunts and uncles for loving me unconditionally and always thinking I was going to amount to something great one day. My extended family, the Weiss', also need to be thanked. They have been so supportive of me over the years as a doctoral student and mom. They have been crucial and extremely giving, both emotionally and financially, in getting through the ups and downs of dissertation writing. Finally, I would like to thank my loving husband and best friend, Clayton Weiss who has been my companion for the past 6 years. Although we have had some wonderful distractions along the way (the births of our two beautiful daughters, Savannah and Harper), since we have been together, he has only but been a cornerstone and close ally in my dissertation quest. I am truly grateful for his constant support and love for his family as well as his crazy humor which makes me smile every day.

This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (<http://www.cpc.unc.edu/addhealth>). No direct support was received from grant P01-HD31921 for this analysis.

TABLE OF CONTENTS

List of Tables.....	viii
List of Figures.....	x
Abstract.....	xi
CHAPTER 1 – INTRODUCTION.....	1
CHAPTER 2 – BACKGROUND: OBESITY.....	5
2.1 Obesity in the United States.....	5
2.2 Childhood Obesity and Social Outcomes.....	9
2.2.1 Stigmatization and Interpersonal Relationships.....	9
2.2.1.1 Peers.....	12
2.2.1.2 Educators.....	13
2.2.1.3 Parents and Family Members.....	15
2.2.2 Psycho-social Consequences.....	17
2.3 Influencing the Association between Childhood Obesity and Social Outcomes....	20
2.3.1 Gender.....	20
2.3.2 Race/Ethnicity.....	21
2.3.3 Immigrant Status.....	22
2.4 Conceptual Model, Theoretical Framework, and Overview of the Dissertation....	23
2.4.1 The Life Course Perspective.....	24
2.4.2 Overview of the Dissertation.....	24
CHAPTER 3 – RESEARCH METHODOLOGY AND DESIGN.....	26
3.1 General Research Questions.....	26
3.2 Data.....	26
3.3 Measurement.....	28
3.3.1 Body Mass Index (BMI).....	28
3.3.2 Covariates.....	29
3.3.2.1 Socio-demographic Characteristics.....	29
3.3.2.2 Family Background Characteristics.....	29
3.3.2.3 Interpersonal Relationships.....	29
3.3.3 Health Risk Distal Outcomes.....	31

3.4 Description of the Sample.....	31
3.5 Analytic Strategy.....	34
3.5.1 Latent Class Analysis.....	34
3.5.1.1 General Equation.....	35
CHAPTER 4 – DISAGGREGATING BMI TRAJECTORIES: ADD HEALTH.....	36
4.1 Number of Classes, Their Shapes and Sample Percentages.....	37
4.2 Discussion.....	44
CHAPTER 5 – COVARIATE EFFECTS ON BMI TRAJECTORY MEMBERSHIP.....	46
5.1 Predictors of BMI Trajectories: Full Sample (Four-Class Model).....	47
5.2 Predictors of BMI Trajectories: Boys/Men (Three-Class Model).....	50
5.3 Predictors of BMI Trajectories: Girls/Women (Four-Class Model).....	52
5.4 Discussion.....	54
CHAPTER 6 – BMI TRAJECTORY MEMBERSHIP AND LATER HEALTH-RISK BEHAVIORS.....	58
6.1 Predictors of Distal Outcomes: Full Sample (Four-Class Model).....	61
6.2 Predictors of Distal Outcomes: Boys/Men (Three-Class Model).....	65
6.3 Predictors of Distal Outcomes: Girls/Women (Four-Class Model).....	68
6.4 Discussion.....	72
CHAPTER 7– DISCUSSION AND CONCLUSION.....	76
7.1 Disaggregating BMI Trajectories: Add Health.....	76
7.2 Covariate Effects on BMI Trajectory Membership.....	77
7.3 BMI Trajectory Membership and Later Health-Risk Behaviors.....	79
7.4 General Limitations.....	80
7.5 Discussion.....	81
APPENDIX – RE-APPROVAL OF USE OF HUMAN SUBJECTS IN RESEARCH.....	83
REFERENCES.....	90
BIOGRAPHICAL SKETCH.....	106

LIST OF TABLES

Table 3.1 Descriptive Statistics for the Total Sample at Study Entry (unless noted otherwise); Add Health 1995.....	32-33
Table 3.2 Body Mass Index Information by Add Health Wave.....	34
Table 4.1 Model fit Statistics for 7 Latent Classes– Bayesian Information Criterion (BIC) and Entropy.....	39
Table 4.2 Classes of BMI Trajectories and Mean BMI Levels without Covariates for the Full Sample (1,669).....	41
Table 4.3 Classes of BMI Trajectories and Mean BMI Levels without Covariates for the Boys/Men Sample (N=708).....	42
Table 4.4 Classes of BMI Trajectories and Mean BMI Levels without Covariates for the Girls/Women Sample (N=961).....	44
Table 5.1 The Odds Ratios for Socio-demographic, Family Characteristics, and Interpersonal Relationship Quality in the Full Sample: Four BMI Trajectories (N=1,669).....	48
Table 5.2 The Odds Ratios for Socio-demographic, Family Characteristics, and Interpersonal Relationship Quality in the Male Sample: Three BMI Trajectories (N=708).....	51
Table 5.3 The Odds Ratios for Socio-demographic, Family Characteristics, and Interpersonal Relationship Quality in the Female Sample: Four BMI Trajectories (N=961).....	53
Table 6.1 Sample Description of Health-Risk Distal Outcomes by Gender.....	60
Table 6.2 The Odds Ratios for the Covariate Effects on Health-Risk Distal Outcomes for the Full Sample (N=1,669).....	62
Table 6.3 The Odds Ratios for BMI Trajectories by Health-Risk Distal Outcomes for the Full Sample (N=1,669).....	63
Table 6.4 The Odds Ratios for Covariate Effects on Health-Risk Distal Outcomes for the Boy/Men Sample (N=708).....	67
Table 6.5 The Odds Ratios of BMI Trajectories by Health-Risk Distal Outcomes for the Boys/Men (N=708).....	68

Table 6.6 The Odds Ratios for Covariate Effects on Health-Risk Distal Outcomes for the Girls/Women Sample (N=961).....	70
--	----

Table 6.7 The Odds Ratios for the BMI Trajectories by Health-Risk Distal Outcomes for the Girls/Women Sample (N=961).....	71
---	----

LIST OF FIGURES

<p>Figure 2.1 Trends in Overweight, Obesity and Extreme Obesity among U. S. Adults ages 20-74 years. (Overweight is classified as BMI 25.0-29.9, obesity is classified as BMI greater than or equal to 30.0 and extreme obesity is classified as BMI greater than or equal to 40. <http://www.cdc.gov/nchs/data/hestat/overweight/overweight_adult.htm> Accessed March 23, 2010.).....</p>	6
<p>Figure 2.2 Prevalence of Obesity (BMI \geq 95th Percentile) among U.S. Children and Adolescents (Aged 2–19 Years) (Sex-and age-specific BMI \geq 95th percentile based on the CDC 2000 growth charts). <i>Sources:</i> Hedley et al 2004; Ogden et al. 2002; Ogden, Carrol and Flegal 2008.....</p>	7
<p>Figure 2.3 Prevalence of Obesity among U.S. Boys and Girls Aged 2 through 19 Years, by Race and Ethnicity, 2007- 2008 (Sex-and age-specific BMI \geq 95th percentile based on the CDC 2000 growth charts. Pregnant girls excluded.) <i>Source:</i> Ogden et al. 2010.....</p>	8
<p>Figure 2.4 Conceptual Diagram of Weight Status Change and Later Health Risk Behaviors..</p>	23
<p>Figure 2.5 Conceptual Diagram: Predictors and Moderator of BMI Trajectory Membership..</p>	25
<p>Figure 2.6 Conceptual Diagram: BMI Trajectory Membership and Health Risk Outcomes...</p>	25
<p>Figure 4.1 BMI Trajectory Membership among Youth who were aged 12 or 13 years at Wave I (N=1,669).....</p>	40
<p>Figure 4.2 BMI Trajectory Membership among Boys/ Young Men who were aged 12 or 13 years at Wave I (N=708).....</p>	42
<p>Figure 4.3 BMI Trajectory Membership among Girls/ Young Women who were aged 12 or 13 years at Wave I (N=961).....</p>	43

ABSTRACT

The physical health dangers, as well as social and emotional consequences, of obesity are well established in the literature. Much is also known about the increasing rates of obesity for youth and adults in the United States. Yet, still poorly understood is how individuals fluctuate in terms of their weight or BMI over time and what different weight experiences may mean for later well-being. This dissertation contributes meaningfully to the existing literature on obesity by exploring how body mass index (BMI) trajectories in early life impact psychosocial well-being and behavior later in life.

Using data from all four waves of the National Longitudinal Study of Adolescent Health (Add Health), the major research questions of this dissertation are, 1) are there a number of distinctly different BMI trajectories found among American youth as they travel through adolescence and into adulthood? If yes, do these vary significantly by gender?; 2) do socio-demographic characteristics, family background characteristics, and youths' perceptions of interpersonal relationship support predict BMI trajectory membership? If yes, does the association between trajectory membership and these factors differ by gender?; and finally, 3) is there a relationship between adolescent BMI trajectory membership and certain health-risk behaviors, including prescription drug abuse, problematic drinking, and daily cigarette smoking behaviors, during adulthood? If yes, are there conditioning effects of gender?

The findings of this dissertation indicate that a four-class model of BMI trajectories generally characterizes the full sample and the sub-sample of girls/women, whereas a three-class model best reflects the boys/men's BMI experiences during adolescence and young adulthood. Among the predictors of individual trajectory membership, it appears that being non-Hispanic Black or Hispanic, attending public schools, reporting lower levels of parental attachment and family income, living in a two-biological parent family and having higher levels of parental availability are all risk factors for youth who experience trajectories elevated in BMI over time. On the other hand, missing values for family income and family education and having higher levels of parental attachment appear to protect youth from entering high BMI trajectories. Also, net of socio-demographic and adolescent/young adult interpersonal relationship characteristics, BMI trajectory membership is significantly associated with health-risk behavioral outcomes, yet only for women. The distal analyses show that experiencing elevated BMI trajectories over the

course of early life, specifically being in the *Obese to Morbidly Obese* and the *Obese to High Morbidly Obese* classes, is associated with a lower likelihood of engaging in some potentially very harmful health behaviors - *prescription drug abuse* (for the *Obese to Morbidly Obese*) and *problematic drinking* (for the *Obese to High Morbidly Obese*). Overall, the findings presented in this dissertation add to the emergent knowledge on individual heterogeneity in BMI experiences among adolescents and adults. Future research should strive to uncover some of the paths through which the identified risk factors work to influence weight changes, as well as the odds of engaging in health risk behaviors over time.

CHAPTER 1

INTRODUCTION

“The surge in obesity in this country is nothing short of a public health crisis that is threatening our children, our families, and our future...In fact, the health consequences are so severe that medical experts have warned that our children could be on track to live shorter lives than their parents.”

First Lady Michelle Obama (U.S. Department of Health and Human Services Press Release; January 28, 2010)

In the United States and throughout much of the industrialized world, obesity is widely recognized as a significant and growing public health problem. Obesity and overweight are of serious concern given that they mark ranges of weight that are greater than what is usually deemed healthy for a particular height. Although extensive research points to the health dangers of obesity (Alley and Chang 2007; Field et al. 2001; Olshansky et al. 2005; US Department of Health and Human Services 2001), American waistlines continue to expand. In fact, over the next two decades, the prevalence of obesity is projected to increase by 33 percent. It is estimated that 42 percent of the U.S. population will be obese and that eleven percent will be severely obese (Finkelstein et al. 2012). Our ‘*obesogenic*’ lifestyle is thought to advance the present weight problem, where eating large quantities of food, overindulgence in unhealthy foods, and physical inactivity are typical daily occurrences for many Americans. To combat this growing problem, the health and science communities, the popular media, and more recently the White House are working diligently to promote awareness of the health, social, psychological, and economic ramifications of excess body fat. Obesity is not only a crisis of the present, its effect on the health and social outcomes of today’s adults, and more than ever today’s children, may have a lasting impact on future generations’ health, longevity and overall well-being.

Given the high prevalence of obesity among U.S. children, this issue has become a key concern to health officials and social scientists alike. While not all overweight or obese children become obese adults, earlier onset and greater severity of weight problems in

childhood increase the likelihood that obesity will continue into adolescence and adulthood (Guo et al. 2002). The extent of the obesity threat among our young, therefore, is particularly troublesome because research has clearly linked adolescent and adult obesity to numerous serious health and medical problems, such as an increased risk for coronary heart disease, type 2 diabetes mellitus (DM), hypertension, certain cancers, stroke and other complications (Ebbeling, Pawlak, and Ludwig 2002; Must et al. 1999; US Department of Health and Human Services 2001). As a result, higher levels of obesity are associated with increased mortality (Allison et al. 1999; Flegal et al. 2005) and may also have a substantial damaging effect on longevity (Fontaine et al. 2003; Olshansky et al. 2005), although not all researchers agree (Preston 2005).

Obesity's effect on individual well-being, however, reaches well beyond that of physical health and functioning (Anderson and Butcher 2006; Ferraro and Kelley-Moore 2003). Evidence increasingly suggests that there are also significant social and emotional consequences associated with excess body weight and that these may negatively influence aspects of child and adolescent development and well-being, independent of the physical health ramifications. For example, some research indicates that childhood obesity is related to decreased scholastic achievement, educational attainment, and earnings during adulthood, as well as increased levels of health-risk behaviors and negative internalizing behaviors, such as depression, low self-esteem and poor body image, during childhood and adolescence (Bradley et al. 2008; Crosnoe 2007; Crosnoe and Muller 2004; Farhat, Iannotti, and Simons-Morton 2010; Pagan and Davila 1997; Shore et al. 2008). To date, however, research has rarely been devoted to identifying how obesity in early life continues to impact psychosocial well-being later in life (Crosnoe 2007; Crosnoe and Muller 2004; Merten, Wickrama, and Williams 2008).

On top of these challenges, pediatric obesity is also connected with health-risk behaviors and externalizing problems (Datar et al. 2004; Farhat et al. 2010; Lawlor et al. 2005; Mustillo et al. 2003) that are not only serious hazards to adolescent health and well-being, but may also contribute to some of the physical and psychological problems experienced by obese youth during their adulthood. Studies have found a positive association between body mass index and a variety of problem behaviors among youth, including smoking initiation (Cawley 2004), alcohol use, binge drinking, the use of tobacco and other drugs (Berg, Simonsson, and Ringqvist 2005; Farhat et al. 2010; McLaren et al. 2007; Pasch et al. 2008; Strauss 2000),

fighting and aggression, violent behavior and bullying (Farhat et al. 2010; Griffiths et al. 2006; Janssen et al. 2004; Pasch et al. 2008; Zeller et al. 2008).

Although current cross-sectional research suggests an association between weight status and negative behavioral outcomes (Bradley et al. 2008; Datar and Sturm 2006; Datar et al. 2004; Lawlor et al. 2005), we know little about how the potential relationship between these outcomes and weight status changes over time. As such, we need new research that uses representative longitudinal data to assess the dynamic relationship between weight status and outcomes. It is not unusual to experience weight fluctuations in childhood, especially during the adolescent years (Guo et al. 2000). Cross-sectional data do not permit for clear tests of temporal order or the study of changes or trajectories in weight as youth age, nor do they provide insight into whether particular patterns of weight are linked to particular outcomes later in life. Longitudinal data throughout the transition to adulthood would allow for the identification of distinct developmental trajectories of weight classifications, clearly delineating between those who are transiently obese and those who are chronically obese. One might speculate that long-term obesity (or overweight) and/or rapid increases in weight status over time may pose even more serious health consequences for young individuals than short-term experiences with obesity or gradual increases in weight. Longitudinal data would provide insight into this issue and would also allow for the identification of familial and social factors that help to explain membership in the various weight status trajectories.

In addition to the lack of longitudinal research on this issue, few studies have focused on how gender, age, and race/ethnicity might moderate the effects of obesity on young people's social and emotional well-being (Crosnoe 2007; Merten 2008), and several other potential moderating factors of importance have been all but ignored by researchers. For example, analyses that focus on the moderating impact of immigrant status are quite rare (for an exception see Harris et al. 2009). In general young immigrants, particularly immigrant girls, tend to be healthier and engage in fewer risk behaviors than their non-immigrant peers (Weiss and Tillman 2009), but over time young immigrants appear to acculturate to American diets and lifestyles that can lead to unhealthy weights (Akresh 2007). Given that the size of the immigrant child population is currently at an unparalleled high, if data allow, researchers should explore immigrant status disparities in obesity as these children age into adulthood.

In an effort to address some of these limitations in the literature, using all four waves of the National Longitudinal Study of Adolescent Health (Add Health) this dissertation employs latent class analysis to explore the impact of family and social relations on longitudinal weight status trajectories during the transition to adulthood. It also examines the link between weight status trajectory membership and health-risk behaviors as young adults. Finally, it explores the conditioning effects of gender, as the data and statistical techniques do not permit other potentially important moderators, like race and immigrant status, to be examined. The conceptual framework for the dissertation project is based on a life course perspective.

This dissertation consists of five additional chapters. Chapter 2 provides a literature review, a theoretical overview for the importance of this study, and a discussion of this study's contributions to sociological research. Chapter 3 describes the research questions, data, measures, and analytic strategy. Chapter 4 reports results from latent class analysis estimating the number and type of body mass index (henceforth referred to as BMI) trajectories experienced by the Wave I 12 and 13 year-old cohort over the course of the next three waves of data collection (selection of this cohort is discussed in section 3.2 Data). Chapter 5 reports on the variables that predict BMI trajectory membership, including Wave I socio-demographic and family background characteristics and youths' perceptions of familial and extra-familial relationships and supports. Chapter 6 tests the relationship between BMI trajectory membership and engagement in later health-risk behaviors, including prescription drug abuse, problematic drinking, and daily cigarette smoking behaviors measured at Wave IV. Chapter 7 is the concluding chapter and addresses the limitations of the study, discusses the implications of this research, and suggests directions for future research that examines the developmental weight trajectories of America's young people.

CHAPTER 2

BACKGROUND: OBESITY

The background portion of this dissertation begins with a description of trends and patterns in obesity in the United States. I then discuss the link between obesity during childhood/ adolescence and a variety of social and emotional outcomes over the life course. In particular, I discuss outcomes such as relationship development and engagement in risky behaviors. Finally, the background section concludes with a discussion of how the association between childhood obesity and later outcomes may be conditioned by individual characteristics. A primary aim of this section is to explicate the mechanisms underlying the associations between obesity and individual behaviors that are known to be problematic for health and later status attainment.

2.1 Obesity in the United States

The prevalence of obesity among adults and children has increased to dangerous proportions, and is projected to continue into the future (Finkelstein et al. 2009; Finkelstein et al. 2012). Studies examining the National Health and Nutrition Examination Survey (NHANES) reveal that between 1980 and 2008, the prevalence of obesity in the United States more than doubled among adults. In 2007-2008, more than 33 percent of all American adults were classified as obese (i.e. defined as having body mass index, or BMI, of 30.0 or higher), 34.2 percent were classified as overweight (i.e. defined as having body mass index, or BMI, of 25.0 to 29.9), and 5.7 percent were classified as extremely obese (i.e. defined as having body mass index, or BMI, of 40.0 or higher) (Flegal et al. 2010). Figure 2.1 shows the trends for overweight, obesity and extreme obesity in adults since the 1960s. These trends show that the rise in the prevalence of overweight and obesity over the past fifty years has been fed largely by the stark increases in the rates of obesity and extreme obesity. Moreover, the NHANES data show that the prevalence of obesity (35.1 percent) exceeded the prevalence of overweight (32.2 percent) for the first time in 2005-2006.

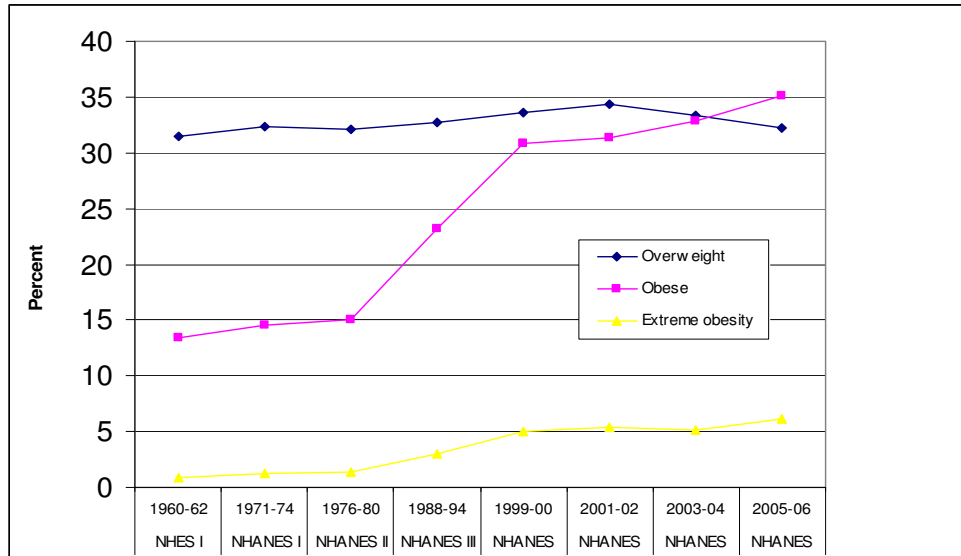


Figure 2.1: Trends in Overweight, Obesity and Extreme Obesity among U. S. Adults ages 20-74 years. (Overweight is classified as BMI 25.0-29.9, obesity is classified as BMI greater than or equal to 30.0 and extreme obesity is classified as BMI greater than or equal to 40. <http://www.cdc.gov/nchs/data/hestat/overweight/overweight_adult.htm> Accessed March 23, 2010.)

The problem of obesity is not limited to adults, however. Children and adolescents living in the U.S. are particularly hard-hit by rising levels of overweight and obesity. Although the terminology used for various weight or BMI categories differs considerably when we speak of children as opposed to adults, terms such as *overweight*, *obesity* and *at risk for overweight* are often seen in the literature referring to children’s weight issues. In 1994, the Expert Committee on Clinical Guidelines for Overweight in Adolescent Preventative Services recommended that children and adolescents aged 2-19 years who are at or above the 95th percentile of BMI for their age be labeled as “overweight,” and youth who are between the 85th and 95th percentiles be labeled as “at risk for overweight” (Barlow and Dietz 1998). However, in 2005, the Institute of Medicine elected to define youth with BMIs greater than the 95th percentile as “obese” (Koplan, Liverman, and Kraak 2005) in order to stress the importance and urgency of the issue. Current experts endorse the change and recommend that the term “at risk for overweight” be replaced with “overweight,” arguing that it will not only be easier for parents to understand, but it will also provide greater continuity with the adult cutoff points for obesity and overweight (Krebs et al. 2007).

As with adults, rates of obesity and overweight among U.S. children and teens have been explored in a variety of studies using the NHANES. Figure 2.2 (see below) shows the results of some of these studies, and indicates that the prevalence of obesity among school-aged youth nearly tripled between 1971 and 2006, rising from approximately 4 percent to just over 12 percent among 6 to 11 year olds and from 6 percent to almost 18 percent among 12 to 19 year olds (Ogden, Carroll, and Flegal 2008). By 2007-2008, 16.9 percent of all children and adolescents in the U.S. were considered obese, with 11.9 percent categorized as extremely obese. In total, about 32 percent of children and adolescents were considered overweight or obese (Ogden et al. 2010).

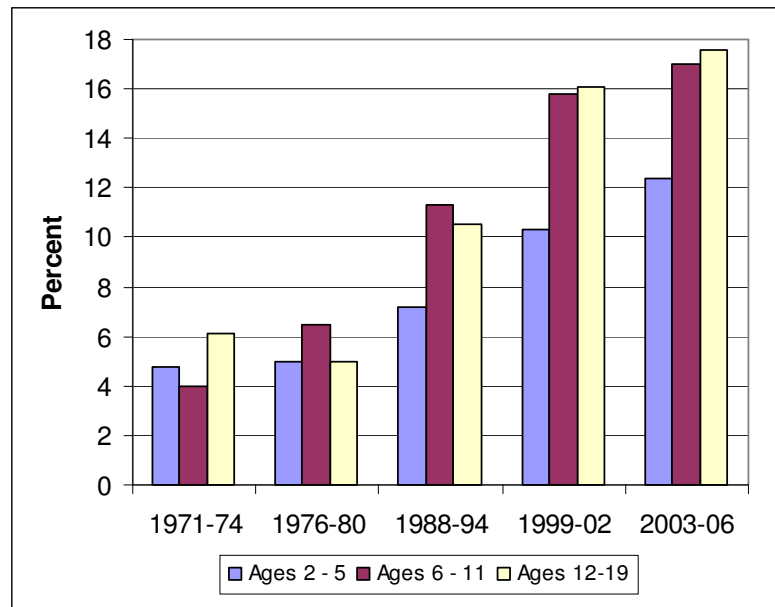


Figure 2.2: Prevalence of Obesity (BMI \geq 95th Percentile) among U.S. Children and Adolescents (Aged 2–19 Years) (Sex-and age-specific BMI \geq 95th percentile based on the CDC 2000 growth charts). *Sources:* Hedley et al 2004; Ogden et al. 2002; Ogden, Carrol and Flegal 2008.

There are, however, large socio-demographic differentials in the occurrence of overweight and obesity among young people, suggesting a heterogeneous nature to obesity. Much of the current research on racial and ethnic differences in youth obesity focuses on the largest racial/ethnic groups, including Blacks, Whites, and Hispanics. Very little research explores rates of obesity among Asian Americans and other smaller racial/ethnic sub-groups (exceptions include: Crawford et al. 2001; Goel et al. 2004; Gordon-Larsen et al. 2003; Harris,

Perreira, and Lee 2009). In general, though, Asian youth appear to have the lowest rates of obesity, followed by non-Hispanic Whites, non-Hispanic Blacks and then Hispanics (Gordon-Larsen, Adair, and Popkin 2003; Ogden et al. 2010).

Recent data from the NHANES indicates that racial/ethnic differentials in rates of obesity among children aged 2 through 19 years vary significantly by gender and age (See Figure 2.3). Among boys, Hispanics are at a greater disadvantage than their non-Hispanic White and non-Hispanic Black peers. This pattern holds at the preschool age (2-5 years), the early school age (6-11 years) and during the teen years. While non-Hispanic Black boys are more likely than their White counterparts to be categorized as obese during the preschool and teen years, they are less likely to be obese during the early school years. Among girls, different patterns emerge. For example, few racial/ethnic differences in obesity are seen among preschool aged girls. Furthermore, while Hispanic and Black girls appear to be slightly more likely than their non-Hispanic White peers to experience obesity during the early school age years, it is non-Hispanic Black girls who are the most likely to be obese during the teen years (Ogden et al. 2010). By this later age range, an astonishing 25 percent of Hispanic boys and almost 30 percent of Black girls are categorized as obese.

