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Within the last four decades in the United States pediatric obesity prevalence has nearly quadrupled (Ogden, Carroll, Kit, & Flegal, 2014), tracking with fidelity into adulthood (Dietz & Robinson, 2005). At the subpopulation level, there is clear evidence to support that overall pediatric obesity prevalence is unequally distributed across races and socioeconomic (SES) groups (Bethell, Simpson, Stumbo, Carle, & Gombojav, 2010; Wen et al., 2012), and the gap that has historically separated the health of individuals from different racial and ethnic backgrounds and from low and high social classes has widened both in the United States and across the globe (Adler & Rehkopf, 2008). Our understanding of adolescent obesity and the different factors that promote obesogenic behaviors within and across groups is limited by gaps in the existing literature (Patrick, Hennessy, McSpadden, & Oh, 2013).

To address these issues more comprehensively, it is imperative that researchers focus on: (a) integrating parenting research within the context of childhood obesity, (b) developing a better understanding of the social and environmental contexts that shape parenting and adolescent weight-related behaviors in various populations, and (c) developing a greater understanding of the factors that mediate or moderate the relationship between parenting and adolescents' obesogenic behaviors. With data from the National Longitudinal Study of Adolescent Health (Add Health), a large, nationally representative sample of adolescents, this dissertation focuses on adolescents of color and

aims to address obesity in the context of adversity and disadvantage from a non-deficit perspective.

This study investigates the varying effect of individual-level factors (adolescent characteristics and perceptions of parenting), and neighborhood-level factors on adolescent weight outcomes in adolescence and in young adulthood, and explores the potential influences of supportive parenting behaviors and neighborhood disadvantage on adolescent weight outcomes. Results indicate that higher levels of neighborhood disadvantage at earlier points in adolescence are associated with higher BMI percentile scores in cross-sectional analyses, and are predictive of higher BMI percentile scores in later adolescence or early adulthood and of increases in BMI percentile scores over time. This is consistent with prior studies suggesting that neighborhood contextual factors during adolescence play a role in shaping outcomes in later adolescence and young adulthood, with differential effects on outcomes depending on whether neighborhood contexts are advantaged or disadvantaged as indicated by poverty, neighborhood unemployment, and housing quality (Kwon & Wickrama, 2014). This dissertation ultimately provides a critique of adolescent weight status, particularly overweight and obesity, as legitimate public health issues whose higher prevalence among adolescents of color is a function of institutionalized racism.

NEIGBORHOOD DISADVANTAGE, PARENTING, AND OBESITY IN THE TRANSITION FROM ADOLESCENCE TO YOUNG ADULTHOOD AMONG ADOLESCENTS OF COLOR

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CHAPTER I

INTRODUCTION

Adolescent Obesity

Within the last four decades in the United States pediatric obesity prevalence has nearly quadrupled (Ogden, Carroll, Kit, & Flegal, 2014), tracking with fidelity into adulthood (Dietz & Robinson, 2005). Defined by a body mass index (BMI) at or above the 85th and 95th percentiles for age and gender (Kuczmarski et al., 2000), estimates from the 2009-2010 National Health and Nutrition Examination Survey (NHANES) indicate that 32 percent of children and adolescents between 2 and 19 years old are overweight, and 17 percent are obese (Ogden et al., 2014). Recent epidemiological evidence suggests that the obesity epidemic now may be plateauing after three decades of steady increase (Centers for Disease Control and Prevention, 2013; Rossen & Schoendorf, 2012; Wang, 2011; Zhang & Wang, 2007), as overall rates of obesity have remained relatively stable over recent years. Between 1988 and 2004 obesity rates among adolescents 12 to 17 years old increased from 9.1% to 17%. Since 2004, rates among this age group have remained unchanged, suggesting that the velocity of growth in obesity rates has slowed (Ogden et al., 2014). These findings, though they may appear promising at face value, do not accurately reflect obesity rates within specific subpopulations. When focusing on rates of pediatric obesity at the subpopulation level, there is clear evidence to support that the reported decline in overall pediatric obesity prevalence is unequally distributed across

races and socioeconomic (SES) groupings (Bethell, Simpson, Stumbo, Carle, & Gombojav, 2010; Wen et al., 2012). The overall trend indicating a reduction in obesity prevalence among children and adolescents masks an expansion in the social gap separating youth from upper and lower socioeconomic classes (Frederick, Snellman, & Putnam, 2014).