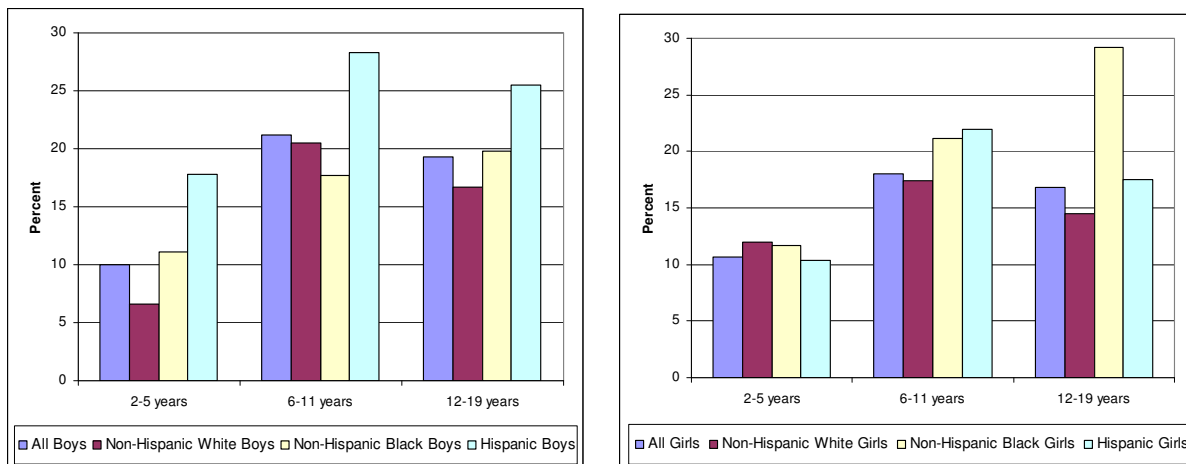


Figure 2.3: Prevalence of Obesity among U.S. Boys and Girls Aged 2 through 19 Years, by Race and Ethnicity, 2007- 2008 (Sex-and age-specific BMI \geq 95th percentile based on the CDC 2000 growth charts. Pregnant girls excluded.) *Source:* Ogden et al. 2010.

2.2 Childhood Obesity and Social Outcomes

Research clearly indicates that there are substantial short- and long-term physical health consequences associated with the high levels of pediatric obesity now seen in the United States. However, a growing emphasis has also been placed on exploring the social and psychological consequences (e.g. stigmatization, relationship/friendship patterns, self-esteem, academic achievement, etc.) and other more enduring developmental consequences (e.g. future aspirations, status attainment, etc.) of excess weight (Cottrell and Neuberg 2005). Childhood, especially the adolescent period, is a time during which vital social milestones that may affect future long-term health and well-being are achieved. This section of the dissertation proposal provides a review of the literature on how obesity during this period is associated with social and psychological outcomes, focusing specifically on issues of relationship development and engagement in health risk behaviors. The section will discuss both the short-term and long-term social consequences of obesity (and overweight, depending on the definition of childhood obesity) for youth.

2.2.1 Stigmatization and Interpersonal Relationships

In our modern society, being obese is often considered unattractive and has been associated with a variety of negative stereotypes, including beliefs that obesity represents flaws in an individual's personal effort/hygiene (laziness, lack of willpower, dirty), flaws in central attributes of competence (being stupid) and even flaws in morality (lying, cheating) (Puhl and Brownell 2001). Although Latner and Stukard (2003) find that the stigma associated with obesity is worse today than it was 40 years ago, others suggest that these attitudes may be slowly changing over time. As Americans become increasingly heavy, negative opinions about obese individuals might be waning in some ways. For example, it appears that obese individuals are now being held less personally responsible for their weight condition than was the case in the past (Sobal 1999). Christakis and Fowler (2007) suggest that this may be due to the expansion of obese social networks, which may change one's tolerance for being obese and/or may influence one's adoption of specific behaviors (e.g. eating and exercising). Regardless of whether weight-related stigmas have begun to decline, however, research shows that negative stereotypes about the obese remain widespread.

Moreover, negative beliefs about obesity have been found in children as young as age 3 (Brylinsky and Moore 1994; Cramer and Steinwert 1998) and weight-based stigmas are often

displayed and transmitted in the form of verbal teasing, bullying, and victimization. Recent evidence indicates that stigmatization of, and in some instances discrimination against, obese individuals frequently occurs in areas of education, employment and health care (Puhl and Brownell 2001; Schwartz et al. 2003; Teachman et al. 2003). Indeed, American culture's slender body ideals are so widespread and potent that above-average, and sometimes even average-sized, individuals often find themselves to be targets of weight-based stigmatization (Puhl and Brownell 2001).

In particular, obese and overweight youth are frequently victims of weight stereotypes and prejudice. Negative experience with weight bias can come from interaction with a variety of individuals, including peers (Neumark-Sztainer et al. 2002), educators (Bauer, Yang, and Austin 2004), health-care professionals (Teachman et al. 2003), and parents or other family members (Davison and Birch 2004; Eisenberg, Neumark-Sztainer, and Story 2003). Stigmatizing encounters and biased attitudes about body weight may vary, however, depending on one's gender, age, and racial/ethnic background. Although girls are generally more stigmatized for being overweight than boys (Ge et al. 2001), there are conflicting data about the effect of age on weight stigma. Some suggest that stigmatization becomes worse as children age (Cramer and Steinwert 1998) and others claim that, over time, children become more tolerant of overweight and obesity (Latner, Stunkard, and Wilson 2005). To date, the influence of race/ethnicity on weight stigma also appears to be unclear. Research on body image and identities, however, suggests a stark difference in the desire for thinness between whites and blacks (or other minorities/lower status groups), especially among girls (Brown 2003).

Overall, though, research suggests that negative experiences with weight bias are common among youth. In a study about weight-based teasing among middle and high school students, Neumark-Sztainer and colleagues (2002) find that both overweight/obese and underweight youth reported higher levels of teasing than their average weight peers. Among normal weight youth, 21 percent of girls and 14 percent of boys indicated ever being teased by peers. However teasing prevalence jumped to its highest level for youth with BMIs greater than or equal to the 95th percentile. For obese girls and boys the prevalence rate of teasing was 63 percent and 58 percent, respectively. Other more recent research shows that about 34 percent

of obese girls and 36 percent of obese boys reported being victims of weight-based teasing and other forms of bullying (Griffiths et al. 2006).

Moreover, overweight and obese children are just as likely to possess negative stereotypes about their heavy peers as are normal weight children. For example, Cramer and Steinwert (1998) find that among pre-school aged children, negative attitudes about overweight and obese children remained, regardless of the children's own body weight. In fact, they find that, on some weight perception assessments, overweight/obese children demonstrated even stronger negative stereotypes than did their non-overweight/obese peers. Another examination of children ages 7-9 years old finds that BMI is not associated with negative ratings of overweight/obese individuals in silhouette drawings (Kraig and Keel 2001) and other research indicates that there is no association between body weight and negative weight attitudes, at least among girls (Davison and Birch 2004). Thus, this body of research suggests that among youth, even those who are overweight and obese may be internalizing negative societal stereotypes about "the fat kids". Of particular concern is that these youth apparently find little or no protection and social support from other heavy peers, which may possibly reinforce the negative impact of this stigmatization (Erickson et al. 2000).

Experience with weight stigmatization during childhood and adolescence is especially problematic, as this is an important period of social relationship formation and, therefore, a period during which youth may experience higher levels of vulnerability and sensitivity to stigma (Puhl and Latner 2007). Accordingly, it is no surprise that the stigmatization of overweight/obese youth can have serious health ramifications. Psychological health problems are well-documented for overweight/obese adolescents; such youth generally have a higher prevalence of depressive symptoms, low self-esteem, and social isolation, as well as elevated levels of eating disorders, compared to their normal-weight peers (Crosnoe, Frank, and Strassmann 2008; Erickson et al. 2000; Friedman et al. 2005; Haines and Neumark-Sztainer 2006; Strauss et al. 1985). Research also finds a positive association between stigma and poor self-rated physical health (Krieger 1999).

The experience of weight stigma is clearly prevalent for overweight and obese youth and it can be particularly problematic for the formation of social relationships (e.g. friendships, peer relationships, romantic partnerships, etc.) during this time period. Social relationships, the foundation for social support and the development of social capital, are not only vital to the

behavior and socio-psychological development of children and adolescents, but are also important in family formation processes, socioeconomic attainment and other life course processes (Crosnoe et al. 2008; Carr and Friedman 2006; Youniss and Haynie 1992). It is within relationships that youth can obtain positive feelings of self-worth and receive confirmation and support for personal characteristics, thoughts, and feelings (Parker and Asher 1993). Social relationships may also lead to negative feelings (e.g. depression, low self concept, suicidal thoughts, etc.) and behaviors, however, particularly when those relationships are marked by a lack of support or by conflict (Berndt 2002). In the following three subsections, I will identify the three main perpetrators of weight stigma in young people's lives – peers, educators, and parents – and discuss how stigma may influence the relationships that overweight/obese youth experience with these groups of people.

2.2.1.1 Peers

Peers' negative attitudes about excess weight may adversely affect social relationships for overweight and obese children. Past research on elementary school children has shown that, even at a very young age, obese children are less liked and more frequently rejected by peers than are non-obese children (Strauss et al. 1985). In studies using peer-nomination methods, overweight/obese children have consistently been ranked among the least-desirable friends (Richardson et al. 1961; Staffieri 1967) and receive fewer friendship nominations than normal-weight youth, indicating social marginalization of the overweight (Strauss and Pollack 2003). Compared to their thinner counterparts, obese students also appear to spend less time with friends and obese boys are more likely to feel that their friends do not care about them (Falkner et al. 2001). In a recent study, Zeller et al. (2008) find that obese children and adolescents are considered by peers to be less apt in leadership roles and to possess greater aggressive-disruptive behavior.

Weight bias also appears to influence adolescents' concerns regarding their prospects for romantic relationships, and intimate relationships and dating may be inhibited by being overweight or obese. The adolescent period is generally the time when young people begin dating and form preferences for the type of partner with whom they will eventually settle down and/or marry. During this time period, many young people become highly concerned with aspects of their physical appearance that they believe will be associated with their ability to attract potential romantic partners. Although boys and girls may be similarly concerned about

their appearance in general, gender differences exist in the degree to which boys and girls are concerned with body weight and the particular ideals to which they aspire. Girls typically report more concern with weight in itself and a greater desire to maintain a thin body, while boys often seek muscularity (Sobal, Nicolopoulos, and Lee 1995). At the same time that youth become concerned with their own physical appearance, they also tend to form opinions on acceptable standards for physical attractiveness in potential romantic partners. Interestingly, while adolescent girls report more stringent weight ideals for themselves, boys are less tolerant of overweight partners than are girls (Sobal et al. 1995). Thus, in terms of both girls and boys' beliefs, the weight range in which it is considered socially acceptable to be is more narrow and constrained for girls than boys.

While both obese teenage boys and girls are more likely than their average-weight peers to report being dissatisfied with their own dating status, some research suggests that girls' social lives may be more negatively affected by obesity. For example, girls and young women who are overweight, or who perceive themselves as overweight, often report that their weight interferes with social activities such as dating (Pearce, Boergers, and Prinstein 2002; Tiggemann and Rothblum 1988) and keeps them from being considered attractive (Tiggemann and Rothblum 1988). Moreover, among college students, obese women are typically considered by others to be less attractive and less erotic, are expected to be less likely to date or to have a boyfriend/partner, and are thought to be more deserving of a fatter, uglier partner than are other women (Harris 1990).

2.2.1.2 Educators

Since children and adolescents spend most of their time at school, it is to no surprise that negative experiences with weight bias often take place within the school context. While peers instigate many of these experiences, some studies suggest that weight stigmatization experiences while at school also come from interactions with educators and school staff. In their review of the literature on weight stigma, Puhl and Latner (2007) find that teachers often report negative attitudes about obese students. They conclude that, "Although teachers and other staff members are invested in the well-being of their students, they are not immune to the societal attitudes that stigmatize obese individuals, and they may perpetuate bias unintentionally or through differential treatment of overweight students" (563).

In fact, educators have been found to hold many of the same stereotypes about obese youth as do the children with whom they work. An investigation of obesity-related beliefs and attitudes among a sample of middle and high school teachers and school faculty, for instance, found that about half of the respondents believed that obesity was caused by individual behavior. Over one-fifth of the respondents also believed that obese people are more untidy, more emotional, less likely to succeed at work, and have more family problems than non-obese people (Neumark-Sztainer, Story, and Harris 1999). Research suggests that physical education (PE) teachers, in particular, tend to hold negative beliefs about overweight and obese students. College students training to become PE teachers hold significantly stronger anti-fat attitudes than other college students and are more likely than their peers to endorse the belief that obese people lack willpower (O'Brien, Hunter, and Banks 2006). Individuals currently working as PE teachers are also more likely than other teachers to believe that obese children have poorer social reasoning, physical skills, and cooperation skills than their average-weight counterparts and are more likely to express higher expectations for average-weight students across a variety of ability and performance areas (Greenleaf and Weiller-Abels 2005).

Students inevitably recognize that some of their educators hold negative weight-related beliefs and treat students differentially on the basis of weight. In a study of middle school students, for example, Bauer and colleagues (2004) find that many overweight youth have received upsetting, negative comments about their physical abilities from their teachers. Many of these youth also report that teachers fail to enforce school policies prohibiting teasing and harassment, making them more vulnerable to negative peer-related experiences (Bauer et al. 2004). Overall, 32 percent of overweight and obese women report that they had experienced, at some point in their lives, weight-related stigma from an educator. Twenty-one percent report having experienced this kind of stigma more than once (Puhl and Brownell 2006). Although anti-fat attitudes and weight-based discrimination among educators are not universal, when educators do stigmatize overweight/obese students serious consequences for youth wellbeing can follow.

Weight-based stigmatization from teachers can have not only an immediate impact on psychosocial well-being (Puhl and Brownell 2006), but also can have an impact on behavioral outcomes, academic achievement and future educational attainment. Puhl and Brownell (2001) propose that weight-based stigmatization can, in fact, be more overt at higher levels of

education. At the college level, for instance, Weiler and Helms (1993) show that overweight (and obese) students frequently receive poor evaluations from their teachers, have lower rates of college acceptance, and on occasion, encounter academic dismissals due to their weight. Even five decades ago, Canning and Mayer (1966) found in their study of school records and college applications that obese high school children, despite having equal application rates and similar levels of academic performance, were significantly less likely to be accepted to college than were normal-weight students. The weight bias in college acceptance was particularly stark among overweight and obese female students, who were less likely to be accepted than their equally heavy male counterparts (Canning and Mayer 1966). Furthermore, recent research by Fowler-Brown and colleagues (2010) finds that, despite having similar expectations for obtaining a college degree, obese youth are less likely to complete college. Overall, the literature in this area suggests that weight bias from teachers and educational staff has substantial ramifications for student well-being; influencing young people from the early years in nursery school all the way through college.

2.2.1.3 Parents and Family Members

One of the more unfortunate, yet not unexpected, findings in the literature on weight stigma suggests that much of the weight bias experienced by the overweight/obese stems from family members, particularly parents. Puhl and Brownell (2006) surveyed overweight and obese women, asking them about their experiences with the most common perpetrators of weight-based stigma. They discovered that among 22 potential perpetrators of weight bias, family members topped the list (reported by 72 percent of women). When asked about the specific family members involved in negative weight-related experiences, the women most frequently indicated being stigmatized by their mothers (53 percent), followed by fathers (44 percent), sisters (37 percent), brothers (36 percent), sons (20 percent) and daughters (18 percent). The reported stigmatization included receiving negative, inappropriate comments from parents and/or siblings and being the target of verbal teasing.

Other studies provide evidence that these kinds of experiences are faced not just by adults, but also by many overweight/obese children. In fact, 47 percent of very heavy girls and 34 percent of very heavy boys report that they have experienced weight-based teasing by family members (Neumark-Sztainer et al. 2002). Moreover, a study of 9-year old girls and their parents suggests that both girls and their parents hold ‘fat’ stereotypes (e.g., thin people are

smart, fat people are lazy, etc.) (Davison and Birch 2004). Fathers with higher levels of education and family income were more likely to ascribe negative characteristics to obese individuals, as were mothers and fathers who reported a strong investment in their own physical appearance and girls whose parents persuaded them to attempt to be thinner. Interestingly, parents who themselves were overweight or obese were just as likely as thinner parents to express stereotypical attitudes (Davison and Birch 2004). Overall, it appears that youth are prone to adopt fat stereotypes from family members, particularly parents, and that parents' negative attitudes may lead to lowered levels of social support and some forms of discrimination within families.

Although support and acceptance from peers become increasingly important as children age, parents are the central source of social support during childhood and adolescence (Helsen, Vollebergh, and Meeus 2000). Social support from parents is important for a variety of health and social measures, including positive self-esteem, social competence, pro-social behavior and general well-being for youth. Therefore, we can expect that when parents engage in weight-based stigmatization and express weight-related stereotypes to their overweight/obese children, the psychosocial outcomes of these children will be compromised.

In addition to the negative impact on social support, stigmas against overweight/obesity may also lead parents to provide less financial support and assistance to heavy children. In fact, Crandall (1991) finds in her study of young adults that overweight students rely more heavily on jobs, savings and financial aid to pay for college, whereas normal-weight students are more likely to receive financial support from their parents. This association between weight and parental financial support was especially prominent for women and was not explained by differences in parental education, income, race/ethnicity, family size, or the number of children competing for college funds. A subsequent study by Crandall (1995) finds that this bias may be due, in part, to politically conservative attitudes. Although she shows that conservative families are more likely than liberal families to support their daughters in college, families of both political ideologies are less likely to pay for their heavier daughters' expenses, despite similar ability to pay. In addition, girls of conservative families tend to be thinner than girls of liberal families who are in college, which may indicate that conservative families are less likely to send their heavy-weight daughters to college in the first place. Crandall explains that individuals who have strongly conservative ideological attitudes, characterized by a tendency

to value self-discipline and hold people accountable for their own fate, may be more inclined to blame their overweight and/or obese youngsters for their weight and to withhold financial support from them (Crandall 1994, 1995).

In sum, the experience of stigmatization, rejection, and harassment from significant others in both the outside world *and* the inside world of overweight children and adolescents is often reported in the literature. This relationship between weight status and interpersonal relationships is, however, very complicated. On the one hand, as discussed, negative treatment by peers and authority figures, such as teachers and parents, to whom youth look for support and guidance is associated with negative consequences. Youth recognize that their weight impacts their interpersonal relationships and that it is often the reason for social rejection (Tiggemann and Rothblum 1988). This recognition, along with the actual adverse treatment they receive, may then lead to psychological distress, poorer social outcomes, and, of primary interest to this study, unhealthy and high-risk behaviors among overweight and obese youth. On the other hand, it may be that harmful interpersonal relationships impact youth's weight trajectories going forward in time, such that stigmatizing events may potentially lead to overeating, social isolation, and a lack of physical activity and, subsequently, further weight gain.

As such, the quality of interpersonal relationships may both be a consequence of weight or a cause of weight trajectories over time. In this dissertation study, I am able to examine both parental/familial supports as well as extra-familial measures that indirectly capture internal and external levels of stigma. I speculate that these interpersonal relationships may help to predict youths' weight trajectory experiences.

2.2.2 Psycho-social Consequences

Although limited research exists on the relationship between obesity and mental health outcomes, an assumption is often made that obese individuals, including obese children, carry a large psychological burden (Wardle and Cooke 2005). This cultural viewpoint may be maintained by the evidence discussed in the previous section, which suggests that being obese impedes one's social relationships and makes one subject to more social stressors, like stigmatization and discrimination. Some recent research, however, suggests that this viewpoint might not be supported in fact.

There has been a substantial amount of research that has focused on the psycho-social consequences of weight, especially for body image, self-esteem and depression among youth. The general consensus in this literature holds that higher BMI is associated with more negative outcomes, particularly among girls (Merten 2008; Mustillo et al. 2003; Puhl and Latner 2007; Ricciardelli and McCabe 2001; Strauss 2000; Talen and Mann 2009; Tiggemann 2005). However, some recent studies demonstrate that this is not always the case. Some overweight children and adolescents are not aware that they are overweight (Daniels 2006), and some appear to be no more vulnerable to depression (Frisco, Houle, and Martin 2009; Stice and Bearman 2001) or low levels of self-esteem than non-overweight youth (Wardle and Cooke 2005). Thus, the relationship between weight status and these three psycho-social outcomes remains somewhat unclear. Prior research more clearly indicates, however, that obesity has significant consequences for engagement in health-risk behaviors and externalizing problems (Datar et al. 2004; Farhat et al. 2010; Lawlor et al. 2005; Mustillo et al. 2003) that are serious hazards to adolescent health and well-being and that might contribute to some of the physical and psychological problems experienced by obese youth during their adulthood.

During the adolescent period, youth are gaining greater independence from their parents, the desire for peer approval is at an all time high, and the availability of drugs, alcohol, and other unsafe/illegal substances increases. When these three circumstances collide, it is not uncommon for young people to exhibit externalizing behavioral problems and/or to experiment with health-compromising behaviors. This may be particularly true for adolescents who are facing higher than average levels of stress or who have compromised emotional wellbeing. Externalizing behavioral problems are often characterized in the literature as aggressive, oppositional, disruptive, or inattentive behaviors beyond actions that would generally be expected provided a child's age and development level (Aschenbach 2000). These externalizing behavioral problems may severely impact mental and physical health outcomes among youth when they are expressed as behaviors that contribute to injuries and violence, substance use and abuse (tobacco, alcohol and other drug use), unintended pregnancies and sexually transmitted infections, unhealthy dietary practices, and so on (Centers for Disease Control and Prevention 2010).

Previous research indicates that, regardless of weight status, young people who encounter maltreatment or neglect, bullying, social marginalization, or academic difficulties

are more likely to experience behavioral problems (Deater-Deckard et al. 1998; Kupersmidt and Coie 1990). Since overweight/obese youth are more likely than their peers to experience these issues, they may also face an increased danger of engaging in health-risk behaviors (Booker et al. 2004; Farhat et al. 2010; Janssen et al. 2004; Lawlor et al. 2005; Pasch et al. 2008; Zeller et al. 2008). Indeed, recent studies have found a positive association between body mass index and a variety of problem behaviors among youth, including smoking initiation (Cawley 2004), alcohol use, binge drinking, the use of tobacco and other drugs (Berg, Simonsson, and Ringqvist 2005; Farhat et al. 2010; McLaren et al. 2007; Pasch et al. 2008; Strauss 2000), fighting and aggression, violent behavior and bullying (Farhat et al. 2010; Griffiths et al. 2006; Janssen et al. 2004; Pasch et al. 2008; Zeller et al. 2008). Some research suggests that overweight and obese women (15-44 years of age) are also more likely than normal weight women to report ever engaging in heterosexual sexual intercourse (Kaneshiro et al. 2008).

These findings are indicative of overweight and obese youth's vulnerability to behaviors that may have a detrimental impact on their health and well-being. However, research to date has still to confirm a relationship between weight status changes, or weight trajectories, and behavioral outcomes (Bradley et al. 2008; Datar and Sturm 2006; Datar et al. 2004; Lawlor et al. 2005), the directionality of the relationship (Datar 2004, Lawlor 2005), or the generalizability of the relationship. It is not unreasonable to assume that certain weight trajectory experiences, such as being chronically obese or overweight as opposed to being in an increasing or decreasing weight trajectory, may pose more (or less) risk for health compromising behavior. Future studies also need to focus on the factors that might moderate the relationship between weight status changes and health risk behaviors. Research, thus far, shows that gender moderates the association between weight status and participation in bullying (Janssen et al. 2004) and smoking (Park et al. 2009), but other behavioral outcomes have yet to be examined in this way. Of particular interest to this dissertation is the exploration of commonly known health-risk behaviors (e.g. cigarette smoking), and other more acutely risky behaviors like problem drinking and prescription drug abuse. According to a recent report by the Centers for Disease Control and Prevention (CDC 2010), death rates due to drug overdose in the United States have never been higher, and this is predominantly a result of prescription opioid painkillers. No obesity-related study to my knowledge, however, has

examined such behavioral outcomes. The present study seeks to add to this literature by exploring the association between particular weight trajectory experiences and three specific health-risk outcomes, including daily cigarette smoking, problem drinking and prescription drug abuse.

2.3 Factors that Influence the Association between Childhood Obesity and Social Outcomes

Reviewing the general trends and patterns in obesity has been crucial to increasing my understanding of how heavy young individuals navigate through American society. This endeavor has created awareness, though, that more detailed examinations of the social contexts in which overweight and obese individuals live can provide a better understanding of the larger obesity problem in the United States. As previously mentioned, there is a strong anti-fat bias in American society, but the extent to which a person's weight is stigmatized may differ across various people, groups, and settings within our society (Crosnoe and Muller 2007). In this section, I discuss some specific factors that may moderate the link between obesity and/or weight trajectories and social outcomes. In particular, I elaborate on three potentially important individual level characteristics: gender, race/ ethnicity and immigrant status.

2.3.1 Gender

Children and adults who are overweight and obese regularly experience stigma and discrimination as a result of their weight and, as we know, these negative incidences may lead to serious health and social penalties. Yet the effect of weight appears to be differently experienced by boys/men and girls/women. The norms about weight in our society, especially norms concerning what is an appropriate or desirable weight, are usually stricter and more publically enforced (through media and other forums) for girls/women than boys/men (Martin 1996). As such, obese girls and women tend to face more disapproval from themselves and others than do their male counterparts (Harris 1990; Martin, May, and Frisco 2010). Research indicates that overweight adolescent girls are, in general, subject to more weight-based teasing and victimization than are overweight boys (Eisenberg et al. 2003, Neumark-Sztainer et al. 2002; exception see Kraig and Keel 2001) and that being obese may be more detrimental for girls' than for boys' outcomes. For example, studies demonstrate that obesity makes girls more emotionally distressed, socially isolated, and more concerned about their appearance or weight (Ge et al. 2001; Needham and Crosnoe 2005; Sobal et al. 1995). Crosnoe (2007)

further demonstrates that obese girls are less likely to enter college after high school than are non-obese girls and that this is partly explained by their higher rates of internalizing symptoms (e.g. depression, anxiety), self-medication, and academic disengagement. Obese boys, however, do not differ from their non-obese peers in terms of college attendance. Thus, there seem to be gendered differences in how obese and overweight individuals are perceived and treated in our society. As such, it is vital that boys/men and girls/women are examined separately when exploring associations between overweight/obesity, as well as weight trajectories that include overweight/obesity, and later social or health outcomes.

2.3.2 Race/Ethnicity

Like gender, race/ethnicity may moderate the relationship between weight status and social and health outcomes. A large body of research suggests that attitudes about weight vary a great deal by racial/ethnic background, particularly between Whites and Blacks. African Americans generally consider a larger body size to be more desirable than do Whites (Averett and Korenman 1999). In fact, compared with young White women, young Black women report feeling more positively about their bodies and are more likely to report satisfaction with their size, weight, and the function of their bodies (Parker et al. 1995; Wildes, Emery, and Simons 2001). Even at higher BMIs, research indicates that Black girls are more likely than White girls to consider themselves to be attractive and socially acceptable (Padgett and Biro 2003). These more tolerant attitudes towards and perceptions of overweight/obesity could be protective for the health and social outcomes of Black girls and women, particularly for those who are heavy. White women and girls, on average, have lower BMIs than their Black peers, however they are more inclined to perceive themselves as overweight, regardless of their actual weight (Abrams, Allen, and Gray 1993). In turn, white girls/women may suffer more negative social and health consequences as a result of overweight/obesity, as well as perceptions of being overweight. Although little research in this area has focused on individuals from other racial/ethnic backgrounds, a recent study suggests that Hispanic girls tend to report body esteem/ perceptions similar to White girls (Vander Wal 2004). Clearly, more knowledge is needed on racial differences in the effects of obesity on the outcomes of young people in the United States, especially among youth of racial/ethnic backgrounds other than Black and White and among young men. Due to sample size constraints, this dissertation examines race/ethnicity as a predictor (and not a moderator) of BMI trajectory membership.

Specifically, I explore whether being Non-Hispanic White, Non-Hispanic Black, and/or Hispanic (of any race) makes one more prone to certain BMI trajectories than others.

2.3.3 Immigrant Status

Another individual-level characteristic that should be considered as a moderator to the relationship between weight status and social and emotional outcomes, but is rarely seen in the literature on obesity, is immigrant status. The effects of obesity may vary not only by gender and race/ethnicity, but recent research suggests that they may also vary by nativity and generational status among immigrants (Harris et al. 2009).

It is well-established that newly-arrived immigrants generally enjoy better health outcomes, which includes having lower BMIs, than their native-born counterparts. This immigrant health advantage, however, appears to diminish with increasing exposure and acculturation to U.S. society (Cho, Frisbie, and Rogers 2004; Hummer et al. 2007; Landale, Oropesa, and Gorman 2000). A study on immigrant adults, for instance, demonstrates that women and men enter the U.S. with BMIs approximately two and five percentage points lower than native-born women and men, respectively. Yet the longer they reside in the United States, the more likely they are to converge to unhealthy American BMI levels (Antecol and Bedard 2006; also see review by Oza-Frank and Cunningham 2010). Among immigrant children and adolescents, on the other hand, there have been inconsistent findings about the relationship between acculturation and pediatric overweight/ obesity. Some research suggests that immigrant youth tend to become heavier as they become more acculturated to American society (Gordon-Larsen et al. 2003; Popkin and Udry 1998). Other more recent research, conversely, demonstrates that weight does not uniformly increase with each successive generation, especially for immigrant boys of Hispanic origin (Balistreri and Van Hook 2009; Baker, Balistreri, and Van Hook 2009).

Given that some immigrant youth, particularly Hispanic boys, appear to experience different trends in overweight and obesity, it may be safe to assume that cultural and family background factors influence these disparities. In particular, attitudes about weight may differ by nativity status. Newly-arrived immigrants from countries where food was scarce may believe that being overweight is a marker of newly-achieved social status. It could also be that some parents who were raised outside the U.S. may have different notions about what is considered a healthy weight, they may not know about the health risks of certain foods, and/ or

may indulge boys more than girls due to traditional gender preferences. Little research, however, has examined these kinds of potential explanations.

Furthermore, it is unclear in the literature if immigrant youth who are overweight/obese experience similar levels of weight-based stigma or social pressures to become thin as do native-born children. It is also unknown how these experiences may differ by country-of-origin. Some immigrant youth, depending on their generation status and/or country-of-origin could be more or less protected by their ethnic, socio-cultural environments, and consequently, be more or less at risk of obesity's social and psychological consequences. Unfortunately, due to a small immigrant sample, this dissertation is unable to examine immigrant status differences at all. It is safe to assume, however, that weight trajectory experiences over the course of adolescence and young adulthood may differ by immigrant status and that it may hold influence on the association between weight trajectories and early adult outcomes.

2.4 Conceptual Model, Theoretical Framework, and Overview of Dissertation

Below I present a figure (see Figure 2.4) detailing the overall conceptual model that is employed in my dissertation project and was derived from the literature reviewed in the preceding sections of this chapter.

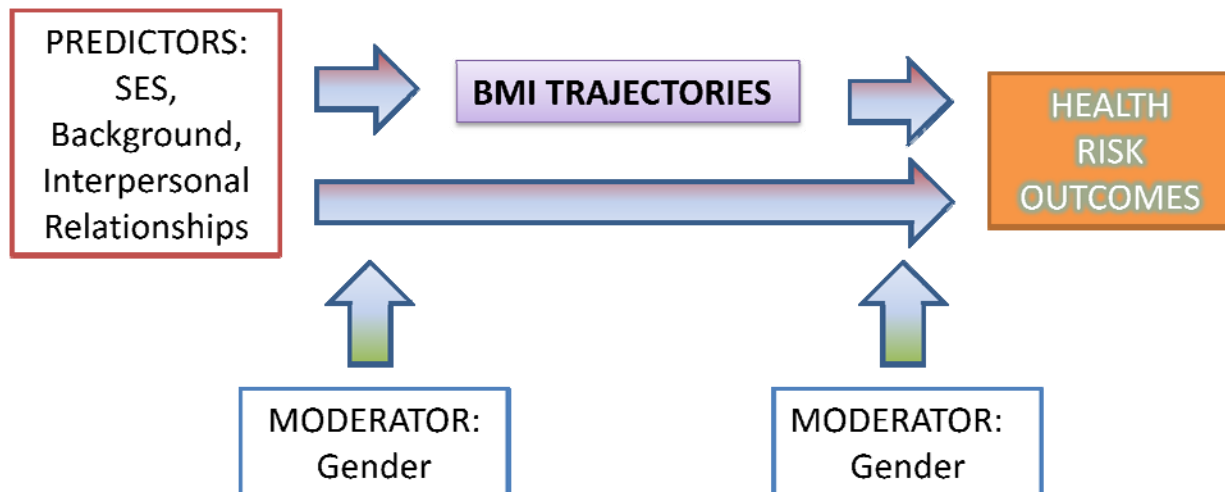


Figure 2.4: Conceptual Diagram of Weight Status Change and Later Health Risk Behaviors.

2.4.1 The Life Course Perspective

In this dissertation, I utilize a life course perspective to conceptualize both weight status and health and well-being outcomes among young people as the products of a developmental trajectory that begins during childhood and progresses through each subsequent life stage (Ge et al. 1994). As individuals age, their unique experiences build on each other, affecting, and directing their life trajectory in society (Elder, 1998). Human development literature from diverse disciplines indicates that early childhood experiences influence adult attainments and well-being. As such, adverse events in a child's life can constrain future life options, but they may also be occasions for development (Elder 1999). The early adult years, in particular, can be an important time for young people's development, as they are facing a wide variety of changes not only to their biology (e.g. puberty), but also in their social roles and relationships and their awareness and contact with the world outside of their home and/or neighborhood (Ge et al., 1994; Ge, Conger, and Elder 2001; Wichstrom 1999).

Research is clear that being overweight and obese during adolescence and early adulthood can shape social, economic and mental/physical health prospects for the future. Yet the degree to which individual fluctuations in weight vary over time, and how particular trajectories of weight change influence young people's future life prospects, is still largely unexamined.

2.4.2 Overview of the Dissertation

In order to meet the objectives of my dissertation research, this study is divided into three distinct empirical chapters. It is a step-by-step process, whereby each chapter builds on the next. Since this area of research has not yet been adequately explored in the literature, the first empirical chapter provides a descriptive overview of the BMI trajectories experienced by American boys and girls. I then explore whether and how BMI trajectory membership varies by gender.

My second empirical chapter examines how differences in BMI trajectory membership may be predicted by pre-existing socio-demographic and familial background characteristics and youths' perceptions of interpersonal relationship quality and support. In addition, I explore whether or not the relationship between these factors and trajectory membership is conditioned by gender. The figure below (see Figure 2.5) highlights the portion of the overall conceptual model that is examined in this chapter.

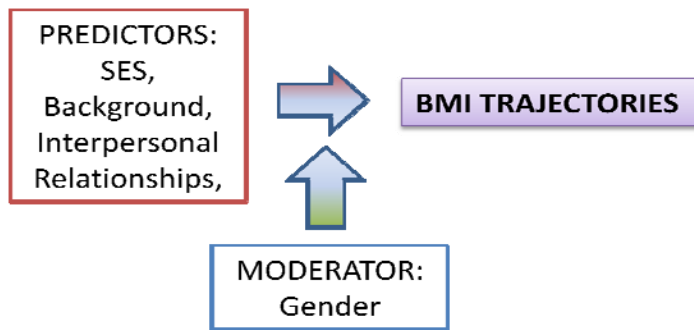


Figure 2.5: Conceptual Diagram: Predictors and Moderator of BMI Trajectory Membership.

Lastly, the third empirical chapter explores the association between BMI trajectory membership and later high-risk behavioral outcomes, including prescription drug abuse, problematic drinking, and daily smoking behaviors. I also attempt to uncover the potential complexity of this association by examining whether gender might condition the effects of trajectory membership on behavioral outcomes during early adulthood. The figure below (see Figure 2.6) highlights the portion of the overall conceptual model that will be examined in this chapter.

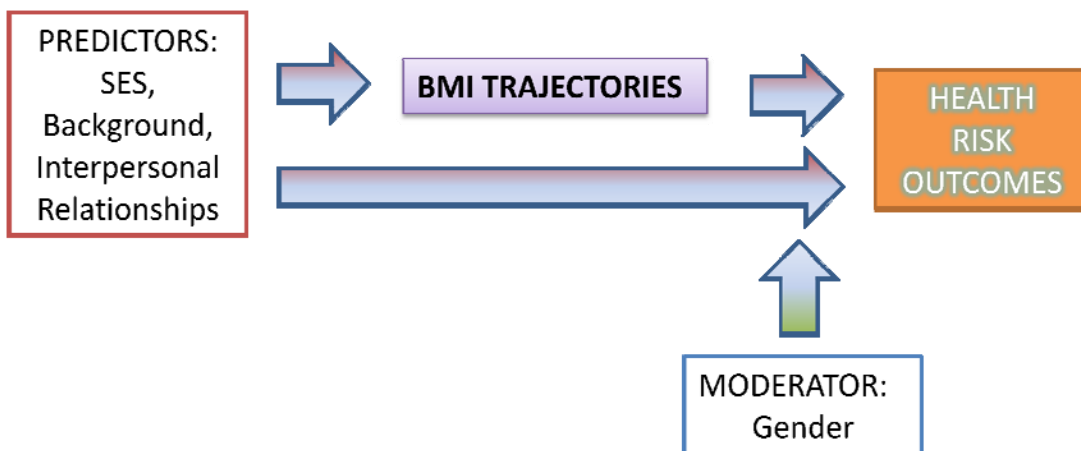


Figure 2.6: Conceptual Diagram: BMI Trajectory Membership and Health Risk Outcomes.

The final chapter of the dissertation discusses the results and study limitations, examines the potential implications of my findings, and suggests directions for future research.

CHAPTER 3

RESEARCH METHODOLOGY AND DESIGN

3.1 General Research Questions

This dissertation contributes meaningfully to the existing literature on weight status and psycho-social and health-related outcomes by addressing the following three research questions:

1. Are there a number of distinctly different BMI trajectories found among American youth as they travel through adolescence and into adulthood? If yes, do these vary significantly by gender?
2. Do socio-demographic characteristics, family background characteristics, and youths' perceptions of interpersonal relationship support predict BMI trajectory membership? If yes, does the association between trajectory membership and these factors differ by gender?
3. Is there a relationship between adolescent BMI trajectory membership and certain health-risk behaviors, including prescription drug abuse, problematic drinking, and daily cigarette smoking behaviors during adulthood? If yes, are there conditioning effects of gender?

3.2 Data

I use the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative study of adolescents in grades 7 through 12 in the United States in 1995. Based on a multistage, stratified, school-based, cluster sampling design, this study was designed to explain the causes of adolescent health and health behaviors, primarily focusing on the multiple contexts in which adolescents live (e.g., families, schools, neighborhoods, peer groups). Included in the sample were students from 80 high schools (both public and private) and a corresponding feeder junior high/middle school. Most minority ethnic groups were sampled in proportion to their size within the United States population, however smaller ethnic groups were oversampled (Harris et al. 2003; Bearman, Udry, and Jones 1997). Data for this

study were collected in four waves between the years of 1994 and 2008 through multiple data collection components.

The In-School component, a self-administered questionnaire, was conducted during 1994-1995. At this time, school administrators from each of the participating schools also completed a School Administrator Questionnaire regarding school characteristics, and school enrollment rosters were used to randomly select students from each of the school pairs to participate in a more extensive Wave I In-Home interview. Additionally, Wave I Parental Questionnaires were completed by one of the participant's parents or guardians, usually a mother. Wave II, conducted in 1996, included in-home interview follow-ups with those students who had completed an in-home interview at WI. In-home interview follow-ups were conducted again at Wave III in 2001 and Wave IV in 2007. I utilize data from all four In-Home interviews as well as the Wave I School Administrator and Parental Questionnaire. Readers may refer to Bearman, Udry and Jones (1997) for more details on the Add Health Study.

Since I am interested in the identification of individual differences in BMI changes throughout early adolescence and into adulthood, employing a longitudinal design allows me to assess weight status for all respondents at every wave. Consequently, I can determine weight fluctuations at the individual level over time. For these analyses, the sample is first limited to respondents who participated in the Wave I In-Home interviews, had a Wave I sample weight and were not currently pregnant (N= 18,912). Next, I limit the sample to youth who have complete weight and height data (N=16,720) and are 12 and/or 13 years of age at baseline (N=2,254). The selection of youth ages 12 and/or 13 years at Wave I stems from the unique spacing between the four waves which makes them ages 13 or 14 years at Wave II; 18, 19, or 20 years at Wave III; and 24, 25 or 26 years at Wave IV. The grouping of these particular ages permit for a view of vital life transition periods in adolescence and young adulthood, where young people are entering into new academic realms, such as middle school, high school and college/university, as well as new adult roles, such as working and family formation. Lastly, I limit the sample to respondents who are non-Hispanic White, non-Hispanic Black and Hispanic, have complete information on socio-demographic factors, family background characteristics and interpersonal relationships. My final sample size is 1,669 respondents (961

for females, 708 for males). All analyses conducted for this research are weighted in order to address the complex sampling design of the Add Health study.

3.3 Measurement

3.3.1 Body Mass Index (BMI)

This section outlines the various measures of weight status that I utilize in my dissertation project. For this project, current weight status, specifically BMI, is calculated at each wave using measured height and weight data with the exception of Wave I where only self-reported height and weight data is available. Analysis not shown here and previous Add Health research reveal that self-reported and measured BMI are highly correlated among young individuals (between .93 and .99) (Kuczmarski 2001; McAdams 2007). All individuals have at least one child/adolescent BMI measure and two or more adult BMI measures. BMI changes over time are conceptualized as trajectories of change in these cross-sectional weight measures at the individual level. Operationally, the different possible BMI trajectories to which respondents can belong are derived from the results of latent class analysis (LCA).

Child/Adolescent BMI values are calculated for all respondents under the age of 20 at time of survey (during any of the four surveys included in this analysis). The BMI value for youth is plotted on the 2000 CDC growth charts to determine the corresponding BMI-for-age percentile. The classifications of weight status for children and adolescents are age- and sex-specific, because children's body composition differs not only as they age, but also differs between boys and girls. The youth BMI classifications used in this study are the following:

Underweight is defined as BMI-for-age <5th percentile.

Normal weight is defined as a BMI-for-age \geq 5th percentile and <85th percentile.

Overweight is defined as a BMI-for-age \geq 85th percentile and <95th percentile.

Obesity is defined as a BMI-for-age \geq 95th percentile.

Adult BMI is calculated for respondents who are 20 years of age or older at time of survey (during any of the four surveys included in this analysis). Adult BMI is calculated as weight in kilograms (kg) divided by height in square meters (m²) and is used to express weight adjusted for height. All respondents are assigned a BMI classification according to the categorization scheme recommended by the National Institutes of Health Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults

(National Institutes of Health 1998). The BMI classifications for adults are not adjusted for age or sex and are listed below:

Underweight is defined as BMI less than 18.5 kg/m².

Normal weight is defined as BMI of 18.5 to 24.9 kg/m².

Overweight is defined as BMI of 25 to 29.9 kg/m².

Obesity is defined as BMI of 30 kg/m² to 39.9 kg/m².

Morbid Obesity is defined as BMI of 40 kg/m² or greater.

3.3.2 Covariates

3.3.2.1 Socio-demographic Characteristics

All socio-demographic characteristics are measured at Wave I. Gender is measured by the respondents' self-identification as either "male" or "female." Race/ethnicity is self-identified and is measured with a series of three dummy variables, including non-Hispanic White, non-Hispanic Black, and Hispanic. Region of country, location of residence and middle/high school type are obtained through the Wave I school administrator questionnaire. Region of country is broken down into four dummy variables indicating West, Midwest, South, and Northeast regions, and location of residence is measured with three dummy variables indicating urban, suburban, and rural locations of residence. The indicator for school type is dichotomized into public versus private school.

3.3.2.2 Family Background Characteristics

I also examine several variables that represent the structural and cultural features of the family environment at Wave I. Five dummy variables are created to measure annual family income (measured in thousands): \$15,000 or less, \$16-34,000, \$35-59,000, \$60,000 or more, and missing income data. Highest educational attainment achieved by either mother or father (henceforth referred to as "family education") is measured with four dummy variables: less than high school, high school graduate or GED, more than high school, and missing education data. I also assess family structure with one simple dichotomous indicator, two-biological parent family. Mother's work status is measured as a dichotomous variable specifying whether a mother had worked for pay outside of the home for more than 35 hours per week in the last 12 months.

3.3.2.3 Interpersonal Relationships

The concept of interpersonal relationships will be broken into three categories, familial and extra-familial relationships, measured at Wave I, and romantic relationships measured at Wave III. ‘Familial relationships’ will assess the relationship quality and warmth found within families, particularly with parents. I use indices to measure familial relationships, including parents’ availability and parental attachment. The availability indices include responses to three questions regarding the frequency of the presence of either a mother-figure or father-figure in the morning, after school, and at bedtime. The five response options to these questions range from *never* to *always* (1-5). Attachment to mother and/or father is assessed using indices that include responses to two items—“How close do you feel to your mother/father?” and “How much do you think she/he cares about you?” The response options to these questions range from *not at all* to *very much* (1-5). Chronbach’s alpha tests indicate reliability for the indices, with scores of .6809 for parents’ availability and .6766 for parental attachment.

Extra-familial relationships are measured with three items, two of which focus on youths’ perceptions of support from adults outside of their family. One question asked respondents about their relationships with adults in general (“How much do you feel that adults care about you?”) and the other asked about their relationships with teachers (“How much do you feel that teachers care about you?”). Each of these questions had five response options, ranging from *not at all* (1) to *very much* (5). In addition, I include a mean-item index measuring social connections to the school attended at Wave I. The school connectedness index, based on the work of Resnick et al. (1997) and Zweig et al. (2002), includes three questions which asked respondents to indicate their level of agreement with the following statements: “You feel close to people at your school,” “You feel like part of your school,” “You are happy to be at your school.” The response options ranged from *not very [close/much/happy]* to *very [close/much/happy]* (1-5) and the Cronbach’s alpha is .7764.

Romantic relations at Wave III are measured with the two following questions about cohabitation, “Have you ever lived with someone in a marriage-like relationship for one month or more? (if, for at least one month, you lived with someone whom you later married, include that relationship)” (coded as 0,1) and “With how many people have you lived in such a marriage-like relationship?” The response options for this latter question are coded none, one, two, three, and lastly, four or more cohabiting relationships. I chose to capture romantic

relations through measures of cohabitation because the Add Health does not contain good measures of non-cohabiting intimate relationships and cohabitation is increasingly becoming more of a normative experience for young people. Although it is a very rough indicator for engaging in romantic relationships, I believe that it is still useful in assessing adult interpersonal relationships that occur while in one's late teens and early twenties, as many young people in this age group are not yet married.

3.3.3. Health Risk Distal Outcomes

All distal outcomes are measured at Wave IV and are coded in a binary fashion to simplify model estimation as the models are already quite computationally complex. The three substance use outcomes examined include measures relating to prescription drug abuse, problems associated with alcohol drinking, and daily smoking behaviors. Respondents in the sample who indicated yes to the question; "Have you ever taken any prescription drugs that were not prescribed for you, taken prescription drugs in larger amounts than prescribed, more often than prescribed, for longer periods than prescribed, or taken prescription drugs that you took only for the feeling or experience they caused?" were coded as '1' for prescription drug abuse, while all others were coded as '0.' The question used to assess problematic drinking is, "How often have you been under the influence of alcohol when you could have gotten yourself or others hurt, or put yourself or others at risk, including unprotected sex?" I coded respondents as '0' if they indicated never being under the influence of alcohol and '1' if they indicated being under the influence one or more times. Finally, to explore daily tobacco smoking, I coded as '1' those who responded "every day" to the question: "During the past 30 days, on how many days did you smoke cigarettes?"

3.4 Description of Sample

Table 3.1 displays the descriptive characteristics of the study sample. The mean age of respondents in each of the four consecutive waves is 12.8, 13.8, 19.3, and 25.7 years, respectively, and about 43 percent of the sample is male. Most of the respondents indicate their race/ethnicity as non-Hispanic White (65.5 percent), followed by non-Hispanic Black (22.8 percent) and Hispanic (11.7 percent). About 11.5 percent of individuals report being foreign-born or having at least one parent of foreign-born descent. Also, just over half of the sample (51.6 percent) indicates living in a suburban area, while 32.6 percent live in an urban area and about 16 percent live in a rural area. For region of residence, most boys and girls

report residing in the southern (40.8 percent) parts of the United States, and 19.2, 24.7, and 15.3 percent report living in the West, Midwest, and Northeast, respectively.

Almost all respondents in the sample indicate attending public schools (90.7 percent). Regarding annual family household incomes, 11.2 percent report incomes of less than \$15,000 a year, 22.3 percent report between \$16-\$34,000, 27.2 percent report between \$35-59,000, and about 22 percent indicate an annual family income of \$60,000 or more (another 17.5 percent have missing data for income). Furthermore, thirty-seven percent of youth report family educational attainment of at least a high school diploma or GED and 21.5 percent report some college education or more (41.4 percent have missing data for family educational attainment). More than half (54.6 percent) of the sample have mothers who work outside of the home and most live in two-biological parent families (59.3 percent).

Table 3.1: Descriptive Statistics for the Total Sample at Study Entry (unless noted otherwise); Add Health 1995.

	Mean	S.D.	N
<i>Age</i>			
Wave I	12.803	0.398	1669
Wave II	13.752	0.475	1459
Wave III	19.256	0.536	1669
Wave IV	25.726	0.561	1412
<i>Gender (Male=1)</i>	0.427	0.495	708
<i>Race/Ethnicity</i>			
Whites	0.655	0.475	1092
Blacks	0.228	0.411	381
Hispanics	0.117	0.321	196
<i>Location of Residence</i>			
Urban	0.326	0.468	545
Suburban	0.516	0.499	860
Rural	0.158	0.365	264
<i>Region of Country</i>			
West	0.192	0.394	321
Midwest	0.247	0.431	412
South	0.408	0.492	681
Northeast	0.153	0.360	255
<i>School Type</i>			
Public	0.907	0.290	1514
Private	0.098	0.369	155

Table 3.1 continued

	Mean	S.D.	N
<i>Family Income</i>			
Less than \$15,000	0.112	0.315	187
\$16-34,000	0.223	0.415	372
\$35-59,000	0.272	0.445	455
\$60,000 or more	0.219	0.413	365
Missing	0.175	0.379	290
<i>Family Education</i>			
Less than High School	0.074	0.262	124
High School/GED	0.297	0.457	496
More than High School	0.215	0.411	359
Missing	0.414	0.494	691
<i>Mother's Work Status</i>			
	0.546	0.498	911
<i>Family Structure</i>			
Two Biological Parents	0.593	0.490	989
<u>Interpersonal Relationships:</u>			
<i>Familial Relationships</i>			
Parents' Availability (1-5)	3.296	0.961	1669
Parents' Attachment (1-5)	4.235	0.912	1669
<i>Extrafamilial Relationships</i>			
Adult Cares (1-5)	4.581	0.689	1669
Teacher Cares (1-5)	3.713	0.954	1669
School Connectedness (1-5)	3.912	0.760	1669
<i>Ever Cohabitated- Wave III</i>			
# Cohabiting Partners Ever- Wave III	0.228	0.420	1669
Zero	0.772	0.553	1289
One	0.196	0.463	327
Two	0.022	0.404	37
Three	0.008	0.389	14
Four +	0.001	0.305	2

The mean level of parents' availability and parents' attachment are 3.3 and 4.2, respectively. In other words, on average, youth feel that their parents are available "some of the time" and feel attached to their parents "most of the time". Also, most respondents report feeling that an adult cares for them between "most of the time" and "always" (mean of 4.6) and that a teacher cares for them nearly "most of the time" (mean of 3.7). In terms of feeling connected to one's school, the average youth indicates feeling connected "most of the time" (mean of 3.9). Moreover, at Wave III approximately 23 percent of the respondents report that

they have ever cohabited. Of the full sample, 19.6 percent have had only one cohabiting partner and 3.1 percent have had more than one partner.

Table 3.2 presents the BMI characteristics of the sample. The results show that mean BMI increases for respondents over the duration of the four waves. During the first two waves, the respondents have mean BMIs that are within the normal weight range, with a mean BMI of 21.1 at Wave I and 21.8 at Wave II. By Wave III, the mean BMI increases to overweight, at 25.5. In the final wave, the average young person is overweight and verging on obese, with a mean BMI of 28.4.

Table 3.2: Body Mass Index Information by Add Health Wave.

	Mean	S.D.	Minimum	Maximum
BMI				
Wave I	21.110	4.187	13.259	43.752
Wave II	21.835	4.575	13.238	48.695
Wave III	25.532	5.772	14.319	60.082
Wave IV	28.390	7.312	16.300	71.410

3.5 Analytic Strategy

3.5.1 Latent Class Analysis

I use latent class analysis (LCA) to first identify and describe BMI trajectory membership and then to examine the association between trajectory membership and a number of covariates. Finally, I examine the association between trajectory membership and later health risk outcomes among the young people in my sample. To do so, I use the statistical package MPLUS (version 5.0) (Muthén and Muthén, Los Angeles, CA). LCA, a widely used technique in the social sciences, is a nonparametric or semiparametric group-based statistical method that uses a multinomial modeling strategy to estimate group trajectories as latent classes in the data (Jones, Nagin and Roeder 2001). In order to determine its model parameters, LCA utilizes maximum likelihood estimates of conditional response probabilities. Originally introduced by Lazarsfeld and colleagues (Lazarsfeld and Henry 1963), LCA’s basic assumption is that some of the parameters of a postulated statistical model vary across unobserved subgroups. In other

words, individual attributes may fluctuate due to unobserved “latent” categories to which they belong (Land 2001, Vermut and Magidson 2004). Since it is unlikely that all individuals will precisely fall into these distinct categories (or trajectories), these analyses are unique in that they permit for some imprecision in classification as they group by distinct categories of experience over time or age (Nagin 1999).

3.5.1.1 General Equation

In a homogenous population, a parametric model of $f(\mathbf{y}, \lambda)$ may be assumed for a behavior or attribute, where $\mathbf{y} = (y_1, y_2, \dots, y_T)$ is the longitudinal sequence of observed behaviors or attributes across T periods. If it is assumed that various groups of attributes exist in a population and vary in parameter values, then the model may be rewritten as:

$$f(\mathbf{y}) = \sum_{k=1}^K \Pr(C = k) \Pr(\mathbf{Y} = \mathbf{y} | C = k) = \sum_{k=1}^K p_k f(\mathbf{y}, \lambda_k) \quad (1)$$

In Equation (1), p_k is the probability of belonging to class k with corresponding parameter(s) λ_k , and λ_k is dependent on time.

The above equation 1 can also be extended, first to include covariates such that each “upstream” or predictor variable predicts membership in a given trajectory across the k classes. Therefore, it can be established whether certain significant demographic, behavioral, and/or other profiles exist for each of the trajectories, as compared to one referent trajectory. Second, the model can be further extended such that the trajectories, conditional on the values on the set of covariates, can be used as predictors of some distal outcome. Therefore, one can examine how membership in a particular latent trajectory impacts a “downstream” or future outcome, compared to one referent trajectory. Since covariates are included in the models, these effects are net of any socio-demographic and family background factors selecting individuals into trajectories.

CHAPTER 4

DISAGGREGATING BMI TRAJECTORIES: ADD HEALTH

The objective of this first empirical chapter is to explore whether there exist different classes of BMI trajectories that span across childhood and into adulthood. Although recent research in this area shows support for individual differences in the development of obesity, few studies have explored weight changes using BMI, a continuous indicator, or used a developmental approach to assess subgroups of weight change trajectories over time.

Moreover, studies often explore body mass index patterns by using conventional growth modeling techniques, such as mixed or random coefficient models or growth curves. However, these techniques assume one average pattern among the sample with individual variation from it characterized by error terms. Thus, they assume that the BMI patterns of all individuals have roughly the same shape of growth and that there is no distinction between overweight and obese individuals (for example) beyond their varying distance from an average weight individual. These models also assume that covariates have an equal effect on weight stability and change for all persons, even though it is likely that variables such as gender have varying effects depending on the level and shape of BMI trajectories. Such assumptions may be too simplistic to thoroughly explicate BMI heterogeneity in the general population over time, especially when there are known distinctions between individuals who are normal weight, overweight, and obese in terms of both their predictors and long term health outcomes (Alley and Chang 2007; Field et al. 2001; Olshansky et al. 2005; US Department of Health and Human Services 2001). As such, the analyses in this chapter use latent class analysis to examine the number, shape, and sample percentages of BMI trajectories across four time points for young people between the ages of 12 and 26 in the Add Health.