Socioeconomic data obtained at the national level since the 1970's have routinely indicated higher age-adjusted mortality rates among people of color, individuals with lower educational attainment or lower income, and among those in labor professions (Deaton & Lubotsky, 2003; D. L. Miller & Paxson, 2006; Stockwell, Kitagawa, & Hauser, 1975). Despite initiatives to increase access to and affordability of health care services in an effort to eliminate such inequalities, the gap that has historically separated the health of individuals from low and high social classes has widened both in the United States and across the globe (Adler & Rehkopf, 2008). This social health gradient has become increasingly apparent with the rise in pediatric obesity prevalence in the United States.

Between the years 1980 and 2002, rates of obesity increased similarly across children and adolescents from both genders, across racial and ethnic groups, and across socioeconomic classes (Frederick et al., 2014). Data obtained more recently indicate a decline in obesity rates among children and adolescents from higher socioeconomic classes, whereas rates have continued to rise among their counterparts from lower socioeconomic classes (Bethell et al., 2010; Miech et al., 2006; Wen et al., 2012). Despite one recent report indicating a decline in obesity rates among low-income preschool-aged

children (Centers for Disease Control and Prevention, 2013), the majority of studies accounting for socioeconomic status and race reflect a significant public health disparity with grave implications for children and adolescents from lower socioeconomic classes. Low-socioeconomic (SES) groups, regardless of age and race, are more affected by obesity than are high-SES groups (Wang & Beydoun, 2007). NHANES data indicate that boys from higher SES backgrounds have the lowest prevalence of obesity compared with boys of lower SES backgrounds, with little difference in obesity prevalence between girls of higher and lower SES during early childhood (Zhang & Wang, 2007). During adolescence, however, differences in obesity prevalence among girls are strongly and consistently explained by SES, such that girls from lower SES backgrounds have had a much higher prevalence of obesity (20%) compared to girls with middle- (14.2%) and higher-SES (12.9%) backgrounds.

It is important to note, however, that race- and ethnicity-related disparities in childhood obesity cannot easily be disentangled from socioeconomic disadvantage. The inverse association between obesity prevalence and SES is strongest among European American children, but is not mirrored in other racial and ethnic groups. For example, African American adolescent girls' risk for developing obesity has been higher among those from higher SES backgrounds (38%) compared to girls from middle- (18.7%) and lower-SES (24.5%) backgrounds (Zhang & Wang, 2007). Among young children of US-born Hispanic American and European American parents, SES is inversely associated with BMI; the association has been positive among children of foreign-born Hispanic

parents (Balistreri & Van Hook, 2009). Thus, SES alone is insufficient to explain racial and ethnic differences in obesity prevalence (Dixon, Pena, & Taveras, 2012).

Gaps in the extant literature currently limit our understanding of adolescent obesity and the factors that promote obesogenic behaviors (Patrick, Hennessy, McSpadden, & Oh, 2013). These gaps include a need for: (a) greater integration of parenting research within the context of childhood obesity, (b) better understanding of the social and environmental contexts that shape parenting and adolescent weight-related behaviors, and (c) greater understanding of the factors that mediate or moderate the relationship between parenting and adolescents' obesogenic behaviors. Understanding these factors that promote adolescent obesity is critical for the well-being of current and future generations of youth in the United States, and requires that research focus on the forces of influence most proximal to child development: parents and communities.

There also is a need to shift away from a deficit perspective when exploring health disparities, as such a perspective localizes health problems within racial and ethnic groups, and does so in comparison to populations of privilege (European Americans). This shift in discourse away from the perspectives of the dominant race or culture (as is the normal approach) to the within-group perspectives of socially marginalized groups is the central axis around which Critical Race Theory revolves, and allows for more critical analysis of the lived experiences of people of color in order to enhance understanding of inequities without essentializing people of color. The alternative approach, a deficit perspective, therefore is more likely to overlook sources of social oppression that are unique to marginalized individuals and assume that differences between dominant and

non-dominant groups can be explained by inherent or natural characteristics of such groups, resulting in stereotypical thinking and inaccurate interpretations of individual differences.