I start this section by discussing the procedures used to determine which type of latent class model best captures the observed BMI trajectories of my overall sample. I then explore the number and shape of trajectories in my cohort of 12 and 13 year olds by examining model fit statistics (including the Bayesian Information Criterion [BIC]), amount of classification error (entropy) and value of class membership probabilities. After establishing that there are

unique and substantive differences in BMI experiences among the respondents, I present graphs for the latent classes of BMI trajectories for the total sample and for male and female respondents separately. As a reminder, analyses not shown here indicate that due to small sample sizes, I am unable to explore the conditioning effects of race/ethnicity and immigrant status. In the estimation of all the latent classes, BMI is treated as a continuous variable.

In order to justify estimating different classes of BMI trajectories over time, rather than modeling a single growth curve in this dissertation, I performed several analyses of the raw BMI data. I performed a linear test, a quadratic model and a freed loadings model where there is no specified shape. The linear test, the unconditional model and the quadratic model results (not shown) indicate that the individual observed BMI trajectories are particularly heterogeneous in my sample and, consequently, using a singular growth curve would not capture all of the observed heterogeneity in body mass changes among youth over time. Furthermore, growth curves cannot test the hypothesis that a finite number of subgroups exist, thus in this dissertation I estimate multiple classes of BMI trajectories using latent class analysis. Since LCA methods on the whole are either nonparametric or semiparametric (depending on how they parameterize time), they can better capture non-linear specifications of trajectory classes. For instance, using LCA methods, the experience of abrupt weight increases at only older ages may be estimated as a class trajectory of its own.

The data used for the latent class analyses in this chapter are weighted and have a prospective cohort design. Attrition, either due to death or dropping out of the Add Health, after baseline (Wave I) is not replenished. Mplus permits for estimating models with missing data with a full information maximum likelihood (FIML) estimator. This choice of estimator allows each individual to have a likelihood calculated for them even if they are missing information for some variables. A FIML estimator follows ‘missing at random’ assumptions similar to other procedures such as multiple imputation (Muthén and Muthén 2007).

4.1 Number of Classes, Their Shapes, and Sample Percentages

Given the previous work by developmental scientists (Nonnemaker et al. 2009; Ostbye et al. 2010, Pryor et al. 2011, Ventura et al. 2009), I predict that there are four distinct classes of BMI trajectories that emerge from the observed individual trajectories of American youth. The four predicted trajectories include: a low-stable trajectory of BMI, a moderate-increasing trajectory of BMI, a chronic high trajectory of BMI, and a high-increasing trajectory of BMI.

Furthermore, I predict that gender differences exist in the data, where young women will experience higher and more accelerated weight increases than young men.

In order to explore the prediction that four different classes of trajectories exist in the data, I estimate models with up to seven latent classes for the full sample, and also for the sub-samples of boys/men and girls/women separately. To determine the best fitting model for each sample/sub-sample, I compare the BIC and the Entropy statistics of all seven latent classes. As a general rule, models that have smaller BIC values provide a better ‘fit’ and Entropy statistics that are close to 1 (or above .80) suggest that the classes are well-defined or separated (Celeux and Soromentho 1996). Next, I compare the number of trajectories, their trajectory shapes, and the sizes of the trajectories (i.e. the value of group probability for the various classes).

Shown in Table 4.1 are the model fit statistics, including the BIC and Entropy values, for the seven latent classes among the total sample, and the boys/men and girls/women samples. Although for the full sample the BIC appears lowest for the 7-class model, the estimation of models did not terminate normally after the 4-class model and later classes also had very small sample probabilities (less than 5 percent). Thus, a 4-class solution appears the best fit for the full sample. For men, the 4-class model is lowest in BIC, however the estimation of models failed to terminate normally, leaving only a 3-class solution as best model fit. As with the full sample, women had best fit with the 4-class model; subsequent latent classes once again failed to terminate, leaving behind very small class probabilities. Consequently, my prediction of four latent BMI trajectories is confirmed for the full sample and for young women. For young men, on the other hand, three latent BMI trajectories emerge.

Table 4.1: Model fit Statistics for 7 Latent Classes– Bayesian Information Criterion (BIC) and Entropy.

class #	Full Sample (N=1,669)		Boys/men (N=708)		Girls/women (N=961)	
	BIC	Entropy	BIC	Entropy	BIC	Entropy
1	33488.98		14151.45		19352.61	
2	33141.99	0.89	14032.36	0.86	19122.44	0.93
3	32954.10	0.90	13970.83	0.88	19013.52	0.92
4	32842.01	0.90	13946.58	0.90	18936.55	0.92
5	32824.06	0.90	13960.73	0.80	18912.19	0.86
6	32801.07	0.84	13931.12	0.85	18903.19	0.85
7	32791.57	0.85	13932.94	0.80	18874.42	0.86

Given the model fit statistics outlined above, the observed latent classes of BMI trajectories with best fit are graphed by their predicted means for each sample (see Figures 4.1 through 4.3). Table 4.2 also presents a more in depth description of the full samples’ trajectory classes, including their class probabilities and mean BMIs over the four waves. The BMI trajectory classes for the full sample include: *Normal to Overweight*, *High Normal to High Obese*, *Stable Obese*, and *Obese to Morbidly Obese* (see Figure 4.1). The BMI trajectory groupings, however, differ slightly for males and females. Figure 4.2 displays the trajectory groups found for male respondents, while Figure 4.3 displays the trajectory groups found for female respondents. Although all trajectories increase in BMI over time, as I predicted, females in heavier BMI trajectories increase more drastically in weight over time than do their male counterparts.

Within the full sample (see Figure 4.1), most (81.5 percent) of the youth were placed in a trajectory that transitioned from normal to overweight BMI over their young lives. Of the remaining roughly 18 percent, all youth were in a trajectory that transitioned to an obese or morbidly obese BMI category by adulthood. More than ten percent of the sample began their BMI trajectory with a normal BMI (mean BMI of 23.72), albeit on the higher end of normal, and experienced a precipitous increase in BMI to borderline morbidly obese (mean BMI of 39.64) as adults.

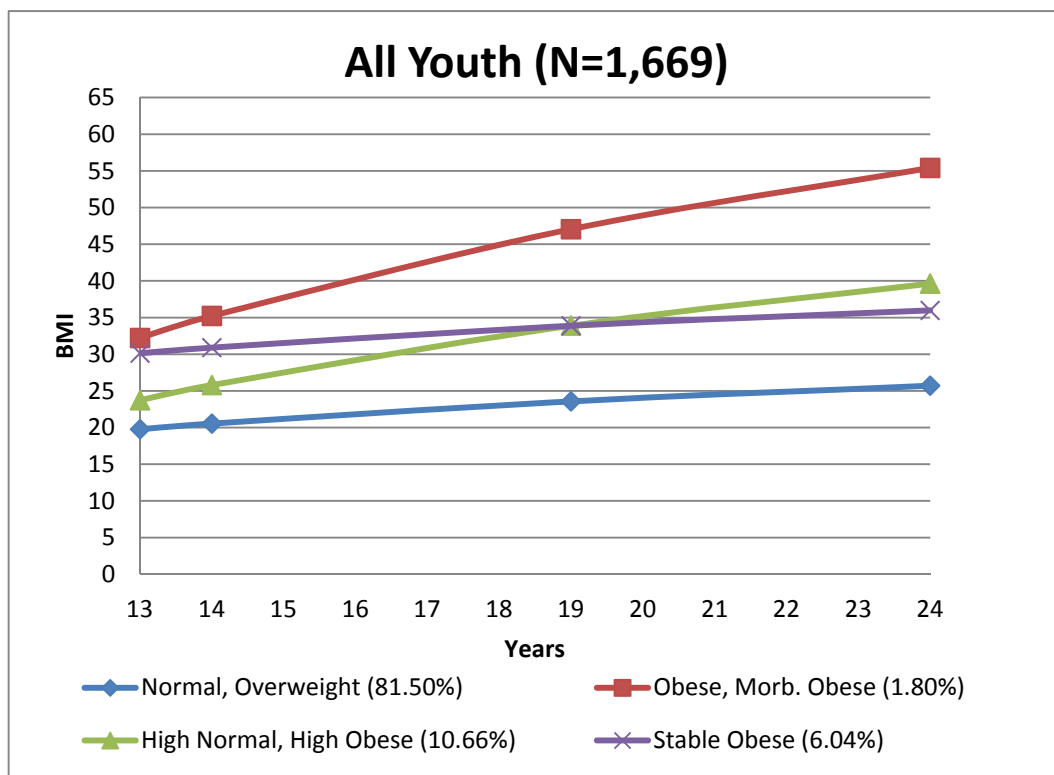


Figure 4.1: BMI Trajectory Membership among Youth who were aged 12 or 13 years at Wave I (N=1,669).

Among the young teenagers who are obese at Wave I, 6.04 percent maintain their weight category, while about 2 percent (or 31 individuals) gain more than 23 BMI points over the eleven-year survey period, increasing from a mean BMI of 32.20 to a mean BMI of 55.40. There are no BMI trajectories that included a decline in BMI over time. Surprisingly, there are also no BMI trajectories that consist of youth who consistently maintained a weight within the normal BMI range.

Table 4.2: Classes of BMI Trajectories and Mean BMI Levels without Covariates for the Full Sample (1,669).

Full Sample (N=1,669)				
Classes:	Normal, Overweight	High Normal, High Obese	Stable Obese	Obese, Morbidly Obese
N (Sample %)	1360 (81.5%)	178 (10.66%)	100 (6.04%)	31 (1.8%)
Mean BMI W I	19.77	23.73	30.14	32.20
Mean BMI W II	20.54	25.80	30.89	35.21
Mean BMI W III	23.56	33.91	33.87	47.05
Mean BMI W IV	25.70	39.64	35.94	55.40

Although the general patterns of increasing weight are similar for boys/men and girls/women, some notable differences in weight acceleration appear by gender. The trajectory analyses by gender show that not only does girls/young women’s weight increase to heavier BMIs (i.e. obese levels) more rapidly than boys, but also that the girls/women’s trajectories have starting BMI values that are more extreme than are the boys/men’s values. For example, all of the girls/women’s trajectories start with a BMI value within either the “normal” or “obese” range, none within the “overweight” range (BMI of 25-29.5). Over 16 percent of young men, however, begin their BMI trajectory within the overweight range, and none begin a trajectory within the obese range.

On the whole, the majority of young men in my sample (83.52 percent) are found within the *Normal to Overweight* trajectory (see Figure 4.2 and Table 4.3). The other males are in trajectories that transition from being overweight at 12 and 13 year olds to being either obese (7.61 percent) or morbidly obese (8.87 percent) by age 23-24 years.

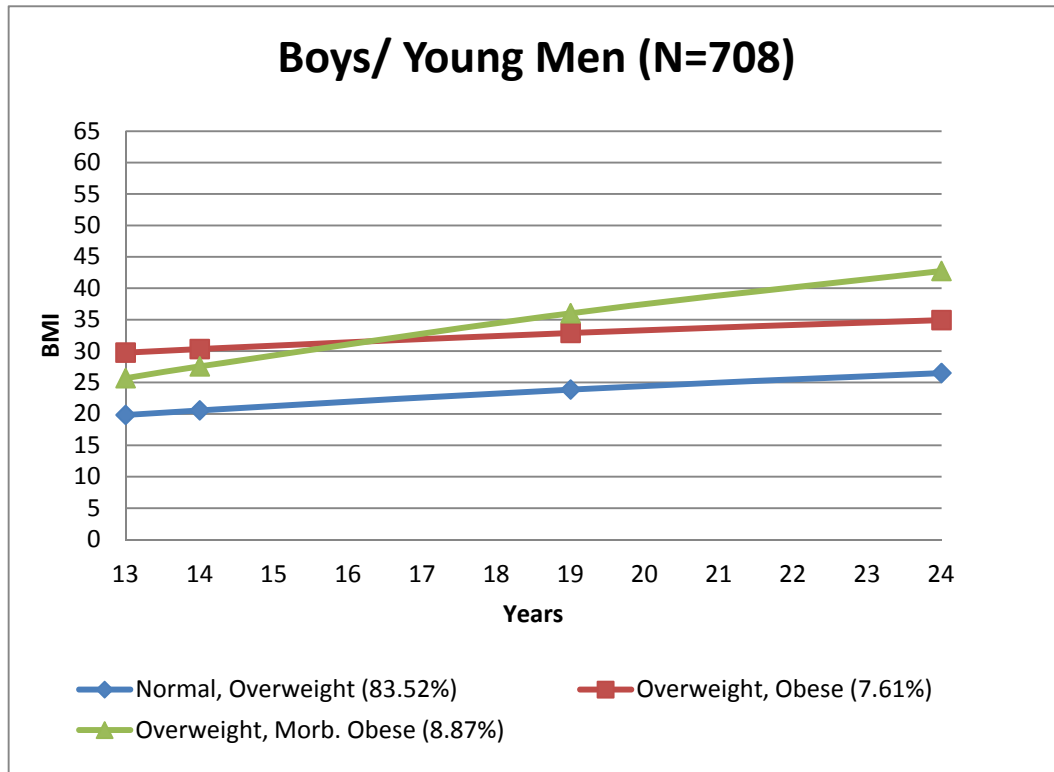


Figure 4.2: BMI Trajectory Membership among Boys/ Young Men who were aged 12 or 13 years at Wave I (N=708).

Table 4.3: Classes of BMI Trajectories and Mean BMI Levels without Covariates for the Boys/Men Sample (N=708).

Boys/ Young Men (N=708)			
Classes:	Normal, Overweight	Overweight, Obese	Overweight, Morbidly Obese
N (Sample %)	591 (83.52%)	54 (7.61%)	63 (8.87%)
Mean BMI W I	19.83	29.75	25.68
Mean BMI W II	20.57	30.32	27.56
Mean BMI W III	23.87	32.89	36.02
Mean BMI W IV	26.51	34.93	42.74

Young women, on the other hand, experience more dramatic and diverging BMI changes over time (see Figure 4.3 and Table 4.4). As with the men, women generally transition from normal BMI in childhood to overweight BMI in adulthood (83.19 percent).

However, the substantial number of women (162 individuals, or about 17 percent) who do not follow this pattern appear to very precipitously gain weight throughout adolescence and into young adulthood. About eleven and a half percent of women fall into the *High Normal to High Obese* trajectory, which rises from normal BMI points as children to borderline morbidly obese BMI points as adults.

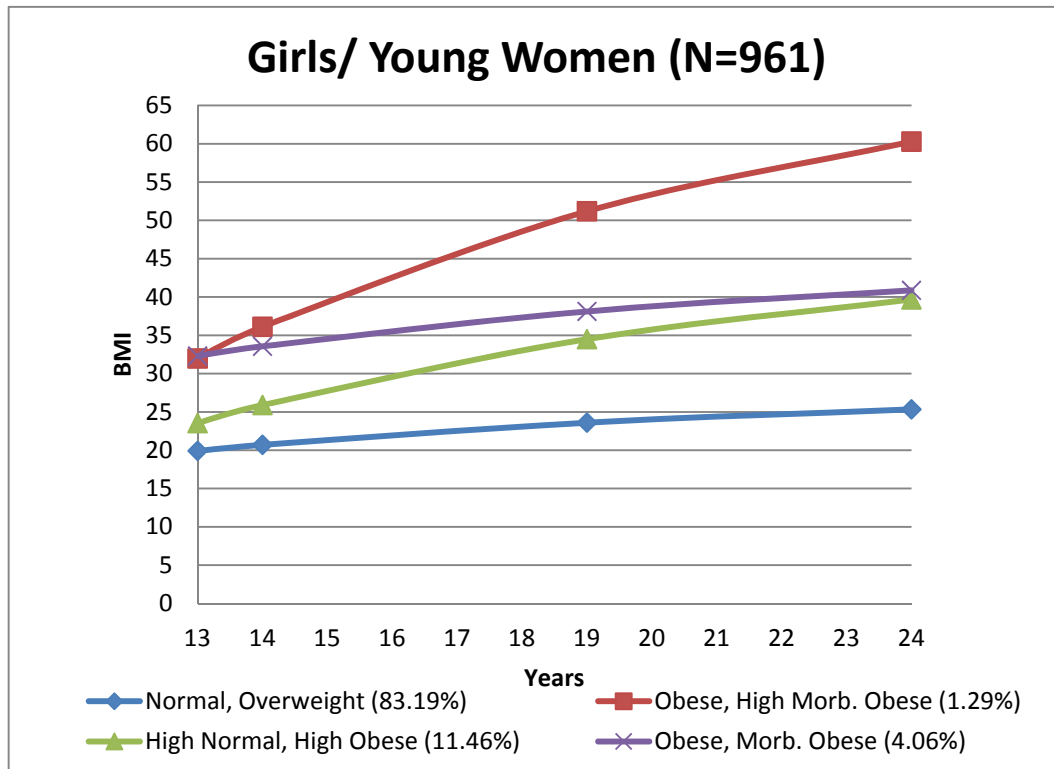


Figure 4.3: BMI Trajectory Membership among Girls/ Young Women who were aged 12 or 13 years at Wave I (N=961).

The remaining girls/women begin their weight status as obese, at a BMI of around 32, and move to morbidly obese levels of BMI, with mean points of 41 (*Obese to Morbidly Obese trajectory*) and 60 (*Obese to High Morbidly Obese*). These analyses, therefore, suggest that gender has an important moderating impact on BMI trajectory group membership.

Table 4.4: Classes of BMI Trajectories and Mean BMI Levels without Covariates for the Girls/Women Sample (N=961).

Girls/ Young Women (N=961)				
Classes:	Normal, Overweight	High Normal, High Obese	Obese, Morbidly Obese	Obese, High Morbidly Obese
N	799	110	39	13
(Sample %)	(83.19%)	(11.46%)	(4.06%)	(1.29%)
Mean BMI W I	19.91	23.54	32.30	31.97
Mean BMI W II	20.70	25.89	33.55	36.10
Mean BMI W III	23.59	34.49	38.11	51.19
Mean BMI W IV	25.33	39.68	40.86	60.28

4.2 Discussion

The research performed in this chapter uses latent class analysis to explore the number, shape, and sample percentages of BMI trajectories for all youth in my sample and then for young men and women separately. I first predicted that I would find four distinct classes of BMI trajectories: a low-stable trajectory of BMI, a moderate-increasing trajectory of BMI, a chronic high trajectory of BMI, and a high-increasing trajectory of BMI. This prediction was generally supported by model fit analyses, although I did not find a low-stable or “normal” BMI trajectory. The vast majority of young individuals (over 80 percent) fell in a fairly low-increasing trajectory of BMI, labeled here as the *Normal to Overweight* trajectory. Thus, the four observed trajectories for the full sample arose as *Normal to Overweight*, *High Normal to High Obese*, *Stable Obese*, and *Obese to Morbidly Obese*.

In line with my second prediction, I also found that observed individual trajectories vary by gender. While analyses indicate four distinct classes of BMI trajectories among girls/women, only three distinct classes emerge for the subsample of boys/men. Moreover, as predicted, young women experience more accelerated weight increases with higher BMI scores and more diverging BMI changes over time than do their male counterparts. Specifically, young women are more likely to experience a precipitous increase from borderline overweight to morbidly obese levels than are men (11.46 vs. 8.87 percent). Women also tend to have higher scores of BMI at baseline; two classes emerge (*Obese to Morbidly Obese* [4.06 percent], *Obese to High Morbidly Obese* [1.29 percent]) where starting values begin at a BMI of 32.

Although the percentiles are fairly small for these two trajectory groups and, consequently, require some caution in interpretation, model estimation suggests the presence of two different groups of young women who have particularly high BMI scores over the entire course of their young lives. For young men, on the other hand, none of the trajectory groups have starting BMI values that fall within the obese range.

It is important to note that in the “real” world, there are certainly individual youth who maintain a normal weight (7.25 percent in my sample), or even lose a substantial amount of weight (0.48 percent in my sample) over time. Yet these analyses clearly show that those weight paths are not common enough patterns to show up as a distinct class. As such, these results indicate that young people in the U.S., particularly young women, are generally at serious risk for transitioning into “unhealthy” BMI categories as they age into adulthood. Here I find that the most commonly traveled weight pathways are those that move relatively quickly towards quite heavy weights. This study’s examination of BMI trajectories, after all, ends when respondents are only in their early twenties. I believe this is a more profound finding than what previous research has shown by simply reporting the percentage of people at each age who are in the overweight or obese weight categories.

Although it would have been ideal to have more than four waves of data over the course of childhood and into young adulthood, these findings still suggest that weight changes over time are fluid and they do not follow a singular path of growth for all individuals over time. This is confirmed by examining the observed individual BMI trajectories separately for boys/men and girls/women. Although all youth increase in BMI as they age, women tend to become heavier and to follow along different paths than men. As a result, I argue that this method of analysis is necessary in order to fully grasp the complexity of weight change dynamics that are taking place during critical periods of role and life changes during the early years. Given the interesting gender differences found here, future research should also explore the conditioning effects of race/ethnicity and immigrant status, as these variables likely will provide valuable insight into the differing weight experiences found among American youth and adults.

CHAPTER 5

COVARIATE EFFECTS ON BMI TRAJECTORY MEMBERSHIP

This second empirical chapter builds on Chapter 4 and examines the impact of socio-demographic characteristics, family background characteristics, and youths' perceptions of interpersonal relationship quality and support on the established BMI trajectories. In addition, I explore whether the association between trajectory membership and these factors differs by gender. In order to meet these objectives, I extend the latent class analysis (LCA) performed in Chapter 4 and calculate odds ratios from the obtained γ coefficients. These odds ratios show the effect of the predictor variables on trajectory membership for each of my three samples - *all respondents*, *boys/men*, and *girls/women*. The odds ratios presented in this chapter show the odds of trajectory or class membership for each covariate when all others are held constant. Essentially, the interpretation of results is similar to that of multinomial logistic regression, where one compares covariate effects on class membership in the various BMI trajectories with the referent trajectory (i.e. *Normal to Overweight* class) for each sample. In this way, profiles of characteristics or statuses may be obtained for each specific trajectory, since factors like gender and family background influence one's experience in a specific BMI trajectory stretching from adolescence to young adulthood. Analogous to the previous chapter, I utilize latent class analysis techniques here and the data are weighted for Add Health's complex sampling design.

I examine several socio-demographic and family background characteristics, as well as interpersonal relationship predictors, for my three samples. However, it must be noted that for the analysis run with the female sample, the 'school type' (public versus private school) variable is omitted, as the model became unstable with its inclusion. Difficulty in maintaining model stability when using such complex models is fairly common and is a limitation of LCA and other similar latent variable techniques that estimate so many models parameters simultaneously. Such analytical techniques have very stringent methodological demands, where the slightest change in model parameters, such as adding too many predictors or having predictors that are non-varying within most classes, having too many classes (supported by

model fit, but perhaps not by class probabilities where parsimony is vital), and so forth, can result in the failure of a model run to terminate or the lack of convergence on a unique solution by the maximum likelihood estimator. This also explains why I am unable to explore for any of my samples the significance of immigrant status or age as predictors of BMI class membership.

5.1 Predictors of BMI Trajectories: Full Sample (Four-Class Model)

For the full sample (N=1,669), Table 5.1 presents the odds ratios associated with the socio-demographic factors, family background characteristics, and interpersonal relationships by BMI trajectory (*High Normal to High Obese*, *Stable Obese*, and *Obese to Morbidly Obese*). The odds of class membership are discussed one trajectory at a time in comparison to the reference trajectory - *Normal to Overweight*. An odds ratio value of one implies that there is no effect of the covariate on class membership. An odds ratio value of greater than one indicates a greater likelihood of class membership compared to the referent class. Conversely, odds ratios of less than one suggest a lesser likelihood of class membership.

Findings indicate that race/ethnicity, family socioeconomic status and parental attachment are significant predictors of being in the *High Normal to High Obese* trajectory, as opposed to the *Normal to Overweight* trajectory. In particular, compared to their White counterparts, Black youth have more than twice (OR 2.15) the odds of being in the *High Normal to High Obese* trajectory than the *Normal to Overweight* trajectory. On the other hand, youth with missing values for family income (OR .55) and family education (OR .66) have significantly lower odds of being in the *High Normal to High Obese* trajectory than the *Normal to Overweight* trajectory when compared to youth whose parents report an income of \$60,000 or more or who have more than a high school education. Furthermore, for every one unit increase in parental attachment there is a .69 reduction in odds of being in the *High Normal to High Obese* trajectory (as opposed to the *Normal to Overweight* trajectory).

Table 5.1: The Odds Ratios for Socio-demographic, Family Characteristics, and Interpersonal Relationship Quality in the Full Sample: Four BMI Trajectories (N=1,669).

Full Sample (1,669):			
<i>Classes (ref. Normal, Overweight)</i>	High Normal, High Obese	Stable Obese	Obese, Morbidly Obese
Male	1.07	1.54	0.53
Biological Parents	1.55	2.46*	3.09*
<i>Race/Ethnicity (ref. White)</i>			
Black	2.15***	1.11	1.37
Hispanic	1.27	1.09	2.68
<i>Location of Residence (ref. Rural)</i>			
Urban	0.89	0.61	0.56
Suburban	0.74	0.59	0.55
<i>Region of Country (ref. Midwest)</i>			
West	1.11	1.54	0.24
South	1.17	1.57	0.83
Northeast	1.08	0.84	0.42
<i>School Type (ref. Private)</i>			
Public	1.36	1.74	24.45**
<i>Family Income (ref. \$60K+)</i>			
Less than \$15,000	0.93	2.76*	0.82
\$16-34,000	0.75	1.06	1.65
\$35-59,000	0.74	1.08	1.90
Missing Income	0.55*	0.77	0.44
<i>Family Education (ref. HS+)</i>			
Less than High School	1.49	2.08	1.73
High School (HS)/GED	0.71	1.21	1.15
Missing Education	0.66*	1.00	0.94
Mother Works	1.16	1.46	1.55
Parents' Availability (1-5)	1.23	1.05	1.71*
Parental Attachment (1-5)	0.69*	0.61	0.36*
Adult Cares (1-5)	0.91	1.01	1.24
Teacher Cares (1-5)	0.97	1.16	1.54
School Connectedness (1-5)	0.84	1.27	0.93
*p<0.05, **p<0.01, ***p<0.001			
Loglikelihood Value	-16666.435		
BIC	34015.508		
Entropy	0.89		
Free Parameters	92		

In terms of the odds of being in the *Stable Obese* trajectory, as opposed to the *Normal to Overweight* trajectory, family structure and family income appear to be significant. Interestingly, compared to their peers who live in other types of family arrangements, youth in two-biological parent families have 2.46 times the odds of being in this chronically obese group as opposed to the *Normal to Overweight* trajectory. Also, compared to youth whose parents are in the top income bracket (\$60K or more), individuals whose family income is less than \$15,000 a year have increased odds (OR 2.76) of being in the *Stable Obese* trajectory rather than the referent trajectory.

Finally, family structure, school type, parents' availability, and parental attachment all significantly predict being in the *Obese to Morbidly Obese* trajectory, as opposed to the *Normal to Overweight* trajectory. Similar to the findings for the *Stable Obese* trajectory, youth with two biological parents in the home also have increased odds (OR 3.06) of being in the *Obese to Morbidly Obese* trajectory as opposed to the *Normal to Overweight* trajectory. Moreover, young people who attend public school (vs. private school) have substantially higher odds (OR 24.45) of being in this accelerated BMI trajectory than the referent trajectory. Finally, while a one unit increase in parents' availability to their children increases the odds of being in the *Obese to Morbidly Obese* trajectory, compared to the *Normal to Overweight* trajectory, by 1.71 times, parental attachment reduces the odds by .36 times.

So, for the full sample, the analysis suggests both risk factors and protective factors which may influence young people's BMI paths over the duration of adolescence and into adulthood. In line with previous research (Harris et al. 2009, Li et al. 2007, Nonnemaker et al. 2009, Ventura et al. 2003), risk factors for being in a BMI trajectory that includes a particularly steep increase in BMI (*High Normal to High Obese* and *Obese to Morbidly Obese*) include one's race/ethnicity, particularly being non-Hispanic Black as opposed to non-Hispanic White, and being enrolled in a public school as opposed to a private school during adolescence. Contrary to previous work (Nonnemaker et al. 2009), two unexpected risk factors for being in the heaviest of BMI trajectories (*Obese to Morbidly Obese*), also arose from this covariate analysis. It seems that, net of other background and interpersonal relationship factors, living in a two-biological-parent family and having greater levels of parental availability place a child at an increased risk for transitioning from obesity to morbid obesity as they age. Living with both

biological parents also increases the risk for experiencing stable obesity over time (as opposed to being in the *Normal to Overweight* trajectory), as does having a low family income.

In terms of protective factors, two socio-demographic predictors and one familial relationship predictor appear to reduce the odds of youth entering into a BMI trajectory that includes an accelerated increase in BMI (*High Normal to High Obese* and *Obese to Morbidly Obese*). The socio-demographic factors include having missing values for family income (as opposed to \$60,000 or more) and missing values for family education (as opposed to high school or more). Although the meaning of this is a bit obscure, these findings suggest that there may be something unique about youth who either choose not to report these items or, perhaps, do not know the answers to them. Finally, feeling more attached to one's parents during adolescence also appears to be important in preventing the movement into an obese or morbidly obese BMI category from a lower BMI category.

5.2 Predictors of BMI Trajectories: Boys/Men (Three-Class Model)

Table 5.2 displays the odds ratios for the socio-demographic factors, family background characteristics, and interpersonal relationships by BMI trajectory (*Overweight to Obese* and *Overweight to Morbidly Obese*) for boys/men (N=708). As with the full sample analysis, the odds of class membership are discussed one trajectory at a time in comparison to the referent trajectory - *Normal to Overweight*.

As a whole, there are not as many significant predictors of BMI class membership for males as there are for the full sample. Interestingly, the findings here show that none of the predictors are related to an increased risk of being in the *Overweight to Obese* trajectory as opposed to the *Normal to Overweight* trajectory. Boys/men whose family income is not reported (or missing), however, have .39 times lower odds of being in the *Overweight to Obese* trajectory compared to their male counterparts whose family income is \$60,000 or more annually. As indicated in the above section on the full sample analysis, it remains unclear as to the reason why having missing family income data is associated with a protective effect on BMI trajectory membership.

Table 5.2: The Odds Ratios for Socio-demographic, Family Characteristics, and Interpersonal Relationship Quality in the Male Sample: Three BMI Trajectories (N=708).

Boys/Young Men (N=708): Classes (<i>ref. Normal, Overweight</i>)	Overweight, Obese	Overweight, Morbidly Obese
Biological Parents	1.58	2.23
<i>Race/Ethnicity (ref. White)</i>		
Black	1.63	0.76
Hispanic	0.79	1.07
<i>Location of Residence (ref. Rural)</i>		
Urban	0.82	0.52
Suburban	0.70	0.62
<i>Region of Country (ref. Midwest)</i>		
West	1.13	1.12
South	1.25	2.48*
Northeast	1.24	0.92
<i>School Type (ref. Private)</i>		
Public	1.03	1.855
<i>Family Income (ref. \$60K+)</i>		
Less than \$15,000	1.22	1.58
\$16-34,000	0.58	0.79
\$35-59,000	0.84	0.88
Missing Income	0.39*	0.41
<i>Family Education (ref. HS+)</i>		
Less than High School	1.32	1.19
High School (HS)/GED	1.03	1.20
Missing Education	0.73	0.81
Mother Works	1.02	1.87
Parents' Availability (1-5)	1.22	1.38
Parental Attachment (1-5)	0.83	0.40**
Adult Cares (1-5)	0.76	0.86
Teacher Cares (1-5)	0.99	1.44*
School Connectedness (1-5)	1.12	0.94
*p<0.05, **p<0.01, ***p<0.001		
Loglikelihood Value	-7085.703	
BIC	14578.277	
Entropy	0.884	
Free Parameters	62	

In terms of being in the *Overweight to Morbidly Obese* trajectory, as opposed to the *Normal to Overweight* trajectory, each unit increase in perceptions of parental attachment

reduces the odds by .40. In addition, analyses suggest several risk factors associated with the odds of being in the *Overweight to Morbidly Obese* trajectory, as opposed to the referent trajectory. Boys/men who reside in the South (vs. the Midwest) have 2.48 times higher odds of being in this trajectory. Moreover, net of other background and interpersonal relationship factors, each unit increase in perceptions that teachers care for them is associated with 1.44 times higher odds of being in this highest BMI trajectory.

In sum, these results indicate, once again, that missing family income values and parental attachment are protective factors. Here they are associated with a reduction in the risk of experiencing a BMI trajectory that includes a transition from overweight to obesity or morbid obesity over time. Among boys/men, the risk factors associated with membership in the heaviest of BMI trajectories (*Overweight to Morbidly Obese*) include residing in the Southern region of the United States and, surprisingly, holding higher perceptions of having teachers who care for them during their adolescence.

5.3 Predictors of BMI Trajectories: Girls/Women (Four-Class Model)

Table 5.3 presents the covariate results for the girls/women in my sample (N=961). The odds of class membership (*High Normal to High Obese*, *Obese to Morbidly Obese*, and *Obese to High Morbidly Obese*) are discussed in comparison to the referent trajectory - *Normal to Overweight*. First, the findings show that low family education is an important risk factor for experiencing an accelerated increase in BMI, during adolescence and adulthood. Specifically, compared to their female counterparts whose parents have more than a high school education, girls/women who indicate a family educational level of less than high school have higher odds of being in both the *High Normal to High Obese* (OR 2.55) and the *Obese to High Morbidly Obese* (OR 4.93) trajectories than in the *Normal to Overweight* reference trajectory.

In terms of being in the *Obese to Morbidly Obese* trajectory, race/ethnicity, family structure and school connectedness appear to be important predictors. In particular, being Hispanic (as opposed to non-Hispanic White) and living in a two-parent biological family (vs. any other type of family arrangement) increases the odds of being in this trajectory rather than in the referent BMI trajectory by 3.03 and 2.95 times, respectively. In contrast, girls/women who are more connected to school have significantly lower odds (OR .53) of being in the *Obese to Morbidly Obese* trajectory than in the *Normal to Overweight* one.

Table 5.3: The Odds Ratios for Socio-demographic, Family Characteristics, and Interpersonal Relationship Quality in the Female Sample: Four BMI Trajectories (N=961).

Girls/ Young Women (N=961):			
<i>Classes (ref. Normal, Overweight)</i>	High Normal, High Obese	Obese, Morbidly Obese	Obese, High Morbidly Obese
Biological Parents	1.38	2.95*	2.89
<i>Race/Ethnicity (ref. White)</i>			
Black	1.72	2.13	1.35
Hispanic	1.33	3.03*	1.97
<i>Location of Residence (ref. Rural)</i>			
Urban	1.26	0.55	1.19
Suburban	0.91	0.74	0.77
<i>Region of Country (ref. Midwest)</i>			
West	0.76	1.42	0.45
South	1.02	1.17	0.63
Northeast	0.64	0.88	0.33
<i>Family Income (ref. \$60K+)</i>			
Less than \$15,000	0.85	2.26	0.49
\$16-34,000	0.83	1.22	3.43
\$35-59,000	0.53	0.97	2.18
Missing Income	0.67	1.13	0.98
<i>Family Education (ref. HS+)</i>			
Less than High School	2.55*	1.67	4.93*
High School (HS)/GED	0.77	0.70	1.49
Missing Education	0.58	0.78	1.43
Mother Works	1.11	1.00	1.91
Parents' Availability (1-5)	1.30	0.82	1.71
Parental Attachment (1-5)	0.63	0.60	0.51
Adult Cares (1-5)	0.99	1.49	0.99
Teacher Cares (1-5)	1.22	0.99	1.22
School Connectedness (1-5)	1.10	0.53***	1.10
*p<0.05, **p<0.01, ***p<0.001			
Loglikelihood Value	-9549.062		
BIC	19688.77		
Entropy	0.851		
Free Parameters	86		

In sum, the factors predicting BMI trajectories among girls/women appear to be very different from those predicting BMI trajectories among boys/men. For young women, having low family income appears to increase the risk of being in a trajectory that includes an accelerated increase in BMI, whether they start out classified as either *Normal* or *Obese*. The factors that place girls/women at increased odds for moving steadily from the *Obese* to *Morbidly Obese* categories, however, are being Hispanic, as opposed to Non-Hispanic White, and living in a two- biological parent family, as opposed to any other family form. Unlike for the young men, parental attachment and perceptions of teacher caring are not associated with BMI trajectory membership. Yet, feeling connected to one's school does appear to protect girls/women from being in the *Obese to Morbidly Obese* trajectory during their young lives.

5.4 Discussion

In this chapter, I use latent class analysis (LCA) models to explore the effects of socio-demographic characteristics, family background characteristics, and youths' perceptions of interpersonal relationship quality and support on BMI trajectory membership for my full sample, as well as for boys/men and girls/women separately. To do so, I use odds ratios and discuss the statistical significance of predictor variables for the odds of trajectory membership for respondents in each of the three samples (always using the *Normal to Overweight* trajectory as the reference group).

Many of the findings are consistent with past research on BMI or obesity trajectory membership. Overall, youth who experience trajectories that include a sharp increase in BMI over time are more likely to be Black (as opposed to non-Hispanic White), to attend public schools, and to report lower levels of parental attachment. Youth who begin adolescence as obese and remain so throughout their entry into adulthood (i.e. *Stable Obese*) are also more likely than their peers to have lower family income. There were also a couple of unexpected findings, however. While one would initially assume that living in a two-biological parent family and having high levels of parental availability would reduce the likelihood of a negative BMI trajectory outcome, these factors actually appear to place young people at risk for membership in the highest and most precipitous BMI trajectory (*Obese to Morbidly Obese*).

Living in two-parent families are generally protective environments for youth, as such families tend to provide high levels of stability as well as emotional and financial support. It may be, however, that net of all other factors, one possible reason the protective nature of

having two parents in the home diminishes is the well established strong, positive association between parental BMI and youth BMI/overweight status (Classen and Hokayem 2005; Magarey et al. 2003, Kowaleski-Jones et al. 2010, Vandewater and Huang 2006). Parents' and children's BMI scores, as well as spouses' BMI scores (The and Gordon-Larsen 2009), are often quite close in concordance. Much of this concordance appears to result from the shared familial environment, where common food and exercise habits tend to similarly impact all persons living in the home. Therefore, one could imagine that obese youth are more likely than their lighter peers to live in a household in which all parents present are also obese. Having *two* parents present in this situation, as opposed to only one, may actually pose a weight-related risk. When two very central and influential authority figures in a young person's life are themselves heavy and model "bad" eating and other health behaviors, this 'double trouble' could be especially damaging to an impressionable youth's weight status and lead to a greater likelihood of accelerated weight gain.

Similarly, the finding that greater parental availability, which captures the presence of a parent in the morning, after school and at bedtime, is a risk factor for membership in the *Obese to Morbidly Obese* trajectory (as opposed to the *Normal to Overweight* trajectory) may reflect the role of parental role modeling in children's eating and health habits. For obese youth, who are more likely to have obese parents, spending more time with parents may mean more exposure to very influential adults who are engaging in unhealthy eating habits and physical inactivity. These interesting findings clearly deserve more close attention in future research of the predictors of weight status among the young.

Once the analysis is broken down by gender, I see that the factors that significantly predict trajectory membership differ for boys/men and girls/women. As in the full sample, parental attachment appears protective for boys/men, reducing their odds of being in the highest of the BMI trajectories (*Overweight to Morbidly Obese*). For boys/men, two risk factors also emerge as important predictors of being in this trajectory - living in the South and perceiving that teachers care about them. While the importance of region of residence has been established in the prior literature (Robert Wood Johnson Foundation 2010), the latter finding is quite counter-intuitive and does not appear to coincide with previous research on teachers' general attitudes about overweight/obesity (Puhl and Latner 2007).

It could be, however, that the causal ordering of this relationship should be reversed. Boys who are overweight during the early teen years, particularly those who are already headed down a trajectory that includes more rapid weight gain over time, face more stigmatization and peer-related difficulties and are more removed from peer-related social activities and supports than their normal weight (or more stable-overweight) peers. As such, they may be more focused on academic achievement and/or developing relationships with teachers than with their peers. Teachers may also be more likely to reach out to these boys in an attempt to counteract some of the negative peer treatment that they receive. Thus, the more caring relationships with teachers may actually result from these boys' nascent BMI trajectories, rather than contribute to their development. Interestingly, I do not find that perceptions of teachers' care are associated with trajectory membership for girls/women. Previous research has suggested that overweight and obese girls/women may face more negative stereotypes and discrimination than their overweight/obese male peers (Harris 1990; Martin, May, and Frisco 2010). It could be that compensatory student-teacher relationships do not develop in the same way for girls as they do for boys. Clearly, more research on this issue is also warranted.

In general, interpersonal relationships (e.g. parental attachment, teachers caring) do not appear to be as linked to the BMI trajectories of girls/women as they are for boys/men. One exception to that is the finding that higher levels of school attachment are associated with lower odds of being in the *Obese to Morbidly Obese* trajectory (as opposed to the *Normal to Overweight* trajectory). Socio-demographic and family background characteristics, on the other hand, appear to be more important for girls/women than for boys/men. For example, having a lower income is associated with higher odds of being in BMI trajectory that includes a particularly accelerated increase in BMI. Moreover, being Hispanic (as opposed to non-Hispanic White) and living in a two-biological parent family is associated with increased odds of being in the *Obese to Morbidly Obese* trajectory (as opposed to the *Normal to Overweight* trajectory). Again, this last finding is surprising, especially since it appears for girls and not boys. Perhaps girls spend more time in the home and are more emotionally involved and connected with their parents than are boys, and as a result are more influenced by parental role modeling.

Although this chapter broadens previous work on BMI trajectory membership and its predictors, there are several limitations worth mentioning. First, given data and methodological constraints, it was difficult to completely assess temporal ordering. Particularly limiting is the fact that the beginning of the BMI trajectory is measured at the same time as the predictor variables. Second, as a result of small sample sizes, I was unable to model all predictors originally intended. For instance, I was unable to explore the association between trajectory membership and nativity status and I was forced to drop Asians from all three of my samples. I also had to simplify the way in which some of the predictors were measured (e.g. 2-biological parents vs. all other family types) because there was not enough variability by trajectory class. Third, the analytical technique used here does not assume individual heterogeneity within each latent class; therefore I was unable to explore the effects of the predictors within each BMI trajectory. Finally, my inability to determine what the “missing income” and “missing education” findings substantively mean, in terms of their protection against future BMI increases, is also a limitation. Future work should try to better address all of these issues, as they are important to the understanding of differential risks in BMI/weight changes over time for youth and young adults.

Despite these limitations, this research advances the literature. By exploring the significance of socio-demographic, family background characteristics and interpersonal relationships factors collectively, it is now more apparent which factors are associated with the odds of being in the different BMI trajectories. Being aware of which factors in a child’s life place them at risk or protect them from entering into the more unhealthy trajectories of weight gain during adolescence and early adulthood is critical for families, health practitioners, and others interested in potential health interventions. The next chapter examines several specific high-risk health behavioral outcomes by BMI trajectory membership for the full sample, as well as the subsamples of boys/men and girls/women.

CHAPTER 6

BMI TRAJECTORY MEMBERSHIP AND LATER HEALTH-RISK BEHAVIORS

This final empirical chapter explores the following two research questions: 1) net of the socio-demographic, family background, and interpersonal relationship factors examined in the previous chapter, is there a relationship between adolescent BMI trajectory membership and health-risk behaviors during adulthood?; and 2) If yes, are there conditioning effects by gender? The behavioral outcomes that I examine in this chapter include daily cigarette smoking (tobacco), problem drinking, and prescription drug abuse.

To examine the above-mentioned questions, I extend the latent class analysis (LCA) models carried out in Chapter 5 to incorporate an additional distal outcome. I calculate the odds ratios from the obtained γ coefficients from BMI trajectory membership for the three distal health outcomes (thus, BMI trajectory membership is now a predictor of the health behavior outcomes). The analyses calculate odds ratios for the association between the socio-demographic and other covariates and BMI trajectory membership (as in the previous chapter) and now also incorporate a second set of odds ratios representing the independent effects of the covariates on the distal outcome(s), net of all of the other covariates *and* BMI trajectory membership. Thus, the effects of the covariates, in this extended model, are now parsed into their independent effects on (1) BMI trajectories and (2) the distal health outcomes. The odds ratios for the BMI trajectory effects on the distal outcomes indicate the odds of engaging in a health-risk behavior for a particular BMI trajectory group compared with the referent trajectory (i.e. *Normal to Overweight* class), when controlling for all other predictors. So, for example, the findings of these analyses may help me to understand whether individuals in the “*Stable Obese*” BMI trajectory have increased odds of smoking in adulthood compared to their counterparts in the *Normal to Overweight* trajectory, net of covariate effects on BMI trajectory *and* net of covariate effects on smoking itself. Throughout the analyses, the data are weighted for Add Health’s complex sampling design.

As indicated above, the covariates examined in Chapter 5 are included in the analytical models presented here. Similar to the analysis presented in the previous chapter, however, the

‘school type’ (public versus private school) variable is omitted from the female models, as the models became unstable with its inclusion (see Chapter 5 for a discussion of this issue). In this chapter, I also include two additional interpersonal relationship variables, the experience of cohabitation and the number of cohabitation partners as measured at Wave III when respondents were between the ages of 18 and 20. These measures are added to the distal models since the examined health-risk behavior outcomes are assessed during adulthood when respondents were between the ages of 24 and 26 (at Wave IV). Given the late timing of these distal outcomes, it is important to not only control for baseline interpersonal experiences among youth, but also for some of the more normative interpersonal relationship experiences that tend to occur during early adulthood. The dichotomous measure of *cohabitation* assesses if respondents ‘have ever lived with someone in a marriage-like relationship for one month or more?’ and *cohabitation partners* is a count variable that measures the number of partners with whom a respondent has lived in a cohabiting relationship.

It is important to note here the issue of missing data again (previously discussed in Chapter 4). Add Health has a longitudinal cohort design where attrition after baseline (Wave I) is not replenished. However, since Mplus uses a maximum likelihood estimator, the associated assumptions regarding missing data allow for the estimation of models with missing data on a wide array of variables, including binary distal outcomes (Muthén and Muthén 2007). Therefore, I was able to retain all of the information for respondents in my sample, even if they were not present at Wave IV.

Table 6.1 presents descriptive statistics for the three distal health-risk outcomes explored in this dissertation, including daily cigarette smoking, problem drinking, and prescription drug abuse (see Chapter 3 for the operationalization of these outcome variables). The means, standard deviations (S.D.), and sample sizes are displayed for the full sample, as well as for men and women separately. The sample sizes associated with each of the particular distal outcomes reflect attrition during the final wave of data collection. Essentially, the sample sizes for each of the distal outcomes on the table reflect how many people actually answered the questions used to create those measures, yet in the final analyses I include the full sample of respondents regardless of whether they were present at Wave IV. The distal outcomes of those with missing data are imputed during the estimation of the LCA models.

Table 6.1: Sample Description of Health-Risk Distal Outcomes by Gender.

Distal Outcomes:	Full Sample N= 1,669			Men N=708			Women N=961		
	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N
Daily Smoking (Range = 0-1)	0.212	0.409	1403	0.243	0.429	587	0.189	0.392	816
Problem Drinking (Range = 0-1)	0.274	0.446	1380	0.310	0.462	577	0.248	0.432	803
RX Drug Abuse (Range = 0-1)	0.199	0.399	1404	0.250	0.433	587	0.163	0.369	817

While the majority of respondents in their mid-twenties do not report any of the risky behaviors examined here, a substantial percentage do. Having experienced problems associated with drinking, such as placing oneself or others at risk for harm, is the most common of risky behaviors (27.4 percent of the sample report problem drinking) reported by these adults. This is followed by daily smoking (21.2 percent) and prescription drug abuse (19.9 percent).

There are some interesting gender differences in health-risk behaviors, however. Generally, I find that men are more likely to report engaging in health-risk behaviors than are women. Specifically, about one-quarter of all men indicate daily cigarette smoking (24.3 percent) and prescription drug abuse (25 percent) in the past 30 days and roughly one-third of men have experienced some problems associated with their drinking behavior (31 percent). Among women, on the other hand, only one-quarter have experienced problem drinking (24.8 percent), 18.9 percent indicate daily smoking, and 16.3 percent indicate prescription drug abuse within the past month. Thus, the descriptive statistics indicate that a substantial portion of adults in my sample, particularly among the males, engage in risky behaviors that may jeopardize their current well-being, as well as their future health prospects.

The next section examines the predictors of the three distal outcomes (daily cigarette smoking, problem drinking and prescription drug abuse) for each of the three samples: the full sample of respondents, male respondents, and female respondents. Although not the primary focus of this chapter, I will first discuss the associations between the health-risk behaviors and the covariates of BMI trajectories (socio-demographic, family background, and both baseline and early adult interpersonal relationships), net of BMI trajectory membership, for each

sample. I will then turn to the primary focus of this chapter and discuss the association between the health-risk behaviors and BMI trajectory membership, net of all covariates.

6.1 Predictors of Distal Outcomes: Full Sample (Four-Class Model)

For the full sample of respondents (N=1,669), Table 6.2 displays results from models testing the relationship between the three health-risk outcomes (daily smoking, problem drinking and prescription drug abuse) and the socio-demographic, family background, and interpersonal relationship factors. The results are presented in the form of odds ratios and the odds of engaging in these risky behaviors are discussed with the assertion that the covariate findings hold all other predictors, as well as BMI trajectories, constant.

Several socio-demographic and family background factors are significantly associated with the odds of engaging in health-risk behaviors. Controlling for all other predictors and BMI trajectories, men have higher odds of daily smoking (OR 1.42) and prescription drug abuse (OR 1.71) than do women, but are no more likely to report problem drinking. Non-Hispanic Blacks and Hispanics, however, have lower odds of engaging in any of the health risk behaviors than do their non-Hispanic White peers. Living in an urban region (vs. rural region) during adolescence increases the odds of abusing prescription drugs during adulthood (OR 1.93), while residing in the West (vs. Midwest) lowers the odds of daily smoking (OR .33) and having missing values for family income (vs. \$60,000 plus) lowers the odds of problem drinking behaviors (OR .49).

Interpersonal relationships also appear important to risky health-related behaviors. For example, a one unit increase in parental attachment during adolescence significantly lowers the odds of prescription drug abuse during adulthood (OR .65). Similarly, as adolescents' perceptions that teachers care about them increase, the odds of daily smoking (OR .74) and problem drinking (OR .77) during adulthood decrease. Thus, in general, having positive interpersonal relationships during adolescence appears to be protective with regards to the development of later risky health-related behaviors.

Table 6.2: The Odds Ratios for the Covariate Effects on Health-Risk Distal Outcomes for the Full Sample (N=1,669).

Full Sample (N=1,669)			
<i>Models:</i>	Daily Smoking	Problem Drinking	Prescription Drug Abuse
Male	1.42*	1.27	1.71**
Biological Parents	0.73	0.81	1.33
<i>Race/Ethnicity (ref. White)</i>			
Black	0.34***	0.37***	0.14***
Hispanic	0.42*	0.50*	0.55**
<i>Location of Residence (ref. Rural)</i>			
Urban	0.73	1.57	1.93*
Suburban	0.94	1.40	1.55
<i>Region of Country (ref. Midwest)</i>			
West	0.33***	1.02	1.16
South	0.93	0.77	1.04
Northeast	0.95	0.81	1.13
<i>School Type (ref. Private)</i>			
Public	0.83	0.70	0.59
<i>Family Income (ref. \$60K+)</i>			
Less than \$15,000	1.43	0.64	1.21
\$16-34,000	1.41	0.98	0.81
\$35-59,000	1.00	0.93	1.20
Missing Income	0.86	0.49*	1.12
<i>Family Education (ref. HS+)</i>			
Less than High School	1.29	0.71	0.89
High School (HS)/GED	1.36	0.90	0.91
Missing Education	1.18	1.41	1.23
Mother Works	0.94	1.34	1.09
Parents' Availability (1-5)	1.01	0.98	1.10
Parental Attachment (1-5)	1.10	1.11	0.65*
Adult Cares (1-5)	1.14	1.09	1.00
Teacher Cares (1-5)	0.74**	0.77**	0.85
School Connectedness (1-5)	0.95	1.01	0.88
Cohabitation	1.50	0.68	4.41**
Cohabitation Partners	1.44	1.30	0.45
<i>*p<0.05, **p<0.01, ***p<0.001</i>			
Loglikelihood Value	-17384.084	-17425.903	-17351.932
BIC	35710.505	35794.143	35646.202
Entropy	0.89	0.89	0.89
Free Parameters	127	127	127

Interestingly, however, I find that those individuals who cohabit during their early adulthood (ages 18 to 20 years) have highly elevated odds of prescription drug abuse during their mid-twenties (OR 4.41). It is well known that selection into cohabitating unions occurs (Axinn and Thornton 1992), where individuals who decide to cohabit hold different, generally less supportive attitudes concerning the institution of marriage and more accepting attitudes towards divorce than do their non-cohabiting peers. Although this selection effect may be waning as more people choose to cohabit over time, it may be particularly true of those who cohabit at very young ages (i.e. their late teens and early twenties). Because cohabitation is often viewed as a *trial period* for a potential marriage, it probably attracts young people who are not as committed to the idea of marriage, and are more accepting of the termination of intimate relationships. For couples, this lower level of commitment and individual responsibility to a cohabiting partner may lead to interpersonal relationships that do not offer adequate social support or other mechanisms for reducing high-risk behaviors. Thus, it may be that the quality, rather than simply the presence, of these early adult relationships (cohabiting or otherwise) is more important for protecting young people’s health.

Table 6.3 displays the odds ratios for the distal health outcomes by BMI trajectory membership (*High Normal to High Obese, Stable Obese, and Obese to High Morbidly Obese*) for the entire sample. The significant odds of engaging in the health-risk behaviors are discussed in comparison to the reference trajectory - *Normal to Overweight*. The models presented here control for all covariates shown in Table 6.2.

Table 6.3: The Odds Ratios for BMI Trajectories by Health-Risk Distal Outcomes for the Full Sample (N=1,669).

Full Sample (N=1,669)			
Classes (<i>ref. Normal, Overweight</i>)	Daily Smoking	Problem Drinking	Prescription Drug Abuse
High Normal, High Obese	0.89	0.76	0.67
Stable Obese	0.96	0.89	0.58
Obese, Morbidly Obese	0.98	0.32+	2.69*

+ p<0.055, *p<0.05

Note: The models control for all covariates shown in Table 6.2.

It appears from my distal analyses that only the heaviest BMI trajectory throughout adolescence and young adulthood, the *Obese to Morbidly Obese* trajectory, has a significant association with health risk behaviors during the late twenties and early thirties. Specifically, being in this elevated, accelerated BMI trajectory, rather than the referent category, reduces (albeit moderately) the odds of problem drinking by .32 times. Interestingly, it also increases the odds of prescription drug abuse by 2.69 times. None of the BMI trajectories appear to be significant predictors of daily smoking behavior for the full sample.

I speculate that the explanation for these findings lies in the negative stereotyping and marginalization often experienced by obese individuals in our society. The question used to create the measure pertaining to problematic drinking is, I argue, largely focused on whether or not the respondent has engaged in problematic drinking behaviors while in the presence of other individuals (“How often have you been under the influence of alcohol when you could have gotten yourself *or others* hurt, or put yourself *or others* at risk, including unprotected sex?”). Moreover, the drinking behavior of adults in their mid-twenties often occurs in social settings (e.g., with romantic partners and/or friends at social gatherings, night clubs, and bars) (Single and Wortley 1993). In this context, importance may be placed on the physical attractiveness of an individual, as their attractiveness might help to determine whether they have a romantic partner and whether they are considered by their peers to be someone who would help to attract the attention of potential romantic and/or sexual partners to a social group. Since individuals within the *Obese to Morbidly Obese* trajectory class at Wave IV have a BMI of over 54 points, which roughly equates to a person who is 5’9 and weighs 370 pounds, it could be that adults with this BMI class do not feel welcome to drink in social settings or may not be invited to do so as a result of their weight. From a personal health perspective, it could also be that the combined acts of leaving the home and engaging in drinking behavior is in itself too strenuous.