Rather than discussing disparities in comparison to Whites or European American adolescents, this dissertation focuses on adolescents of color, terminology that from here forward refers specifically to adolescents of African American or Black, Hispanic, Asian or Pacific Islander, or American Indian descent. This dissertation aims to address the contexts of adversity and disadvantage in a way that does not blame the victims of institutional and historical oppression (people of color) for their own victimization – as is the case with deficit-based research approaches and those that draw comparisons against racial groups characterized by greater privilege. Remedies informed by deficit perspectives would fail to meaningfully address the larger social problems that together depress, oppress, and repress the health of certain groups of adolescents. Rather, health disparities must be framed as problems unique to individuals, families, and neighborhoods.

The reference to ‘people of color’ is particularly useful in the context of this work as it does not define racial or ethnic groups as pathologized ‘minorities’ or through negative comparisons as non-European American, non-White or other than White. Note, this is not to say that White people do not have color, rather, the term ‘people of color’ alludes to the marked invisibility of whiteness and the recognition that racial and social hierarchies in the United States perpetuate the privilege of whiteness while simultaneously degrading groups of color (Schaefer, 2007). Thus, this conceptualization

is consistent with the theoretical tenets from which this dissertation was derived. Historically, the phrase "person of color" has been used to refer only to people of African heritage, though today this reference it intended to be inclusive of any and all peoples of African, Latino/Hispanic, or American Indian, Asian or Pacific Island descent. In the *Encyclopedia of Race, Ethnicity and Society*, Dr. Salvador Vidal-Ortiz (Schaefer, 2007) states:

> 'People of color' explicitly suggests a social relationship among racial and ethnic minority groups…[It is] a term most often used outside of traditional academic circles, often infused by activist frameworks, but it is slowly replacing terms such as racial and ethnic minorities. In the United States in particular, there is a trajectory to the term – from more derogatory terms such as negroes, to colored, to people of color. People of color is, however it is viewed, a political term, but it is also a term that allows for a more complex set of identity for the individual – a relational one that is in constant flux. (pp. 1038).

Parental Support and Warmth

Weight status during childhood and adolescence is shaped over time through a series of interactive processes within and across family, school, neighborhood, and neighborhood contexts (Barlow, 2007), but health habits are often established during childhood within the home environment. This implicates parents and caregivers in the development of children's weight-related health behaviors and subsequent weight outcomes. Burgeoning evidence supports parenting as a powerful determinant of children's obesogenic (i.e., obesity-promoting) behaviors, as parents often are responsible for socializing their children in regards to weight-related behaviors such as eating and activity behaviors. Thus, parents are poised to influence these behaviors during critical

periods of child and adolescent development, and may have the potential to influence children's weight trajectories over time (Bjorklund, Yunger, & Pellegrini, 2002; Bjorklund & Yunger, 2001; Patrick et al., 2013). However, the concept of parenting has not been well studied in the pediatric obesity literature (Skelton, Buehler, Irby, & Grzywacz, 2012), and further research is warranted to estimate the role that specific aspects of parenting (e.g., parenting practices and behaviors) may play in shaping child and adolescent weight status over time.

Differences in the qualities of social experiences during early childhood create social gradients in developmental trajectories that can endure throughout the lifespan (Hertzman & Boyce, 2010). Family environments influence health disparity gradients based on the quality of stimulation, support, and nurturance that children receive in their most proximal social interactions (Power & Hertzman, 1999), which are influenced by family resources that are available to facilitate child rearing, effective parenting, a structured home environment, and responsiveness to children's developmental needs. Parents working multiple jobs, those who lack social supports, and those without adequate resources may spend less time with their children or provide less support than parents working fewer jobs or with more adequate resources (Armstrong, Birnie-Lefcovitch, & Ungar, 2005; Lugo-Gil & Tamis-LeMonda, 2008; Nomaguchi & Milkie, 2006). Compared to mother's working full-time jobs, there is some evidence to suggest that mothers working only part-time employ more sensitive parenting, have greater involvement in children's schooling, and provide children with more learning opportunities (Buehler & O'Brien, 2011). Additional research indicates that the amount

of time parents spend with their children, however, may not influence child and adolescent outcomes nearly as much as the quality of time (Nomaguchi & Milkie, 2006). Among parents who are stressed, particularly those living in urban areas with multiple work obligations and facing economic hardship, spending time together may disrupt parenting behaviors and compromise the quality of parent-child interactions (Conger et al., 2002; Nomaguchi & Milkie, 2006; Stephen Scott, 2012). Parent-child time together that is spent primarily watching television or having little interaction with one another also might have a detrimental impact on child health (Hsin, 2009). Findings such as these serve to support the notion that parenting quality is important for child and adolescent development, and suggest that disruptions in parenting quality may be influenced, in part, by social and economic stressors.