It is interesting, however, that respondents in this trajectory class also have greater odds of abusing prescription drugs. These individuals are still engaging in behavior that causes intoxication, but choosing a drug that is less associated with social behavior and that may occur more often within the privacy of the home. Thus, the choice of prescription drugs may have less to do with a distaste for alcohol and more to do with levels of social engagement, as well as access to prescription drugs. Recent research indicates that prescriptions for opioid pain

relievers, in particular, have increased dramatically in the US over recent years (Manchikanti et al. 2010). Given that one of the associated consequences of excess weight is physical pain (Stone and Broderick 2012), adults within the *Obese to Morbidly Obese* trajectory class also may be more likely than their peers to receive prescriptions for pain relieving drugs.

6.2 Predictors of Distal Outcomes: Boys/Men (Three-Class Model)

Since my findings show that the BMI trajectories of boys/men and girls/women are different and that a larger proportion of adult men than women are engaging in high-risk health behaviors, I also ran the distal outcome models separately by gender. These models use the BMI trajectory classes established as appropriate for boys/men and girls/women in Chapter 4. Table 6.4 displays results from models testing the relationship between the three health-risk outcomes (daily smoking, problem drinking and prescription drug abuse) and the socio-demographic, family background, and interpersonal relationship factors for boys/men (N=708). As with the full sample covariate analysis, the odds of engaging in the high-risk health behaviors hold all other predictors and BMI trajectories constant.

As in the full sample analyses, race/ethnicity, region of the country and family income are significant predictors of health-risk behaviors. So, too, is school type. In particular, being non-Hispanic Black, as opposed to non-Hispanic White, appears to protect men from engagement in daily smoking (OR .38), problem drinking (OR .37) and prescription drug abuse (OR .19). Living in the Western region of the country (vs. Midwest) reduces the odds of daily smoking (OR .21), while having missing values for income (vs. \$60,000 plus) reduces the odds of problem drinking (OR .42) and attending a public school (vs. private school) reduces the odds of prescription drug abuse (OR .37).

In terms of interpersonal relationships, the findings suggest that for every one unit increase in perceptions of teacher caring during adolescence, the odds of smoking cigarettes every day during adulthood reduces by .74 times. In contrast to the full sample analyses, however, parental attachment during adolescence does not predict risky health-related behaviors during adulthood for men.

For men, both the experience of ever having cohabited and the number of cohabiting partners lived with during early adulthood are associated with distal health outcomes. While living in a cohabiting union reduces the odds of problem drinking (OR .15), it substantially increases the odds of prescription drug abuse (OR 19.59). Plus, as the number of cohabiting

partners increases, so do the odds of daily smoking (OR 5.78). Thus, cohabitation for men appears to be a risk factor for smoking and prescription drug abuse, but is protective against problem drinking. These different kinds of outcomes suggest that cohabitation is not protective against some of the negative behaviors in which some men engage, particularly those that may be more likely to occur within the home or in more private settings (e.g. prescription drug abuse and smoking). However, cohabitation may still constrain men's social behaviors in some ways that are protective. For instance, men who engaged in co-residential unions during their early adulthood may be less likely than their peers to be out drinking in groups of all male friends, where perhaps more carousing and "dangerous" behavior goes on, or to engage in risky sexual behaviors while drinking.

Table 6.4 The Odds Ratios for Covariate Effects on Health-Risk Distal Outcomes for the Boy/Men Sample (N=708).

Boys/Men (N=708)			
<i>Models:</i>	Daily Smoking	Problem Drinking	Prescription Drug Abuse
Biological Parents	0.88	1.17	1.51
<i>Race/Ethnicity (ref. White)</i>			
Black	0.38*	0.37**	0.19***
Hispanic	0.54	0.51	0.80
<i>Location of Residence (ref. Rural)</i>			
Urban	0.47	1.50	1.37
Suburban	0.75	2.05	0.96
<i>Region of Country (ref. Midwest)</i>			
West	0.21**	0.68	0.67
South	0.96	0.73	0.72
Northeast	1.17	0.57	0.86
<i>School Type (ref. Private)</i>			
Public	0.68	0.65	0.37*
<i>Family Income (ref. \$60K+)</i>			
Less than \$15,000	1.52	0.79	1.30
\$16-34,000	1.26	1.21	0.66
\$35-59,000	1.16	0.79	1.07
Missing Income	0.79	0.42*	0.97
<i>Family Education (ref. HS+)</i>			
Less than High School	1.29	0.90	0.78
High School (HS)/GED	1.82	1.25	0.92
Missing Education	2.18	1.57	1.03
Mother Works	0.61	1.24	0.95
Parents' Availability (1-5)	0.78	1.24	1.19
Parental Attachment (1-5)	0.99	0.88	0.62
Adult Cares (1-5)	1.32	1.16	1.19
Teacher Cares (1-5)	0.74*	0.79	0.92
School Connectedness (1-5)	1.05	0.83	0.89
Cohabitation	0.33	0.15**	19.59*
Cohabitation Partners	5.78***	2.83	0.09
*p<0.05, **p<0.01, ***p<0.001			
Loglikelihood Value	-7394.198	-7408.727	-7399.143
BIC	15393.702	15427.76	15408.597
Entropy	0.89	0.89	0.89
Free Parameters	93	93	93

The distal health outcomes are also examined for men by BMI trajectory membership (see Table 6.5). The reference BMI trajectory is *Normal to Overweight*, and the models presented here control for all covariates shown in Table 6.4. The findings shown in the table indicate that none of the BMI trajectories is significantly associated with the risky health behaviors. Thus, for men, BMI trajectories throughout adolescence and early adulthood do not appear to be important determinants of health-related behaviors. While this finding seems to support some of the prior literature in this area, which holds that young men are relatively less stigmatized and negatively affected by their weight status than young women (Harris 1990; Martin, May, and Frisco 2010), it is important to question whether this lack of an association may also result from the small number of male respondents found within the non-referent trajectory classes or the smaller BMI trajectory variation found among the male sample, as compared to either the full or the female samples.

Table 6.5: The Odds Ratios of BMI Trajectories by Health-Risk Distal Outcomes for the Boys/Men (N=708).

Boys/Men (N=708)			
Classes (<i>ref. Normal, Overweight</i>)	Daily Smoking	Problem Drinking	Prescription Drug Abuse
Overweight, Obese	0.77	0.90	.59
Overweight, Morbid Obese	1.03	0.94	1.45

+ $p < 0.055$, * $p < 0.05$
Note: The models control for all covariates shown in Table 6.4.

6.3 Predictors of Distal Outcomes: Girls/Women Sample (Four-Class Model)

Table 6.6 presents results from models testing the relationship between the three health-risk outcomes (daily smoking, problem drinking and prescription drug abuse) and the socio-demographic, family background, and interpersonal relationship factors for the girls/women in my sample (N=961). The odds of engaging in the health-risk behaviors are net of all other predictors and BMI trajectories.

Of the socio-demographic and family background factors, race/ethnicity, location of residence, and region of the country are significant predictors of adult health-risk behaviors for

women. Compared to their non-Hispanic White counterparts, non-Hispanic Black women have significantly lower odds of daily smoking (OR .22), problem drinking (OR .34), and prescription drug abuse (OR .08). Similarly, Hispanic women experience lower odds of prescription drug abuse (OR .35). The other significant socio-demographic effects, however, appear to increase the odds of engaging in health risk behaviors, especially for prescription drug abuse. In particular, living in an urban or suburban (vs. rural) setting (OR 2.87 and OR 2.69, respectively), as well as residing in the West (vs. Midwest) (OR 2.20), significantly increases the risk of abusing prescription drugs for women.

In terms of the interpersonal relationship predictors, I find that positive adolescent relationships, particularly those with teachers, are protective for adult health-related behaviors, but that cohabitation during early adulthood is not. Each one-unit increase in adolescent perceptions of teacher caring reduces the odds of daily smoking and problem drinking during adulthood by .73 and .75 times, respectively. Yet, as with the men, I find that living in a cohabitating relationship during early adulthood increases the risk of prescription drug abuse (OR 4.73) among women. The experience of cohabitation, but not the number of cohabiting partners, also increases the risk of daily smoking (OR 2.86) for women. Unlike the findings for men, however, it does not appear as though cohabitation experiences during early adulthood are related to later problem drinking behaviors among women. It may be, therefore, that living in a co-residential union does not constrain women's social behaviors in the same ways, or to the same extent, that it does men's social behaviors.

Table 6.6: The Odds Ratios for Covariate Effects on Health-Risk Distal Outcomes for the Girls/Women Sample (N=961).

Girls/ Young Women (N=961)			
<i>Models:</i>	Daily Smoking	Problem Drinking	Prescription Drug Abuse
Biological Parents	0.61	0.66	1.16
<i>Race/Ethnicity (ref. White)</i>			
Black	0.22***	0.34**	0.08***
Hispanic	0.35	0.49	0.35*
<i>Location of Residence (ref. Rural)</i>			
Urban	1.01	1.72	2.87**
Suburban	1.28	1.04	2.69**
<i>Region of Country (ref. Midwest)</i>			
West	0.42	1.41	2.20*
South	0.98	0.65	1.68
Northeast	0.73	1.06	1.62
<i>Family Income (ref. \$60K+)</i>			
Less than \$15,000	1.46	0.56	0.84
\$16-34,000	1.89	0.89	1.17
\$35-59,000	1.00	1.11	1.54
Missing Income	1.07	0.61	1.42
<i>Family Education (ref. HS+)</i>			
Less than High School	1.31	0.86	1.09
High School (HS)/GED	1.20	0.78	0.89
Missing Education	0.75	1.53	1.49
Mother Works	1.48	1.51	1.30
Parents' Availability (1-5)	1.20	0.78	1.04
Parental Attachment (1-5)	1.29	1.27	0.71
Adult Cares (1-5)	0.94	1.11	0.82
Teacher Cares (1-5)	0.73*	0.75*	0.75
School Connectedness (1-5)	0.90	1.09	0.82
Cohabitation	2.86*	1.45	4.73*
Cohabitation Partners	0.94	0.79	0.48
<i>*p<0.05, **p<0.01, ***p<0.001</i>			
Loglikelihood Value	-9917.999	-9949.079	-9882.374
BIC	10073.998	20715.448	20582.037
Entropy	0.85	0.85	0.85
Free Parameters	119	119	119

I also examine women’s health-risk outcomes by BMI trajectory membership, controlling for all background factors (see Table 6.7). The odds of engaging in the three distal health outcomes by BMI trajectory (*High Normal to High Obese*, *Obese to Morbidly Obese*, and *Obese to High Morbidly Obese*) are discussed in comparison to the referent trajectory - *Normal to Overweight*.

Table 6.7: The Odds Ratios for the BMI Trajectories by Health-Risk Distal Outcomes for the Girls/Women Sample (N=961).

Girls/ Young Women (N=961)			
Classes (ref. <i>Normal, Overweight</i>)	Daily Smoking	Problem Drinking	Prescription Drug Abuse
High Normal, High Obese	1.29	0.54	0.73
Obese, Morbidly Obese	0.66	0.77	0.28**
Obese, High Morbidly Obese	1.24	0.22*	1.89

*p<0.05, **p<0.01, ***p<0.001

Note: The model controls for all covariates shown in Table 6.6.

The distal findings show an association between health risk outcomes and the two heaviest BMI trajectories, *Obese to Morbidly Obese* and *Obese to High Morbidly Obese*. As in the full sample analyses, women in the heaviest BMI trajectory (a trajectory class with a mean BMI of 60 at Wave IV) during adulthood, have significantly lower odds of reporting drinking problems than do their *Normal to Overweight* peers (OR .22). Also similar to the full sample analyses, I see that women in the *Obese to High Morbidly Obese* trajectory have higher odds of prescription drug abuse (OR 1.89), although this finding does not reach statistical significance (perhaps as a result of small sample size). Again, I argue that these findings may be a reflection of the negative stereotyping and marginalization of obese women in our society, which can keep these women from participating in social situations that include heavy drinking and may instead encourage them to engage in substance use in private locations. Interestingly, a brand-new finding emerges here where women in the *Obese to Morbidly Obese* trajectory have lower odds of prescription drug abuse than women in the *Normal to Overweight* trajectory. Since their background characteristics and interpersonal relationships do not explain the lower odds of abuse, perhaps their friendship networks or peer relationships are protecting them from

engaging in such behavior. More research on the association between this trajectory and prescription drug abuse is clearly necessary.

6.4 Discussion

In this final empirical chapter, I use an extended version of latent class analysis (LCA) to explore the associations between body mass index (BMI) trajectory membership and later high-risk behavioral outcomes, including daily cigarette smoking, problem drinking, and prescription drug abuse, among three different samples of respondents (the full sample, boys/men, and girls/women). All of my models account for the influence of the socio-demographic, family background and interpersonal relationship factors that were explored as predictors of trajectory membership in Chapter 5 of this dissertation. Furthermore, I expand my previous examination of youths' perceptions of their interpersonal relationships by exploring the association between early adult romantic relationships, as measured by cohabitation experiences at ages 18 to 20, and the distal health outcomes.

Overall, I find that a substantial proportion of young adults report engaging in the three high-risk behaviors examined here. However, the patterns of engagement appear to vary by gender, with a greater proportion of men reporting daily smoking, problem drinking and prescription drug abuse than their female counterparts. Given this finding, along with the fact that the male and female samples experience different BMI trajectories, I believe that I am justified in analyzing the two subsamples separately.

Albeit not the main focus of the chapter, I examine the association between the covariates used to predict BMI trajectory membership and the distal health outcomes. For both the male and female samples, I find that a number of these covariates are significantly predictive of later health-risk behaviors. There are, however, some notable gender differences. Among the socio-demographic and family variables examined, race/ethnicity (particularly being non-Hispanic Black), living in the West (vs. Midwest), and having missing values for family income (vs. \$60,000) all appear to protect young men from engaging in risky behaviors. For women, being non-Hispanic Black or Hispanic (as opposed to non-Hispanic White) is protective, yet living in an urban or suburban area (as opposed to a rural area) and living in the West are risk factors for engaging in health-risk behaviors, mostly for abusing prescription drugs. Among the adolescent interpersonal relationship variables explored, only teacher caring appears significantly related to later behaviors, and it is protective for both men and women.

Finally, I find that young adult cohabiting relationships are generally associated with greater odds of engaging in risky health behaviors for all individuals, with one exception. For men, having lived in a cohabiting union during early adulthood seems to protect them from engaging in problematic drinking.

Of greatest interest to the aims of this dissertation chapter, I explore the relationship between BMI trajectories that occur during adolescence and early adulthood and respondents' later adult health-risk behaviors. I find that, net of socio-demographic and adolescent/young adult interpersonal relationship characteristics, BMI trajectory membership is significantly associated with health-risk behavioral outcomes, but only for women. The distal results show that experiencing elevated BMI trajectories over the course of early life, specifically being in the *Obese to Morbidly Obese* and the *Obese to High Morbidly Obese* classes, is in fact protective against engaging in some potentially very harmful health behaviors - *prescription drug abuse* (for the *Obese to Morbidly Obese*) and *problematic drinking* (for the *Obese to High Morbidly Obese*). On the other hand, being in the highest of BMI trajectories may, at the same time, increase the risk of prescription drug abuse (although this is not statistically significant).

These findings significantly contribute to the literature, which has lacked a clear understanding of the impact of excess weight and the role that gender plays in its association with serious health compromising behavior. Again, of the few previous studies on this topic, most have found positive association between BMI and health risk behaviors (Farhat et al. 2010; Fonseca et al. 2009; Pasch et al. 2008). Other more recent research has shown that measures of body composition among young adolescents do not significantly predict engagement in substance use two years later (Pasch 2012). However, only one cross-sectional study to my knowledge has explored gender differences (Farhat et al. 2010), finding that currently overweight and obese girls, but not boys, are more likely to smoke cigarettes and drink than are their non-overweight peers. No previous studies have taken a longitudinal approach, examining gender differences in the long-term consequences of weight trajectories that begin during adolescence for the health-risk behaviors of adults or accounted simultaneously for impact of covariates on health behavior outcomes.

Since the unique experiences that individuals have over their life course vary across social groups in ways that give rise to different health or weight trajectories, so too can these histories or life experiences impact and shape behaviors. In particular, BMI trajectory

membership may have more of an impact on the outcomes of women than men because of the stricter societal norms about weight that are applied to girls/women (Martin 1996). In general, research suggests that obese girls and women tend to face more disapproval from themselves and others than do their male counterparts (Harris 1990; Martin, May, and Frisco 2010) and, consequently, girls/women are more concerned about, emotionally distressed by, and socially isolated as a result of their appearance or weight than are boys/men (Ge et al. 2001; Needham and Crosnoe 2005; Sobal et al. 1995). Given the disproportionate level of stigmatization, overweight and obese women may be held more accountable (or be more scrutinized) for their “bad” behavior, and so try to avoid additional negative attention. Men, on the other hand, may not be as socially burdened by their weight, making the impact of BMI trajectory group less of an issue when engaging in risky behavior. It could also be that some methodological issues at play prevented significant relationships from emerging among the male sample, such as less variation in number of trajectories and/or smaller sample sizes.

As with the other empirical chapters, there are some methodological limitations worth mentioning here. Latent class analysis offers unique insight into the different classes of BMI experiences over time; however, the complex methodology in this chapter has several constraints. In particular, when estimating the distal outcome models, I was limited in the number of predictors I could add to the models before they become unstable. Out of all the socio-demographic, family background and interpersonal relationship predictors examined in the models, only a few covariates significantly predicted adult health-risk behaviors. Thus, other factors that I could not include in these analyses may be important to explaining the distal outcomes. Given the limited number of variables one can add to the models, it is also difficult to perform tests of mediation and moderation while using LCA. Moreover, the methods used here do not permit for examination of individual variability within classes and the distal models in this chapter do not allow for examination of the predictors across BMI class. While there are many benefits to using longitudinal data and latent class analysis, and doing so allows me to show indirect support for some causal interpretations, it is impossible to truly know if body weight trajectories influence later life health risk behaviors or if there is some other unexplored factor which impacts both BMI trajectories and later behavior. Continued longitudinal research is needed to more carefully explore the directionality of these relationships.

In addition, future research should examine the role of proximate, intermediate and distal predictors of weight status/trajectories in concert. Research finds that individual level factors, such as eating behavior, food accessibility, physical activity levels, beliefs and perceptions about weight (Cullen et al. 2003; Davison and Birch 2001), as well as the role of early life factors (Li et al. 2007), like maternal pre- and post-pregnancy BMI levels, maternal smoking during pregnancy, and breastfeeding, all have an impact on childhood overweight problems. Further, with the recent inclusion of biomarker information in large scale datasets, scientists should try to better understand the role that genetics have on weight gain and obesity.

The influence of family, school, and broader environmental contexts still require more attention in weight/obesity research as well. In particular, researchers should strive to understand what these contexts mean in terms of predicting later health-risk behaviors. Given the growing, increasingly diverse population of the U.S., future studies also need to consider examining youth of different racial/ethnic and nativity status backgrounds and how weight status differentially affects them and their behaviors. With obesity levels increasing for both children and adults, and with a dearth of information on the health-risk behaviors of overweight and obese individuals (above and beyond eating behaviors and activity levels), understanding how weight status/trajectories and health behaviors intertwine is crucial for targeting interventions at both individuals who are at high risk for excess weight gain and those who are at high risk for engaging in risky health-related behaviors.

CHAPTER 7

DISCUSSION AND CONCLUSION

In this dissertation, I explore various aspects of developmental trajectories of body mass index (BMI) in the National Longitudinal Study of Adolescent Health, a nationally representative longitudinal sample of adolescents in grades 7 through 12 in 1994-1995. My analytic sample includes youth who were 12 to 13 years old at baseline and who were followed over the course of four waves of data collection until they were between the ages of 24 and 26 years old. The three primary research questions this study addresses are: 1) Are there a number of distinctly different BMI trajectories found among American youth as they travel through adolescence and into adulthood? If yes, do these vary significantly by gender?; 2) Do socio-demographic characteristics, family background characteristics, and youths' perceptions of interpersonal relationship support predict BMI trajectory membership? If yes, does the association between trajectory membership and these factors differ by gender?; and finally, 3) Is there a relationship between adolescent BMI trajectory membership and certain health-risk behaviors, including prescription drug abuse, problematic drinking, and daily cigarette smoking behaviors during adulthood? If yes, are there conditioning effects of gender?

I begin this final chapter by summarizing the major findings of each empirical chapter in turn. I then address the dissertation's general limitations and lastly, in the discussion section, I talk about the implications of my findings and directions for future research.

7.1 Disaggregating BMI Trajectories: Add Health

The initial empirical chapter of the dissertation explores whether there exist different BMI trajectories that span across childhood and into adulthood. The major aim here was to assess the number, shape, and sample percentages of BMI trajectories for all respondents in my sample and then for boys/men and girls/women separately.

Model fit statistics from latent class analysis (LCA) models showed that four distinct classes of BMI trajectories exist among youth/young adults and that observed individual trajectories vary by gender. For the full sample, the four observed trajectories identified are - *Normal to Overweight*, *High Normal to High Obese*, *Stable Obese*, and *Obese to Morbidly*

Obese. The analyses did not show the existence of a stable normal BMI trajectory or a trajectory that included reductions in BMI points over time. Yet, as expected, the vast majority of young individuals (over 80 percent) fell in the lowest BMI trajectory, the *Normal to Overweight* trajectory.

When exploring BMI trajectories separately by gender, three classes of trajectories emerged for men (*Normal to Overweight*, *Overweight to Obese*, and *Overweight to Morbidly Obese*) and, similar to the full sample, four classes emerged for women (*Normal to Overweight*, *High Normal to High Obese*, *Obese to Morbidly Obese*, and *Obese to Morbidly Obese*). Compared to young men, young women in my sample experienced more accelerated weight increases with higher BMI scores and more diverging BMI changes over time. In particular, women were more likely to experience a precipitous increase from borderline overweight to obese levels than were men and women also had higher scores of BMI at baseline (two trajectories that begin at obese BMI levels).

In sum, the latent class analyses performed in this chapter clearly indicate heterogeneity in BMI experiences among young American men and women. Although the raw data showed that there are some young people who maintain a normal weight, or even lose weight over time, the analyses showed that those paths are not common enough patterns to appear as a distinct class. I found on average the respondents in each of the four estimated classes increased in weight over time, in addition, individuals had BMI patterns that differed substantially from one another, which was also found in two other studies (Nonnemaker et al. 2009, Li et al. 2007). In addition, it was discovered that there are differences in weight experiences for boys/men and girls/women. Future studies should further explore the conditioning effects of other socio-demographic background factors, such as race/ethnicity and immigrant status, on the number, shape and sizes of BMI trajectories among young people. Overall, findings here underscore the need to move beyond static measures of weight status when exploring the differential impact of weight on outcomes.

7.2 Covariate Effects on BMI Trajectory Membership

In the second empirical chapter of this dissertation, I use LCA models to explore the effects of socio-demographic characteristics, family background characteristics, and youths' perceptions of interpersonal relationship quality and support on BMI trajectory membership for my three samples of respondents (full sample, boys/men, and girls/women). Specifically, I discuss the

statistical significance of predictor variables for the odds of trajectory membership for respondents in each of the samples (always using the *Normal to Overweight* trajectory as the reference group).

Many of the findings were consistent with past research on BMI or obesity status. For the full sample, the analyses showed that respondents who experience trajectories that include an accelerated increase in BMI over time are more likely to be Black (as opposed to non-Hispanic White), to have attended public schools, and to have reported lower levels of parental attachment during their adolescence. Respondents who begin adolescence as obese and remain so throughout their entry into adulthood are also more likely than their peers to have had lower family income. There were also a couple of unexpected findings, however. Living in a two-biological parent family and having higher levels of parental availability during adolescence are associated with increased odds of being in the highest and most precipitous BMI trajectory class (*Obese to High Morbidly Obese*) during adulthood.

The analyses also indicate factors that significantly predict trajectory membership separately for boys/men and girls/women. While adolescent parental attachment appeared protective for boys/men, reducing their odds of being in the highest of the BMI trajectories (*Overweight to Morbidly Obese*), living in the South and perceiving that middle school teachers cared about them increased their odds of being in that trajectory. Among girls/women, most of the adolescent interpersonal relationships (e.g. parental attachment, teachers caring) were not significantly linked to BMI trajectories, yet higher levels of school attachment during the middle-school years were associated with lower odds of being in the *Obese to Morbidly Obese* trajectory (as opposed to the *Normal to Overweight*). Adolescent socio-demographic and family background characteristics, on the other hand, appeared to be more important for girls/women than for boys/men. In particular, I found that having a lower income is associated with higher odds of being in a BMI trajectory that includes a particularly accelerated increase in BMI. Moreover, being Hispanic (as opposed to non-Hispanic White) and living with two-biological parents is associated with increased odds of being in the *Obese to Morbidly Obese* trajectory (as opposed to the *Normal to Overweight*). For the most part, the covariate effects work as expected. However, two unexpected findings emerge as risk factors for excess weight gain over time - parental availability and living in a two-parent household. Thus, some factors that are generally shown to be protective of youth well-being may actually pose some risk to

their long-term health, especially with regards to the odds of becoming overweight or obese. Additional exploration of this issue using nationally representative samples is needed.

7.3 BMI Trajectory Membership and Later Health-Risk Behaviors

The final empirical chapter builds on the findings of the previous two empirical chapters to explore the associations between BMI trajectory membership and later high-risk behavioral outcomes (measured when respondents were between the ages of 24 and 26), including daily cigarette smoking, problem drinking, and prescription drug abuse. Specifically, I extend the latent class analysis (LCA) models carried out in Chapter 5 to incorporate each of the three distal outcomes. I also expanded my previous examination of youths' perceptions of their interpersonal relationships by exploring the association between early adult romantic relationships, as measured by cohabitation between the ages of 18 and 20, and the distal health outcomes.

Here, my findings showed that a substantial number of adults in their mid-twenties engage in the three high-risk behaviors. The patterns of engagement appeared to vary by gender though, with a greater proportion of men reporting daily smoking, problem drinking and prescription drug abuse than their female counterparts. Although not the main focus of the chapter, analyses suggest that a number of the covariates used to predict BMI trajectory membership are also significantly predictive of later health-risk behaviors. Being non-Hispanic Black, living in the West, and having missing values for family income all appear to protect men from engaging in risky health-related behaviors. Among women, being non-Hispanic Black or Hispanic also appears protective, yet living in an urban or suburban area and living in the West appear to be risk factors for engaging in health-risk behaviors. For both men and women, adolescent perceptions of teacher caring were protective against later health risk behaviors, whereas early adult cohabitation generally was a risk factor, with one notable exception. For men, living in an early adult cohabiting union is associated with lower odds of later engaging in problematic drinking.

The major objective of this dissertation chapter was to determine whether BMI trajectory membership is significantly associated with adult health-risk behavioral outcomes, net of background and interpersonal relationship factors. I find that it is, but only for women. In particular, my results for the women show that experiencing elevated BMI trajectories over

the course of early life, specifically being in the *Obese to Morbidly Obese* and the *Obese to High Morbidly Obese* classes, is in fact associated with lower odds of engaging in some potentially very harmful health behaviors, namely *problematic drinking* and *prescription drug abuse*.

7.4 General Limitations

There are not only limitations specific to each chapter, but there are also a couple of important general limitations to the measures and analyses employed in this dissertation. The first and most fundamental limitation lies in the use of the body mass index (BMI) measure for capturing the concepts of overweight and obesity. In the social sciences and clinical settings, “fatness” has generally been measured using BMI. However, some recent studies suggest that BMI may not be a valid measure of fatness (Burkhauser and Cawley 2008; Burkhauser, Cawley, and Schmeiser 2009). For example, Burkhauser and Cawley (2008) show that BMI is weakly correlated with obesity as defined by percent body fat, and also suggest that a formula based on height and weight may make too simplistic assumptions about distribution of muscle and bone mass. Consequently, they argue, this can lead to misclassification of individuals into weight statuses in which they do not belong, such as categorizing very muscular individuals and/or pregnant women as obese.

Although BMI is not precise in its measurement of obesity (i.e. “fatness”), it is nonetheless often the most practical measure to use in assessing weight status in youth (Dietz and Bellizzi 1999). Research has identified BMI z-scores as optimal for measuring adiposity at one single occasion, yet they may not be an ideal scale for assessing change in adiposity. Rather, BMI itself or BMI percentiles may be best to examine adiposity in growing children and adolescents (Cole et al. 2005). Furthermore, since BMI is so widely used in social science, as well as clinical research, and often is the only measure of excess weight found within survey data, it is reasonable to use for comparative purposes. With this said, though, future studies should explore and include more accurate measures of “fatness.”

The methodological constraints associated with using LCA techniques is the second major limitation of these analyses. Despite all the benefits of using this technique, I am limited by the relatively small number of variables I can add to the models to predict BMI trajectories. As a result, I am unable to address the impact of other health-related factors, such as depression or previous health problems, on trajectory membership. I am also unable to examine

additional potentially important individual level factors, such as eating behavior, food accessibility, physical activity levels, beliefs and perceptions about weight, early life factors (e.g. maternal health during gestation, breast-feeding history, etc.), or genetics on weight gain. Moreover, I am limited in terms of my exploration of contextual factors, as well as my exploration of mediating and moderating factors that may intervene in the odds of experiencing a particular BMI trajectory.

7.5 Discussion

With the recent news that by 2030 up to 51 percent of the U.S. population will be obese and 11 percent will be severely obese (Finkelstein et. al 2012), it has become clear that understanding and identifying the factors that influence overweight and obesity are of utmost importance. This dissertation explores obesity and weight status in the context of the life course, where individual development and transitions give shape to trajectories of experiences, and in this case, BMI experiences over the course of childhood and into adulthood. In doing so, this dissertation adds substantially to the existing knowledge about obesity and its development. Moreover, because this research identifies the predominant BMI trajectories experienced by young Americans and the associations between these trajectories and later health-risk behaviors, its findings are informative and potentially quite useful to health-related practitioners and policy experts.

The results of this dissertation underscore the importance of taking into consideration heterogeneity or differences in weight growth patterns among young people. Understanding and recognizing which groups of children are likely to become overweight or obese as they move through childhood and into adulthood is critical for interventions and health services. These findings particularly put forward the need for early health screenings and interventions among children most at risk for damaging health repercussions due to their excessive weight status. In addition, since some health-risk behaviors are more likely to occur for some BMI trajectories over others, this suggest that weight experiences over the life course matter above and beyond one's background and interpersonal relationships. Thus, when attempting to target behavioral interventions or educational campaigns to stop adverse health behaviors, clinicians, family members, and/or public health officials may also want to consider weight status in addition to socio-demographic background characteristics when addressing these issues.

There is still a substantial amount of work that needs to be done on the issue of developmental trajectories in weight status in both the child and adult literatures. Again, the findings of this research highlight the need to move beyond the static measures of weight categories and explore weight changes over time, as weight status is truly a fluid process that is influenced by a multitude of factors over the course of one's life. If data permit, future research should examine BMI trajectories over the course of childhood and into old age and explore factors throughout the entire life course that impact particular trajectory membership. Also, it would be interesting to explore which factors act as "turning points" in the early onset of obesity trajectories; these may be triggered by a certain event (e.g. death of a relative), an experience (e.g. pregnancy, depression, job loss), or becoming suddenly aware of something unknown (e.g. finding out one's child is sick, boyfriend/girlfriend is cheating on you, or friends are lying to you) that results in an alteration in the direction of a pathway or persistent trajectory (Teruya and Hser 2010). Exploring turning points may also help shed light on the temporal ordering of obesity onset and provide a better understanding of the directionality of the relationship between weight status and behavioral or other health outcomes.

APPENDIX

RE-APPROVAL OF USE OF HUMAN SUBJECTS IN RESEARCH

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673, FAX (850) 644-4392

RE-APPROVAL MEMORANDUM

Date: 4/16/2012

To: Ursula Weiss

Dept.: SOCIOLOGY

From: Thomas L. Jacobson, Chair

Re: Re-approval of Use of Human subjects in Research

Weight Status Trajectories and Health-Risk Behaviors: Transition to Adulthood

Your request to continue the research project listed above involving human subjects has been approved by the Human Subjects Committee. If your project has not been completed by 4/10/2013, you must request renewed approval by the Committee.

If you submitted a proposed consent form with your renewal request, the approved stamped consent form is attached to this re-approval notice. Only the stamped version of the consent form may be used in recruiting of research subjects. You are reminded that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report in writing, any unanticipated problems or

adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor are reminded of their responsibility for being informed concerning research projects involving human subjects in their department. They are advised to review the protocols as often as necessary to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

Cc: Kathryn Tillman, Advisor [ktillman@admin.fsu.edu]

HSC No. 2012.8067

QUESTIONS FOR RESEARCH INVOLVING HUMAN SUBJECTS

1. GIVE A COMPLETE DESCRIPTION OF YOUR RESEARCH PROCEDURES AS THEY RELATE TO THE USE OF HUMAN SUBJECTS.

A. Data source.

For my research, I will be conducting secondary data analysis using data from the National Longitudinal Study of Adolescent Health (Add Health). Add Health data were collected by the National Opinion Research Center at the University of Chicago for the Carolina Population Center, University of North Carolina at Chapel Hill, J. Richard Udry, PI. The original data collection effort and procedures to maintain confidentiality were approved by the University of North Carolina's School of Public Health's Institutional Review Board on February 28, 1994. The following sections describe the Add Health project. *The proposed research will only use existing data with no personal identifiers attached.*

B. Description of human subjects.

Add Health data were collected in a number of phases from September 1994 through August 1996. The majority of subjects were adolescents, in grades 7 through 12, of all health statuses. Boys and girls were recruited equally. Over samples of selected minority groups (black adolescents with a college-educated parent, Chinese, Cuban, and Puerto Rican adolescents)

were selected to be interviewed. A parent (usually the mother of the adolescent respondent) was also interviewed. The original adolescent respondents were followed-up and more data was collected between August 2001 and April 2002. At this time, the majority of respondents were between the ages of 18 and 26.

Phase 1. A representative national sample of adolescents enrolled in public and private schools in grades 7 through 12 in the 1994-1995 school year. Approximately 90,000 adolescents of all health statuses completed in-school questionnaires.

Phase 2 Wave 1. A subsample of adolescents who completed an in-school questionnaire and a parent or guardian of each adolescent. Approximately 21,000 adolescents and 18,000 parents or guardians of all health statuses participated in the first round of in-home data collection.

Phase 2 Wave 2. Because of attrition and not re-interviewing the majority of adolescents who were 12th graders during the 1994-1995 school year, approximately 15,000 adolescents in grades 8 through 12 during the 1995-1996 school year, of all health statuses, completed a second round of in-home interviews.

Phase 2 Wave 3. Approximately 15,000 young adults between the ages of 18 and 26, of all health statuses, completed a third round of in-home interviews between August 2001 and April 2002. Respondents were asked to provide saliva and urine specimens for HIV and STD testing. A subsample of full siblings and twins were also asked to provide a saliva sample for genetic analysis. In addition, a sample of approximately 1,500 romantic partners (spouses, cohabiting partners, or boyfriends/girlfriends aged 18 or older) of the respondents were interviewed. Approximately 50 percent of the original sample was flagged to be evaluated for partner recruitment, which was then randomly determined by a computer.

C. Research protocol.

During the in-school portion of Wave I, adolescent respondents were asked to complete a paper-and-pencil, optical-scanned questionnaire during one school period.

The adolescent in-home interviews (during all three waves of data collection) consisted of both interviewer-and self-administered sections. The in-home interviews used CAPI/audio-CASI

technology to capture responses to sensitive questions directly onto a laptop computer. Adolescents were also administered an abbreviated Peabody Picture Vocabulary Test, they were weighed and their height was measured. The adolescent in-home interviews took, on average, 90 minutes. During Wave III, respondents were also asked to provide saliva and urine specimens for HIV and STD testing, and a subsample of full siblings and twins were asked to provide a saliva sample for genetic analysis. The collection of biological specimens took, on average, an additional 44 minutes.

During Wave I, a parent or guardian was also asked to complete an interviewer-administered, paper-and-pencil questionnaire in the home. The parental questionnaire took approximately 30 minutes.

During Wave III, partners (spouses, cohabiting partners, boyfriends/girlfriends) of approximately 10% of all respondents were also asked to complete an interviewer- and self-administered questionnaire. Again, these interviews used CAPI/audio-CASI technology to capture responses to sensitive questions directly on a laptop computer. All partners were 18 years of age or older.

D. Compensation and costs.

Respondents were given \$20 at the conclusion of the interview, or whenever he or she decided to withdraw before completing the study. There were no costs to participants.

2. HAVE THE RISKS INVOLVED BEEN MINIMIZED AND ARE THEY REASONABLE IN RELATION TO ANTICIPATED BENEFITS OF THE RESEARCH, IF ANY, TO THE SUBJECTS AND THE IMPORTANCE OF THE KNOWLEDGE THAT MAY REASONABLY BE EXPECTED TO RESULT?

WHAT PROVISIONS HAVE BEEN MADE TO INSURE THAT APPROPRIATE FACILITIES AND PROFESSIONAL ATTENTION NECESSARY FOR THE HEALTH AND SAFETY OF THE SUBJECTS ARE AVAILABLE AND WILL BE UTILIZED?

A. Risks to subjects.

Adolescents participating in Add Health are at risk of exposure of embarrassing information about sensitive and/or illegal behaviors. To minimize the risks to respondents, an extensive security system was implemented by the Carolina Population Center that de-links a respondent's questionnaire or interview responses from his or her identity.

Subjects asked to give biological specimens during the Wave III interview may also encounter minor physical risks and the risk of exposure of embarrassing test results. To minimize these risks, all biological specimens were collected by someone specifically trained to do so. Further, as with all interview responses, results from the biological specimens were de-linked from all respondent identifiers. The researcher of this project does not have access to any identifying information.

B. Benefits to subjects.

This research will benefit adolescents, their families, schools, and communities because researchers will use the data to better understand the factors and processes leading to behaviors that augment or undermine a young person's wellbeing, now and in the future.

3. DESCRIBE PROCEDURES TO BE USED TO OBTAIN INFORMED CONSENT.

Informed consent was obtained prior to the administration of questionnaires or interviews in an appropriate fashion for the instrument. All consent and assent forms were approved by the University of North Carolina's School of Public Health's Institutional Review Board. Specific informed consent procedures follow.

Phase 1. In-school questionnaire: passive (implied) parental consent for the majority of cases; active (explicit) parental consent was obtained when requested by school officials.

Phase 2 Waves 1 & 2. In-home adolescent:

- a. parent signed consent prior to approaching adolescent, and
- b. adolescent signed assent form.

Phase 2 Wave 1: In-home parent: signed adult consent form.

Phase 2 Wave 3: In-home adolescent (now all legal adults): signed adult consent form.

Phase 2 Wave 3: In-home partner (all legal adults): signed adult consent form.

(A) WHO WILL BE OBTAINING INFORMED CONSENT?

Informed consent for in-school questionnaires was obtained by school officials (when requested by schools). Informed consent for in-home interviews was obtained by the trained interviewers.

(B) WHEN WILL THE SUBJECTS BE ASKED TO PARTICIPATE AND SIGN THE CONSENT FORM?

Informed consent was obtained prior to the administration of questionnaires or interviews.

(C) IN USING CHILDREN, HOW WILL THEIR ASSENT BE OBTAINED?

Assent was obtained from minor respondents after informed parental consent had been granted. Minor respondents were both read a “script” and provided with a written consent form informing them about the project and what they would be asked to do.

4. DESCRIBE HOW POTENTIAL SUBJECTS FOR THE RESEARCH PROJECT WILL BE RECRUITED.

A. Methods of recruitment.

Add Health used a two-stage recruiting process. The first step consisted of recruiting schools in 80 communities that spanned grades 7 through 12. All students in these grades were asked to complete a questionnaire during one class period, ensuring equal representation by sex and minority status.

The in-home sample was drawn from the rosters of participating schools, augmented by students who had completed an in-school questionnaire but whose names were not on the original school roster. Advance letters were sent to each sampled respondent’s home informing the adolescent that he or she had been selected to participate in the in-home portion of the Add Health study. Interviewers recruited adolescent respondents by going to the

respondent's home, gaining permission from a parent or guardian to interview the adolescent, and then gaining the adolescent's assent to participate.

5. WILL CONFIDENTIALITY OF ALL SUBJECTS BE MAINTAINED? HOW WILL THIS BE ACCOMPLISHED? PLEASE ALSO SPECIFY WHAT WILL BE DONE WITH ALL AUDIO AND/OR VISUAL RECORDINGS, IF APPLICABLE, PICTURES AND PERSONAL DOCUMENTATION OF SUBJECTS BOTH DURING AND AFTER COMPLETION OF THE RESEARCH.

Add Health has implemented an extremely rigorous system to protect the data and the identities of respondents. A detailed description of the Add Health Security System can be procured from the Carolina Population Center at the University of North Carolina at Chapel Hill.

The researcher of this project does not have access to identifying information or personal documentation. Furthermore, additional precautions have been put in place to prevent any unauthorized access to the data. Please see the attached Sensitive Data Security Plan (An effective security plan is required by Add Health administrators before access to the data is permitted).

6. IS THE RESEARCH AREA CONTROVERSIAL AND IS THERE A POSSIBILITY YOUR PROJECT WILL GENERATE PUBLIC CONCERN? IF SO, PLEASE EXPLAIN.

It is very unlikely that this research would generate public concern.

7. DESCRIBE THE PROCEDURE TO BE USED FOR SUBJECT DEBRIEFING AT THE END OF THE PROJECT. IF YOU DO NOT INTEND TO PROVIDE DEBRIEFING, PLEASE EXPLAIN.

The researcher does not have any contact with the subjects of the Add Health study.

REFERENCES

- Abrams, Kay Kosak, La Rue Allen, and James J. Gray. 1993. "Disordered Eating Attitudes and Behaviors, Psychological Adjustment, and Ethnic-identity - A Comparison of Black and White Female College Students." *International Journal of Eating Disorders* 14:49-57.
- Akresh, Ilana Redstone. 2007. "Dietary Assimilation and Health among Hispanic Immigrants to the United States." *Journal of Health and Social Behavior* 48:404-417.
- Alley, Dawn E. and Virginia W. Chang. 2007. "The Changing Relationship of Obesity and Disability, 1988-2004." *Journal of the American Medical Association* 298:2020-2027.
- Allison, David B., Kevin R. Fontaine, JoAnn E. Manson, June Stevens, and Theodore B. VanItallie. 1999. "Annual Deaths Attributable to Obesity in the United States." *Journal of the American Medical Association* 282:1530-1538.
- Anderson, Patricia M. and Kristin F. Butcher. 2006. "Childhood Obesity: Trends and Potential Causes." *The Future of Children* 16:19-45.
- Antecol, Heather and Kelly Bedard. 2006. "Unhealthy Assimilation: Why Do Immigrants Converge to American Health Status Levels?" *Demography* 43:337-360
- Achenbach, Thomas M.: Assessment of Psychopathology. In *Handbook of Developmental Psychopathology*. Second edition. Edited by: Sameroff A.J., Lewis M, Miller SM. New York: Kluwer Academic/Plenum Publishers; 2000:41-56.
- Averett, Susan and Sanders Korenman. 1999. "Black-White Differences in Social and Economic Consequences of Obesity." *International Journal of Obesity* 23:166-173.
- Axinn, William G. and Arland Thornton. 1992. "The Relationship Between Cohabitation and Divorce – Selectivity or Causal Influence." *Demography* 29(3):357-374.
- Baker, Elizabeth, Kelly Stamper Balistreri, and Jennifer Van Hook. 2009. "Maternal Employment and Overweight Among Hispanic Children of Immigrants and Children of Natives." *Journal of Immigrant and Minority Health* 11:158-167.
- Barlow, Sarah E. and William H. Dietz. 1998. "Obesity Evaluation and Treatment: Expert Committee Recommendations." *Pediatrics* 102:e29.
- Balistreri, Kelly Stamper and Jennifer Van Hook. 2009. "Socioeconomic Status and Body Mass Index Among Hispanic Children of Immigrants and Children of Natives." *American Journal of Public Health* 99:2238-2246.

- Bauer, Katherine W., Y. Wendy Yang, and S. Bryn Austin. 2004. "How Can We Stay Healthy when you're Throwing All of this in Front of Us? - Findings from Focus Groups and Interviews in Middle Schools on Environmental Influences on Nutrition and Physical Activity." *Health Education & Behavior* 31:34-46.
- Baum, Charles L. and William F. Ford. 2004. "The Wage Effects of Obesity: A Longitudinal Study." *Health Economics* 13:885-899.
- Berg, Inga-Märit, Bo Simonsson, and Ivar Ringqvist. 2005. "Social Background, Aspects of Lifestyle, Body Image, Relations, School Situation, and Somatic and Psychological Symptoms in Obese and Overweight 15-year-old Boys in a County in Sweden." *Scandinavian Journal of Primary Health Care* 23:95-101.
- Berndt, Thomas J. 2002. "Friendship Quality and Social Development." *Current Directions in Psychological Sciences* 11:7-10
- Booker, Cara, Peggy Gallaher, Jennifer Unger, Anamara Ritt-Olson, and Anderson Johnson. 2004. "Stressful Life Events, Smoking Behavior, and Intentions to Smoke among a Multiethnic Sample of Sixth Graders." *Ethnicity & Health* 9:369-397.
- Bradley, Robert H. Renate Houts, Philip R. Nader, Marion O'Brien, Jay Belsky, and Robert Crosnoe. 2008. "The Relationship of Body Mass Index and Behavior in Children." *The Journal of Pediatrics* 153:629-634.
- Brown, Lyn Mikel. 2003. *Girl Fighting: Betrayal and Rejection Among Girls*. New York: New York University Press.
- Brylinsky, Jody A., and James C. Moore. 1994. "The Identification of Body Build Stereotypes in Young Children." *Journal of Research in Personality* 28:170-181.
- Burkhauser, Richard V., John Cawley, and Maximilian D. Schmeiser. 2009. "The Timing of The Rise in US Obesity Varies with Measure of Fatness." *Economics and Human Biology* 7(3):307-318.
- Burkhauser, Richard V. and John Cawley. 2008. "Beyond BMI: The Value of More Accurate Measures of Fatness and Obesity in Social Science Research." *Journal of Health Economics* 27(2):519-529.
- Canning, Helen, and Jean Mayer. 1966. "Obesity - Its Possible Effect on College Acceptance." *New England Journal of Medicine* 275:1172-1174.
- Carr, Deborah and Michael A. Friedman. 2006. "Body Weight and the Quality of Interpersonal Relationships." *Social Psychology Quarterly* 69:127-149.
- Cawley, John. 2004. "The Impact of Obesity on Wages." *Journal of Human Resources*

39(2):451-474.

Celeux, Gilles and Gilda Soromenho. 1996. "An Entropy Criterion for Assessing the Number of Clusters in a Mixture Model." *Journal of Classification* 13(2):195-212.

Centers for Disease Control and Prevention. 2010. "Unintentional Drug Poisoning in the United States", National Center for Injury Prevention and Control, July 2010.

Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance - United States, 2009. Surveillance Summaries, June 4, 2010. MMWR 2010; Vol. 59 / SS-5.

Cho, Youngtae, W. Parker Frisbie, and Richard G. Rogers. 2004. "Nativity, Duration of Residence, and the Health of Hispanic Adults in the United States." *International Migration Review* 38:184-211.

Christakis, Nicholas A. and James H. Fowler. 2007. "The Spread of Obesity in a Large Social Network over 32 Years." *New England Journal of Medicine* 357:370-379.

Classen, Timothy J. and Charles Hokayem. 2005. "Childhood Influences on Youth Obesity." *Economics and Human Biology* 3(2):165-187.

Cole, TJ, MS Faith, A Pietrobelli and M Heo. 2005. "What Is The Best Measure of Adiposity Change in Growing Children: BMI, BMI %, BMI z-score or BMI Centile?" *European Journal of Clinical Nutrition* 59:419-425.

Cottrell, Catherine A. and Steven L. Neuberg. 2005. "Different Emotional Reactions to Different Groups: A Sociofunctional Threat-Based Approach to "Prejudice" *Journal of Personality and Social Psychology* 88:770-789.

Cramer, Phebe and Tiffany Steinwert. 1998. "Thin is Good, Fat is Bad: How Early Does it Begin?" *Journal of Applied Developmental Psychology* 19:429-451.

Crandall, Christian S. 1991. "Do Heavy-Weight Students Have more Difficulty Paying for College?" *Personality and Social Psychology Bulletin* 17:606-611.

Crandall, Christian S. 1995. "Do Parents Discriminate Against Their Heavyweight Daughters?" *Personality and Social Psychology Bulletin* 21:724-735.

Crawford, Patricia B., Mary Story, May C. Wang, Lorrene D. Ritchie, and Z.I. Sabry. 2001. "Ethnic Issues in the Epidemiology of Childhood Obesity." *Pediatric Clinics of North America* 48:855-878.

Crosnoe, Robert. 2007. "Gender, Obesity, and Education." *Sociology of Education* 80:241-260.

Crosnoe, Robert, Kenneth Frank, and Anna Strassmann Mueller. 2008. "Gender, Body Size and Social Relations in American High Schools." *Social Forces* 86:1189-1216.

- Crosnoe, Robert and Chandra Muller. 2004. "Body Mass Index, Academic Achievement, and School Context: Examining the Educational Experiences of Adolescents at Risk of Obesity." *Journal of Health and Social Behavior* 45:393-407.
- Cullen, Karen W., Tom Baranowski, Emiel Owens, Tara Marsh, Latroy Rittenberry, and Carl de Moor. 2003. "Availability, Accessibility, and Preferences for Fruit, 100% Fruit Juice, and Vegetables Influence Children's Dietary Behavior." *Health Education & Behavior* 30(5):615-626.
- Daniels, Stephen R. 2006. "The Consequences of Childhood Overweight and Obesity." *The Future of Children* 16:47-67.
- Datar, Ashlesha and Roland Sturm. 2006. "Childhood Overweight and Elementary School Outcomes." *International Journal of Obesity* 30:1449-1460.
- Datar, Ashlesha, Roland Sturm, and Jennifer L. Magnabosco. 2004. "Childhood Overweight and Academic Performance: National Study of Kindergartners and First-Graders." *Obesity* 12:58-68.
- Davison, Kirsten K. and Leann L. Birch. 2001. "Weight Status, Parent Reaction, and Self-Concept in Five-Year Old Girls." *Pediatrics* 107(1):46-53.
- Davison, Kirsten K. and Leann L. Birch. 2004. "Predictors of Fat Stereotypes Among 9-Year-Old Girls and Their Parents." *Obesity Research* 12:86-94.
- Dietz, William H. and Mary C. Bellizzi. 1999. "Introduction: The Use of Body Mass Index to Assess Obesity in Children" *American Journal of Clinical Nutrition* 70(1):123S-125S.
- Duncan, Terry E., Susan C. Duncan, Lisa A. Strycker, Hayrettin Okut, and Fuzhong Li. 2002. "Growth Mixture Modeling Of Adolescent Alcohol Use Data." Retrieved from Oregon Research Institute website: <http://www.ori.org/methodology>.
- Ebbeling, Cara B., Dorota B. Pawlak, and David S. Ludwig. 2002. "Childhood Obesity: Public-Health Crisis, Common Sense Cure." *The Lancet* 360:473-482.
- Eisenberg, Marla E., Dianne Neumark-Sztainer, and Mary Story. 2003. "Associations of Weight-Based Teasing and Emotional Well-being Among Adolescents." *Archives of Pediatrics and Adolescent Medicine* 157:733-738.
- Erickson, Sarah J., Thomas N. Robinson, K. Farish Haydel, and Joel D. Killen. 2000. "Are Overweight Children Unhappy?: Body Mass Index, Depressive Symptoms, and Overweight Concerns in Elementary School Children." *Archives of Pediatrics and Adolescent Medicine* 154:931-935.

- Falkner, Nicole H., Dianne Neumark-Sztainer, Mary Story, Robert W. Jeffery, Trish Beuhring, and Michael D. Resnick. 2001. "Social, Educational, and Psychological Correlates of Weight Status in Adolescents." *Obesity Research* 9:32-42.
- Farhat, Tilda, Ronald J. Iannotti, and Bruce G. Simons-Morton. 2010. "Overweight, Obesity, Youth, and Health-Risk Behaviors." *American Journal of Preventive Medicine* 38:258-267.
- Ferraro, Kenneth F. and Jessica A. Kelley-Moore. 2003. "Cumulative Disadvantage and Health: Long-Term Consequences of Obesity?." *American Sociological Review* 68:707-729.
- Field, Alison E., Eugenie H. Coakley, Aviva Must, Jennifer L. Spadano, Nan Laird, William H. Dietz, Eric Rimm, and Graham A. Colditz. 2001. "Impact of Overweight on the Risk of Developing Common Chronic Diseases During a 10-Year Period." *Archives of Internal Medicine* 161:1581-1586.
- Finkelstein, Eric A., Justin G. Trogon, Joel W. Cohen, and William Dietz. 2009. "Annual Medical Spending Attributable To Obesity: Payer-And Service-Specific Estimates." *Health Affairs* 28:w822-831.
- Finkelstein, Eric A., Olga A. Khavjou, Hope Thompson, Justin G. Trogon, Liping Pan, Bettylou Sherry, and William Dietz. 2012. "Obesity and Severe Obesity Forecasts Through 2030." *American Journal of Preventive Medicine* xx(x):xxx.
- Fitzgibbon, Marian L., Lisa R. Blackman, and Mary E. Avellone. 2000. "The Relationship Between Body Image Discrepancy and Body Mass Index Across Ethnic Groups." *Obesity* 8:582-589.
- Flegal, Katherine M., Margaret D. Carroll, Cynthia L. Ogden, and Lester R. Curtin. 2010. "Prevalence and Trends in Obesity Among US Adults, 1999-2008." *Journal of the American Medical Association* 303:235-241.
- Flegal, Katherine M., Barry I. Graubard, David F. Williamson, and Mitchell H. Gail. 2005. "Excess Deaths Associated With Underweight, Overweight, and Obesity." *Journal of the American Medical Association* 293:1861-1867.
- Fontaine, Kevin R., David T. Redden, Chenxi Wang, Andrew O. Westfall, and David B. Allison. 2003. "Years of Life Lost Due to Obesity." *Journal of the American Medical Association* 289:187-193.
- Fowler-Brown, Angela G., Long H. Ngo, Russell S. Phillips, and Christina C. Wee. 2010. "Adolescent Obesity and Future College Degree Attainment." *Obesity* 18:1235-1241.