Certain aspects of parenting may explain as much as 40 percent of the income-related gaps in children's cognitive outcomes, and account for more variance in the gap between highest and lowest incomes than any other factor (Waldfogel & Washbrook, 2011). After controlling for income and parental education, race accounts for very little, if any, of the variance in parenting quality. These findings associated with cognitive markers of development emphasize parenting quality may be influenced more by deficits in opportunities across racial and ethnic groups than the race they identify with. Parental stress experienced as a result of discrimination and perceived or actual inequalities in opportunities, may also be detrimental to parental warmth and involvement (Gaylord-Harden, Campbell, & Kesselring, 2010), which may be further exacerbated by inequalities in income, access, and education.

As with children's cognitive outcomes, parental education is of particular importance in relation to childhood obesity, as higher parental education is strongly linked with greater understanding of health behaviors and management of a healthy lifestyle (Wardle, Parmenter, & Waller, 2000). After controlling for income and race, parents who have greater formal educational attainment have children who are more likely to have healthier nutrition behaviors, compared to children of parents with less educational attainment (Kant & Graubard, 2013).

Supportive parenting, in particular, has been examined in relation to adolescent health (DeVore & Ginsburg, 2005; Kwon & Wickrama, 2014), and specific aspects of supportive parenting have been linked consistently to adolescent health behaviors and weight outcomes. Parental support is a parenting behavior conceptualized as parental encouragement and acceptance of their adolescent (Fuligni & Eccles, 1993; Lamborn & Steinberg, 1993; Ryan & Lynch, 1989; Silk, Morris, & Steinberg, 2003; Steinberg, Lamborn, Dornbusch, & Darling, 1992; Steinberg, 1990; Supple, Ghazarian, Peterson, & Bush, 2009). This parenting behavior fosters and supports adolescents' self-esteem and developing needs for independence by allowing adolescents to explore their environments and become more self-reliant (Beyers & Goossens, 1999; Bumpus, Crouter, & McHale, 2001). Parental support also is protective and has been associated with lower rates of risk-taking behaviors among adolescents (Ary, Duncan, Duncan, & Hops, 1999; Barber, Olsen, & Shagle, 1994; Latendresse et al., 2008; Mogro-Wilson, 2008; Steinberg, Mounts, Lamborn, & Dornbusch, 1991). Parenting practices that reflect parental support are expected to facilitate self-esteem, self-reliance, and competency

(Baumrind, 2005; Baumrind, 1975; Herman, Dornbusch, Herron, & Herting, 1997; Steinberg et al., 1992; Steinberg et al., 1991) and have been linked to improvement in obesity risk behaviors (Contento, Basch, & Zybert, 2003; Contento, Koch, Lee, & Calabrese-Barton, 2010; Contento, Koch, Lee, Sauberli, & Calabrese-Barton, 2007).

Neighborhood Disadvantage

Though parents and family systems are dominant forces in the lives of most adolescents (Darling & Steinberg, 1993; Steinberg, 1990), parenting, adolescent health behaviors, and the nature of parent-adolescent relationships also are influenced by the social contexts in which they are embedded (Simons, Johnson, Conger, & Lorenz, 1997; Teachman & Crowder, 2002; Wilson, 1987). Neighborhoods provide one such context with potential to impact adolescents' and parents' patterns of interactions (Furstenberg, 1993; Leventhal, Dupéré, & Brooks-Gunn, 2009; Leventhal & Brooks-Gunn, 2005; Rankin & Quane, 2002), as neighborhood-level factors, such as neighborhood poverty, have been linked indirectly with poor adolescent outcomes via compromised parental functioning (Duster & Wilson, 1988; Wilson, 1991; Wilson, 1987), and directly by exposing adolescents to under-resourced and unsafe living environments. Thus, parenting and neighborhood factors each may exert independent and joint effects on adolescent health outcomes. In order to gain a better understanding of adolescent obesity, it is therefore important to recognize neighborhood factors potentially associated with poor adolescent health outcomes, and the complex ways in which neighborhood factors intersect and interact with individual-level factors.