- Friedman, Kelli E., Simona K. Reichmann, Philip R. Costanzo, Arnaldo Zelli, Jamile A. Ashmore, and Gerard J. Musante. 2005. "Weight Stigmatization and Ideological Beliefs: Relation to Psychological Functioning in Obese Adults." *Obesity* 13:907-916.
- Frisco, Michelle L., Jason N. Houle, and Molly A. Martin. 2009. "Adolescent Weight and Depressive Symptoms: For Whom is Weight a Burden?" *Social Science Quarterly* 90:1019-1038.
- Giles-Corti, Billie, and Robert J. Donovan. 2002a. "Socioeconomic Status Differences in Recreational Physical Activity Levels and Real and Perceived Access to a Supportive Physical Environment." *Preventative Medicine* 35:601-611.
- Giles-Corti, Billie and Robert J. Donovan. 2002b. "The Relative Influence of Individual, Social and Physical Environment Determinants of Physical Activity." *Social Science and Medicine* 54:1793-1812
- Ge, Xiaojia, Glen H. Elder Jr., Mark Regnerus, and Christine Cox. 2001. "Pubertal Transitions, Perceptions of Being Overweight, and Adolescents' Psychological Maladjustment: Gender and Ethnic Differences." *Social Psychology Quarterly* 64:363-375.
- Geier, Andrew B., Gary D. Foster, Leslie G. Womble, Jackie McLaughlin, Kelley E. Borradaile, Joan Nachmani, Sandy Sherman, Shiriki Kumanyika, and Justine Shults. 2007. "The Relationship Between Relative Weight and School Attendance Among Elementary Schoolchildren." *Obesity* 15:2157-2161.
- Goel, Mita Sanghavi, Ellen P. McCarthy, Russell S. Phillips, and Christina C. Wee. 2004. "Obesity Among US Immigrant Subgroups by Duration of Residence." *Journal of the American Medical Association* 292:2860-2867.
- Goodman, Elizabeth and Robert C. Whitaker. 2002. "A Prospective Study of the Role of Depression in the Development and Persistence of Adolescent Obesity." *Pediatrics* 110:497-504.
- Gordon-Larsen, Penny, Linda S. Adair, and Barry M. Popkin. 2003. "The Relationship of Ethnicity, Socioeconomic Factors, and Overweight in U.S. Adolescents." *Obesity* 11:121-129.
- Gordon-Larsen, Penny, Kathleen Mullan Harris, Dianne S. Ward, and Barry M. Popkin. 2003. "Acculturation and Overweight-Related Behaviors among Hispanic Immigrants to the US: the National Longitudinal Study of Adolescent Health." *Social Science and Medicine* 57:2023-2034.
- Gortmaker, Steven L, Aviva Must, James M. Perrin, Arthur M. Sobol, and William H. Dietz. 1993. "Social and Economic Consequences of Overweight in Adolescence and Young Adulthood." *New England Journal of Medicine* 329:1008-1012.

- Greenleaf, Christy and Karen Weiller-Abels. 2005. "Perceptions of Youth Obesity among Physical Educators." *Research Quarterly for Exercise and Sport* 76:A105-A106.
- Griffiths, Lucy J., Dieter Wolke, Angie S. Page, and Jeremy P. Horwood. 2006. "Obesity and Bullying: Different Effects for Boys and Girls." *Archives of Disease in Childhood* 91:121-125.
- Guralnik, Jack M., Kenneth C. Land, Dan Blazer, Gerda G. Fillenbaum, and Laurence G. Branch. 1993. "Educational Status and Active Life Expectancy among Older Blacks and Whites." *New England Journal of Medicine* 329:110-116.
- Guo, Shumei Sun, Wei Wu, William Cameron Chumlea, and Alex F. Roche. 2002. "Predicting Overweight and Obesity in Adulthood from Body Mass Index Values in Childhood and Adolescence." *American Journal of Clinical Nutrition* 76:653-658.
- Haines, Jess and Dianne Neumark-Sztainer. 2006. "Prevention of Obesity and Eating Disorders: A Consideration of Shared Risk Factors." *Health Education Research* 21:770-782.
- Harris, Kathleen Mullan, Krista M. Perreira, and Dohoon Lee. 2009. "Obesity in the Transition to Adulthood Predictions Across Race/Ethnicity, Immigrant Generation, and Sex." *Archives of Pediatrics and Adolescent Medicine* 163:1022-1028.
- Harris, Mary B. 1990. "Is Love Seen as Different for the Obese?" *Journal of Applied Social Psychology* 20:1209-1224.
- Hedley, Allison A., Cynthia L. Ogden, Clifford L. Johnson, Margaret D. Carroll, Lester R. Curtin, and Katherine M. Flegal. 2004. Prevalence of Overweight and Obesity among US Children, Adolescents, and Adults, 1999–2002. *Journal of the American Medical Association* 291:2847–2850.
- Helsen, Marianne, Wilma Vollebergh, and Wim Meeus. 2000. "Social Support from Parents and Friends and Emotional Problems in Adolescence." *Journal of Youth and Adolescence* 29:319-335.
- Himes, Christine L. and Sandra L. Reynolds. 2005. "The Changing Relationship Between Obesity and Educational Status." *Gender Issues* 22:45-57.
- Hummer, Robert A, Daniel A Powers, Starling G Pullum, Ginger L Gossman, and W Parker Frisbie. 2007. "Paradox Found (Again): Infant Mortality among the Mexican-Origin Population in the United States." *Demography* 44:441-457.
- Janssen, Ian, Wendy M. Craig, William F. Boyce, and William Pickett. 2004. "Associations Between Overweight and Obesity With Bullying Behaviors in School-Aged Children." *Pediatrics* 113:1187-1194.

- Jones, Bobby L., Daniel S. Nagin, and Kathryn Roeder. 2001. "A SAS Procedure Based on Mixture Models for Estimating Developmental Trajectories." *Sociological Methods & Research* 29(3):374-393.
- Kaestner, Robert and Michael Grossman. 2009. "Effects of Weight on Children's Educational Achievement." *Economics of Education Review* 28:651-661.
- Kaneshiro, Bliss,, Jeffrey T. Jensen, Nichole E. Carlson, S. Marie Harvey, Mark D. Nichols, and Alison B. Edelman. 2008. "Body Mass Index and Sexual Behavior." *Obstetrics and Gynecology* 112:586-592.
- Karnehed, Nina E. K., Finn Rasmussen, Tomas Hemmingsson, and Per Tynelius. 2006. "Obesity and Attained Education: Cohort Study of More Than 700,000 Swedish Men." *Obesity* 14:1421-1428.
- Keery, Helene, Kerri Boutelle, Patricia van den Berg, and J. Kevin Thompson. 2005. "The Impact of Appearance-Related Teasing by Family Members." *Journal of Adolescent Health* 37:120-127.
- Kitagawa, Evelyn M. and Philip M. Hauser. 1973. *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology*. Cambridge, Massachusetts: Harvard University Press.
- Koplan, Jeffrey P., Catharyn T. Liverman, and Vivica I. Kraak, eds. 2005. *Preventing Childhood Obesity: Health in the Balance*. Washington, DC: National Academies Press.
- Kowaleski-Jones, Lori, Barbara B. Brown, Jessie X. Fan, Ken R. Smith, and Cathleen D. Zick. 2010. "Are You What Your Mother Weighs? Evaluating the Impact of Maternal Weight Trajectories on Youth Overweight." *Maternal and Child Health Journal* 14(5):680-686.
- Kraig, Katherine A. and Pamela K. Keel. 2001. "Weight-Based Stigmatization in Children." *International Journal of Obesity* 25:1661-1666.
- Krebs, Nancy F., John H. Himes, Dawn Jacobson, Theresa A. Nicklas, Patricia Guilday, and Dennis Styne. 2007. "Assessment of Child and Adolescent Overweight and Obesity." *Pediatrics* 120:S193-228.
- Krieger, Nancy. 1999. "Embodying Inequality: A Review of Concepts, Measures, and Methods for Studying Health Consequences of Discrimination." *International Journal of Health Services* 29:295-352.

- Kuczmarski, Marie F., Robert, J. Kuczmarski, and Matthew Najjar. 2001. "Effects of Age on Validity of Self-Reported Height, Weight, and Body Mass Index: Findings from the Third National Health and Nutrition Examination Survey, 1988-1994." *Journal of The American Dietetic Association* 101(1):28-34.
- Kupersmidt, Janice B. and John D. Coie. 1990. "Preadolescent Peer Status, Aggression, and School Adjustment as Predictors of Externalizing Problems in Adolescence." *Child Development* 61:1350-1362.
- Land, Kenneth C. 2001. "Introduction to the Special Issue on Finite Mixture Models." *Sociological Methods & Research* 29(3):275-281.
- Landale, Nancy S., R. S. Oropesa, and Bridget K. Gorman. 2000. "Migration and Infant Death: Assimilation or Selective Migration among Puerto Ricans?" *American Sociological Review* 65:888-909.
- Latner, Janet D. and Albert J. Stunkard. 2003. "Getting Worse: The Stigmatization of Obese Children." *Obesity* 11:452-456.
- Latner, Janet D., Albert J. Stunkard, and G. Terence Wilson. 2005. "Stigmatized Students: Age, Sex, and Ethnicity Effects in the Stigmatization of Obesity." *Obesity* 13:1226-1231.
- Lawlor, Deborah A., Abdullah A. Mamun, Michael J. O'Callaghan, William Bor, Gail M. Williams, and Jake M. Najman. 2005. "Is Being Overweight Associated With Behavioural Problems in Childhood and Adolescence? Findings from the Mater-University Study of Pregnancy and its Outcomes." *Archives of Disease in Childhood* 90:692-697.
- Lazarsfeld, Paul F. and Neil W. Henry. 1968. *Latent Structure Analysis*. Boston: Houghton Mifflin.
- Li, Chaoyang, Michael I. Goran, Harshona Kaur, Nicole Nollen, and Jasjit S. Ahluwalia. 2007. "Developmental Trajectories of Overweight During Childhood: Role of Early Life Factors." *Obesity* 15(3):760-771.
- Li, X. 1995. "A Study of Intelligence and Personality in Children With Simple Obesity." *International Journal of Obesity and Related Metabolic Disorders* 355-357.
- Lissau, Inge and Thorkild I. A. Sorensen. 1993. "School Difficulties in Childhood and Risk of Overweight and Obesity in Young Adulthood: A Ten Year Prospective Population Study." *International Journal of Obesity* 17:169-175.
- Lowe, Houston, and Anthony Cook. 2003. "Mind the Gap: Are Students Prepared for Higher Education?" *Journal of Further and Higher Education* 27:53.

- Majarey, Anthea M., Lynne A. Daniels, T. John C. Boulton, and Richard A. Cockington. 2003. "Predicting Obesity in Early Adulthood From Childhood and Parental Obesity." *International Journal of Obesity* 27(4):505-513.
- Manchikanti Laxmaiah, Bert Fellows, Hary Ailinani, Vidyasagar Pampati. 2010. "Therapeutic Use, Abuse, and Nonmedical Use of Opioids: A Ten-Year Perspective". *Pain Physician*. 13:401-435. .
- Martin, Karin A. 1996. *Puberty, Sexuality, and the Self: Boys and Girls at Adolescents*. New York: Routledge.
- Martin, Molly A., Ashleigh L. May, and Michelle L. Frisco. 2010. "Equal Weights but Different Weight Perceptions among US Adolescents." *Journal of Health Psychology* 15:493-504.
- McAdams, Mara, A., Rob M. Van Dam, and Frank B. Hu. 2007. "Comparison of Self-Reported and Measured BMI as Correlates of Disease Markers in US Adults." *Obesity* 15(1):188-196.
- McLaren, Lindsay, Cynthia A. Beck, Scott B. Patten, Gordon H. Fick, and Carol E. Adair. 2007. "The Relationship Between Body Mass Index and Mental Health." *Social Psychiatry and Psychiatric Epidemiology* 43:63-71
- Merten, Michael J., K. A. S. Wickrama, and Amanda L. Williams. 2008. "Adolescent Obesity and Young Adult Psychosocial Outcomes: Gender and Racial Differences." *Journal of Youth and Adolescence* 37:1111-1122.
- Mokdad, Ali H., James S. Marks, Donna F. Stroup, and Julie L. Gerberding. 2004. "Actual Causes of Death in the United States, 2000." *The Journal of the American Medical Association* 291:1238-1245.
- Mokdad, Ali H., James S. Marks, Donna F. Stroup, and Julie L. Gerberding. 2005. "Correction: Actual Causes of Death in the United States, 2000." *The Journal of the American Medical Association* 293:293-294.
- Must, Aviva, and Richard S Strauss. 1999. "Risks and Consequences of Childhood and Adolescent Obesity." *International Journal of Obesity* 23:S2-S11.
- Must, Aviva, Jennifer Spadano, Eugenie H. Coakley, Alison E. Field, Graham Colditz, and William Dietz. 1999. "The Disease Burden Associated With Overweight and Obesity." *The Journal of the American Medical Association* 282:1523-1529.
- Mustillo, Sarah, Carol Worthman, Alaattin Erkanli, Gordon Keeler, Adrian Angold, and E. Jane Costello. 2003. "Obesity and Psychiatric Disorder: Developmental Trajectories." *Pediatrics* 111:851-859.

- Muthén, Bengt O. 2004. "Latent Variable Analysis. Growth Mixture Modeling and Related Techniques for Longitudinal Data" In D. Kaplan (Ed.), *The Sage Handbook of Quantitative Methodology for the Social Sciences* (pp. 345-365). Thousand Oaks, CA: Sage Publications.
- Muthén, Bengt and Kerby Shedden. 1999. "Finite Mixture Modeling with Mixture Outcomes Using the EM Algorithm." *Biometrics* 55: 463–469.
- Muthén, Linda K., and Bengt O. Muthén. 1998–2007. *Mplus User's Guide*. Los Angeles: Author.
- Nagin, Daniel S. 1999. "Analyzing Developmental Trajectories: A Semiparametric, Group-Based Approach." *Psychological Methods* 4(2):139-157.
- National Institutes of Health. 1998. "Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults--The Evidence Report". *Obesity Research* 6(S2): 51S-209S.
- Neumark-Sztainer, Dianne, Mary Story, and Tanya Harris. 1999. "Beliefs and Attitudes about Obesity among Teachers and School Health Care Providers Working with Adolescents." *Journal of Nutrition Education* 31:3-9.
- Neumark-Sztainer, Dianne, Mary Story, Peter J. Hannan, Cheryl L. Perry, and Lori M. Irving. 2002. "Weight-Related Concerns and Behaviors Among Overweight and Nonoverweight Adolescents: Implications for Preventing Weight-Related Disorders." *Archives of Pediatrics and Adolescent Medicine* 156:171-178.
- Nonnemaker, James M., Antonio A. Morgan-Lopez, Joanne M. Pais, and Eric A. Finklestein. 2009. "Youth BMI Trajectories: Evidence From the NLSY97." *Obesity* 17:1274-1280.
- O'Brien, Kerry S., John A. Hunter, and Mike Banks. 2006. "Implicit anti-fat bias in physical educators: physical attributes, ideology and socialization." *International Journal of Obesity* 31:308-314.
- Ogden, Cynthia L., Margaret D. Carroll, Lester R. Curtin, Molly M. Lamb, and Katherine M. Flegal. 2010. "Prevalence of High Body Mass Index in US Children and Adolescents, 2007-2008." *The Journal of the American Medical Association* 303:242-249.
- Ogden, Cynthia L., Margaret D. Carroll, and Katherine M. Flegal. 2008. "High Body Mass Index for Age among US Children and Adolescents, 2003-2006." *The Journal of the American Medical Association* 299:2401-2405.
- Ogden Cynthia L., Katherine M. Flegal, Margaret D. Carroll, and Clifford L. Johnson. 2002. "Prevalence and Trends in Overweight among U.S. Children and Adolescents. 1999–2000." *The Journal of the American Medical Association* 288:1728–1732.

- Olshansky, S Jay, Douglas J. Passaro, Ronald C. Hershov, Jennifer Layden, Bruce A. Carnes, Jacob Brody, Leonard Hayflick, Robert N. Butler, David B. Allison, and David S. Ludwig. 2005. "A Potential Decline in Life Expectancy in the United States in the 21st Century." *New England Journal of Medicine* 352:1138-1145.
- Oza-Frank, Reena and Argeseanu Cunningham. 2010. "The Weight of US Residence Among Immigrants: A Systematic Review." *Obesity Reviews* 11:271-280
- Padgett, Justina and Frank M. Biro. 2003. "Different Shapes in Different Cultures: Body Dissatisfaction, Overweight, and Obesity in African-American and Caucasian Females." *Journal of Pediatric and Adolescent Gynecology* 16:349-354.
- Pagan, Jose A., and Alberto Davila. 1997. "Obesity, Occupational Attainment, and Earnings." *Social Science Quarterly* 78:756-770.
- Parker, Jeffrey G., and Steven R. Asher. 1993. "Friendship and Friendship Quality in Middle Childhood: Links with Peer Group Acceptance and Feelings of Loneliness and Social Dissatisfaction." *Developmental Psychology* 29:611-621.
- Parker Sheila, Mimi Nichter, Mark Nichter, Nancy Vuckovic, Colette Sims, and Cheryl Ritenbaugh. 1995. "Body Image and Weight Concerns among African-American and White Adolescent Females: Differences that Make a difference." *Human Organization* 54:103-114.
- Pasch, Keryn E., Melissa C. Nelson, Leslie A. Lytle, Stacey G. Moe, and Cheryl L. Perry. 2008. "Adoption of Risk-Related Factors Through Early Adolescence: Associations with Weight Status and Implications for Causal Mechanisms." *Journal of Adolescent Health* 43:387-393.
- Pearce, Michelle J., Julie Boergers, and Mitchell J Prinstein. 2002. "Adolescent Obesity, Overt and Relational Peer Victimization, and Romantic Relationships." *Obesity Research* 10:386-393.
- Popkin, Barry M. and J. Richard Udry. 1998. "Adolescent Obesity Increases Significantly in Second and Third Generation U.S. Immigrants: The National Longitudinal Study of Adolescent Health." *The Journal of Nutrition*. 128:701-706.
- Pryor, Laura E., Richard E. Tremblay, Michel Boivin, Evelyne Touchette, Lise Dubois, Christophe Genolini, Xuecheng Liu, Bruno Falissard, and Sylvana M. Côté. 2011. "Developmental Trajectories of Body Mass Index in Early Childhood and Their Risk Factors." *Archives of Pediatrics & Adolescent Medicine* 165(10):906-912.
- Puhl, Rebecca, and Kelly D. Brownell. 2001. "Bias, Discrimination, and Obesity." *Obesity* 9:788-805.

- Puhl, Rebecca M. and Janet D. Latner. 2007. "Stigma, Obesity, and the Health of the Nation's Children." *Psychological Bulletin* 133:557-580.
- Puhl, Rebecca M. and Kelly D Brownell. 2006. "Confronting and Coping With Weight Stigma: An Investigation of Overweight and Obese Adults." *Obesity* 14:1802-1815.
- Reynolds, John R. and Catherine E. Ross. 1998. "Social Stratification and Health: Education's Benefit beyond Economic Status and Social Origins." *Social Problems* 45:221-247
- Ricciardelli, Lina A. and Marita P McCabe. 2001. "Self-Esteem and Negative Affect as Moderators of Sociocultural Influences on Body Dissatisfaction, Strategies to Decrease Weight, and Strategies to Increase Muscles Among Adolescent Boys and Girls." *Sex Roles* 44:189-207.
- Richardson, Laura P., Robert Davis, Richie Poulton, Elizabeth McCauley, Terrie E. Moffitt, Avshalom Caspi, and Frederick Connell. 2003. "A Longitudinal Evaluation of Adolescent Depression and Adult Obesity." *Archives of Pediatrics and Adolescent Medicine* 157:739-745.
- Richardson, Stephen A., Norman Goodman, Albert H Hastorf, and Sanford M. Dornbusch. 1961. "Cultural Uniformity in Reaction to Physical Disabilities." *American Sociological Review* 241-247.
- Robert Wood Johnson Foundation. 2011. "F as in Fat: How Obesity Threatens America's Future." *July Issue Report*.
<http://healthyamericans.org/assets/files/TFAH2011FasInFat10.pdf>
- Roehling, Mark V., Patricia V. Roehling, and Shaun Pichler. 2007. "The Relationship Between Body Weight and Perceived Weight-Related Employment Discrimination: The Role of Sex and Race." *Journal of Vocational Behavior* 71:300-318.
- Ross, Catherine E. and Chia-ling Wu. 1995. "The Links Between Education and Health." *American Sociological Review* 60:719-745.
- Sargent, James D. and David G Blanchflower. 1994. "Obesity and Stature in Adolescence and Earnings in Young Adulthood - Analysis of a British Birth Cohort." *Archives of Pediatrics and Adolescent Medicine* 148:681-687.
- Schwartz, Marlene B., Heather O'Neal Chambliss, Kelly D. Brownell, Steven N. Blair, and Charles Billington. 2003. "Weight Bias among Health Professionals Specializing in Obesity." *Obesity* 11:1033-1039.
- Schwimmer, Jeffrey B., Tasha M. Burwinkle, and James W. Varni. 2003. "Health-Related Quality of Life of Severely Obese Children and Adolescents." *Journal of the American Medical Association* 289:1813-1819.

- Scharoun-Lee, Melissa, Jay S. Kaufman, Barry M. Popkin, and Penny Gordon-Larsen. 2009. "Obesity, Race/ethnicity and Life Course Socioeconomic Status Across the Transition from Adolescence to Adulthood." *Journal of Epidemiology and Community Health* 63:133-139.
- Shore, Stuart M., Michael L. Sachs, Jeffrey R. Lidicker, Stephanie N. Brett, Adam R. Wright, and Joseph R. Libonati. 2008. "Decreased Scholastic Achievement in Overweight Middle School Students." *Obesity* 16:1535-1538.
- Single, Eric and Scot Wortley. 1993. "Drinking in Various Settings As It Relates to Demographic Variables and Level of Consumption: Findings from a National Survey in Canada." *Journal of Studies on Alcohol and Drugs* 54:590-599.
- Sobal, Jeffrey. 1999. "The Size Acceptance Movement and the Social Construction of Body Weight.." Pp. 231-249 in *Weighty Issues: fatness and thinness as social problems*, edited by J Sobal and D Maurer. New York: Aldine de Gruyter.
- Sobal, Jeffrey, Vasiliki Nicolopoulos, and Jennifer Lee. 1995. "Attitudes About Overweight and Dating among Secondary-School Students." *International Journal of Obesity* 19:376-381.
- Staffieri, J Robert. 1967. "A Study of Social Stereotype of Body Image in Children." *Journal of Personality and Social Psychology* 101-104.
- Stice, Eric, and Sarah Kate Bearman. 2001. "Body-Image and Eating Disturbances Prospectively Predict Increases in Depressive Symptoms in Adolescent Girls: A Growth Curve Analysis." *Developmental Psychology* 37:597-607.
- Stone, Arthur A. and Joan E. Broderick. 2012. "Obesity and Pain Are Associated in the United States." *Obesity* XX:XX.
- Strauss, Cyd C., Karen Smith, Cynthia Frame, and Rex Forehand. 1985. "Personal and Interpersonal Characteristics Associated with Childhood Obesity." *Journal of Pediatric Psychology* 10:337-343.
- Strauss, Richard S. and Harold A. Pollack. 2003. "Social Marginalization of Overweight Children." *Archives of Pediatrics and Adolescent Medicine* 157:746-752.
- Strauss, Richard S. 2000. "Childhood Obesity and Self-Esteem." *Pediatrics* 105:-e15.
- Talen, Mary R. and Misty M. Mann. 2009. "Obesity and Mental Health." *Primary Care: Clinics in Office Practice* 36:287-305.
- Taras, Howard, and William Potts-Datema. 2005a. "Obesity and Student Performance at School." *Journal of School Health* 75:291-295.

- Taras, Howard, and William Potts-Datema. 2005b. "Sleep and Student Performance at School." *Journal of School Health* 75:248-254.
- Teachman, Bethany A., Kathrine D. Gapinski, Kelly D. Brownell, Melissa Rawlins, and Subathra Jeyaram. 2003. "Demonstrations of Implicit Anti-Fat Bias: The Impact of Providing Causal Information and Evoking Empathy." *Health Psychology* 22:68-78.
- Teruya Cheryl, Hser Yih-Ing. 2010. "Turning Points in The Life Course: Current Findings and Future Directions in Drug Use Research." *Current Drug Abuse Review* 3(3):189-95.
- The, Natalie S. and Penny Gordon-Larsen. 2009. "Entry Into Romance Partnership Is Associated With Obesity." *Obesity* 17:1441-1447.
- Thompson, J. Kevin, Michael D. Covert, Kevin J. Richards, Sylvia Johnson, and Jill Cattarin. 1995. "Development of Body Image, Eating Disturbance, and General Psychological Functioning in Female Adolescents: Covariance Structure Modeling and Longitudinal Investigations." *International Journal of Eating Disorders* 18:221-236.
- Tiggemann, Marika. 2005. "Body Dissatisfaction and Adolescent Self-Esteem: Prospective Findings." *Body Image* 2:129-135.
- Tiggemann, Marika and Esther D. Rothblum. 1988. "Gender Differences in Social Consequences of Perceived Overweight in the United States and Australia." *Sex Roles* 18:75-86.
- US Department of Health and Human Services. 2001. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. Rockville, MD:US Department of Health and Human Services, Public Health Service, Office of the Surgeon General <http://www.surgeongeneral.gov/topics/obesity>.
- Vander Wal, Jillon S. 2004. "Eating and Body Image Concerns among Average-Weight and Obese African American and Hispanic Girls." *Eating Behaviors* 5:181-187.
- Vandewater, Elizabeth A. and Xuan Huang. 2006. "Parental Weight Status as a Moderator of the Relationship Between Television Viewing and Childhood Overweight." *Archives of Pediatrics & Adolescent Medicine* 160(4):425-431.
- Ventura, Alison K., Eric Loken, and Leann L. Birch. 2009. "Developmental Trajectories of Girls' BMI Across Childhood and Adolescence." *Obesity* 17(11):2067-2074.
- Vermunt, Jeroen K. and Jay Magidson. 2003. "Latent Class Models for Classification." *Computational Statistics & Data Analysis* 41:531-537.
- Viner, Russell M., and Tim J. Cole. 2005. "Adult Socioeconomic, Educational, Social, and Psychological Outcomes of Childhood Obesity: A National Birth Cohort Study." *British Medical Journal* 330:1354-1357.

- Wardle, Jane, and Lucy Cooke. 2005. "The Impact of Obesity on Psychological Well-being." *Best Practice and Research Clinical Endocrinology and Metabolism* 19:421-440.
- Weiler, Kay, and Lelia B. Helms. 1993. "Responsibilities of Nursing Education: The Lessons of Russell v Salve Regina." *Journal of Professional Nursing* 9:131-138.
- Weiss, Ursula K. and Kathryn H. Tillman. 2009. "Risky Sexual Behaviors Among Hispanic Young Adults In South Florida: Nativity, Age at Immigration And Gender Differences." *Perspectives on Sexual and Reproductive Health* 41:202-209.
- Wildes, Jennifer E., Robert E. Emery, and Anne D. Simons. 2001. "The Roles of Ethnicity and Culture in the Development of Eating Disturbance and Body Dissatisfaction: A Meta-Analytic Review." *Clinical Psychology Review* 21:521-551.
- Williams, Joanne, Melissa Wake, Kylie Hesketh, Elise Maher, and Elizabeth Waters. 2005. "Health-Related Quality of Life of Overweight and Obese Children." *The Journal of the American Medical Association* 293:70-76.
- Youniss, James, and Denise L Haynie. 1992. "Friendship in Adolescence." *Journal of Developmental and Behavioral Pediatrics* 13:59-66.
- Zeller, Meg H., Jennifer Reiter-Purtill, and Christina Ramey. 2008. "Negative Peer Perceptions of Obese Children in the Classroom Environment." *Obesity* 16:755-762.
- Zeller, Meg H, and Avani C. Modi. 2006. "Predictors of Health-related Quality of Life in Obese Youth." *Obesity* 14:122-130.

BIOGRAPHICAL SKETCH

Ursula Keller Weiss

Ursula Keller Weiss was born in Miami, Florida, where she lived for the first six years of her life until her family moved to Switzerland. About a decade later, Ursula returned to the United States, where she graduated from South Plantation High School in 1999. She then attended the Florida State University, from which she graduated in 2003 with a Bachelor of Arts degree in International Affairs and two Bachelor of Science degrees, one in Sociology and the other in Political Science. In the spring of 2007, Ursula earned a Master of Science degree in Sociology from the Florida State University. Her thesis is entitled, *Post-Secondary Educational Outcomes of Immigrant and Native Youth*. Throughout her years as a doctoral student, Ursula has also instructed two courses, *Population and Society* and *Family Problems and Social Change*, and worked part-time at the Florida Department of Health. During her free time, she enjoys spending time with her husband, Clayton Weiss, their two daughters, Savannah and Harper Weiss, and her mother Pamela Keller.