Numerous studies implicate the unique role of neighborhood characteristics (e.g., poverty) in shaping adolescent health outcomes such as obesity (Drewnowski & Specter, 2004; Grow et al., 2010; Murry, Berkel, Gaylord-Harden, Copeland-Linder, & Nation, 2011; Wickrama, Wickrama, & Bryant, 2006). Few studies, however, have investigated the ways in which these factors might contribute to adolescent obesity independent of family-level characteristics (Wickrama, Wickrama, & Bryant, 2006). Neighborhoods characterized by disadvantage impact adolescent obesity by: (a) constraining access to resources, (b) increasing deprivation and exposure to unhealthy living environments, (c) shaping neighborhood norms and values, (d) increasing exposure to and emulation of negative role models and health behaviors, and (e) eroding social trust and cohesion (Nicholson & Browning, 2012; Wen & Maloney, 2011; Wickrama, Wickrama, & Bryant, 2005).

In the context of neighborhood disadvantage, ecological models suggest that parental support for adolescents is determined, in part, based on environmental conditions, particularly in response to experiences living in high-risk, economically-marginalized communities (Ambrose & Millar, 2002; Elliott & Aseltine, 2012; Jarrett, 1999) and if parents perceive their children to be exposed to risks that exceed what might be considered typical during childhood and adolescence (Nelson, 2010; Scott, Jackson, & Backett-Milburn, 1998). Within communities and neighborhoods characterized by poverty and high crime, parents may feel pressure to protect their children by managing their exposure to potential threats, limiting adolescent autonomy, and monitoring adolescents' activities to a high degree (Kurz, 2002; Nelson, 2010).

Among families living within disadvantaged neighborhoods there is conflicting evidence regarding whether parental warmth may be affected by neighborhood factors such as poverty. Though some research indicates that neighborhood factors have little effect on parental warmth (Earls, McGuire, & Shay, 1994), there is substantially more evidence highlighting neighborhood poverty as among the most important influences on parenting (Wilson, 1991; Wilson, 1987), with a unique negative influence on parental warmth (Klebanov et al., 1994). However, parental warmth and warmth from other adults within disadvantaged communities may serve to protect adolescents from the harmful effects of adversity such as neighborhood poverty (Luthar, 1999; Smith & Prior, 1995) and high neighborhood crime (Felsman & Vaillant, 1987).

This dissertation employs perspectives and analytics of family systems theory and bioecological models, as well as critical race theory and intersectionality to explore the racial, family, and neighborhood dynamics of the obesity epidemic among adolescents in the United States. The structure of this dissertation enables me to (a) explore adolescent obesity as a public health concern whose higher prevalence among ethnic minorities represents an incarnation of racial injustice, and (b) investigate the unique and collective roles of family and neighborhood factors as predictors of adolescent weight status. Specifically, the present study seeks to fill noteworthy gaps in the current literature regarding disparities in adolescent obesity prevalence across racial and socioeconomic categories by examining: (a) the effects of parenting (i.e., parental support and warmth) on adolescent obesity outcomes, (b) the effects of neighborhood disadvantage (i.e., indexed by proportion of families below the poverty line, unemployment, and housing

quality) on adolescent obesity outcomes, and (c) the moderating effects of neighborhood disadvantage on the association between parental support and adolescent obesity outcomes. Additionally, the present study sheds light on disparities in adolescent obesity prevalence for adolescents of color, and is based on the premise that such disparities may be better explained by other factors beyond race and SES (in particular, family economic stress, racial prejudice, perceived health, and neighborhood segregation). Thus, this work will examine the influence of parenting and neighborhood as contexts for healthy adolescent development and demonstrate how the interaction of individual- and neighborhood-level factors may impact adolescent obesity. The objectives of this work are met using data procured from a large and nationally-representative sample of adolescents in the United States, the National Longitudinal Study of Adolescent Health (Add Health).

CHAPTER II

THEORETICAL FRAMEWORKS

Theoretical Mechanisms for Understanding Family and Neighborhood Contexts

Childhood obesity is a multifaceted problem rooted within the larger contexts of social, political, cultural, and individual experiences (Hammond, 2009), and parents most often play the predominant role in socializing their children around obesogenic behaviors (Patrick et al., 2013). Given the ecologically-oriented approach to understanding pediatric weight management, social-ecological theoretical models have been the foundation for many pediatric obesity and weight management studies (Sallis, Owen, & Fisher, 2008). However, these models have focused predominantly on the unidirectional influences of higher-level forces on lower-level forces (i.e., society to parent, parent to child), with little focus on interactions within and across multiple levels. To address the dynamic connections within and between elements of a child's ecological niche, a family systems approach is well-suited for evaluating the processes and interactions that influence adolescent weight status within the context of the parent-child relationship (Kitzmann & Beech, 2006; Kitzman-Ulrich et al., 2010; Lohman & Jarvis, 2000). As the particular forms and functions of family systems and subsystems depend on the constraints of the larger social milieu in which they are embedded, a conceptual model derived from family

systems theory is appropriate given the broader ecology-oriented lens through which child weight status is most often addressed.

Family Systems Theory. Family systems theory (FST), though it is not a singular theory that defines and explains why families engage in certain behaviors, provides a framework for understanding and exploring families as nexuses of interacting processes and functions (Wrotniak, Epstein, Paluch, & Roemmich, 2004). The tenets of FST are based on the proposition that families are assemblages of members related by their interactions and interdependence with one another, who exhibit coherent behaviors over time. These goal-seeking social systems are open and ongoing, and are characterized by four basic assumptions: (a) system elements are interconnected, (b) the system itself is understood most completely when viewed as a holistic unit, (c) the systems function via feedback loops within the system and between the system and the environment, and (d) systems are heuristic.

Family members are the elements of the system, each with individual and collective characteristics such that the unique qualities ascribed to the system do not necessarily reflect the behaviors and characteristics of individual elements (Wrotniak et al., 2004). Relationships between elements of the system function interdependently. Distinct relationships among individual members within the system create subsystems, which may include but are not limited to, relationships between parents and adolescents. The structure of the system is formed from the total sum of interrelationships among family members and the boundaries that have been established between the family system and the environment. Family systems have predictable patterns of interaction that serve to

maintain equilibrium of the system and guide the functions of the system and its members. Membership in the system is determined by the system itself, and membership in and functions of the system are maintained by boundaries. The degree to which system boundaries are flexible and permeable to the influences of the environment is determined and managed by the system via rules of transformation.

Rules of transformation guide relationships, interactions, and behaviors among members, and influence interactions that the system and its members have with the broader environment (Wrotniak et al., 2004). Rules also determine when and what types of information from the environment can enter the system, and which members are allowed to introduce certain types of information. Interactions between members of the system and with the environment are governed by positive and negative feedback loops which produce outputs (consequences of interactions) that are fed back into the system as inputs. The nature of these inputs determines whether functions of the system are subsequently amplified or dampened in future iterations of those interactions. These feedback loops are vital for directing goal-seeking behaviors of and change within the system. Family systems' options to shape their environments and to evolve as changes occur in their environments characterizes the adaptability of systems and the resources available to facilitate such changes. Each of these core tenets function together to shape the equilibrium of the system, towards which family systems strive.

Each family system operates via first- and second-order levels, which are primarily concerned with rules of transformation and change (Wrotniak et al., 2004). First-order changes occur superficially at a behavioral level with little impact on the rules

of the system. This type of change is considered less sustainable compared to second-order change, but is capable of temporarily shifting dynamics of a system or subsystem to allow for higher-order change. Second-order change occurs at both behavioral level and system levels, such that the rules of the system are changed.

Bronfenbrenner's Bioecological Model. Bioecological theory provides a framework for understanding individual development based on the proximal processes that influence behavior; person characteristics that describe individual identity, appearance, and resources; contextual factors that describe the environments in which development occurs; and the chronicity and historical time in which development takes place (Bronfenbrenner, 2005). The bioecological model posits that development occurs through processes of increasingly complex and enduring interactions between an acting and evolving person and the other persons, objects, and environments surrounding them. These processes are known as proximal processes, and they function differently within different contexts and with different people. The extent to which these processes affect specific aspects of development varies systematically based on the developing person's characteristics, environment, and the continuities and changes experienced throughout life at a given point in history. The context of development is in reference to Bronfenbrenner's ecological systems theory, which preceded the conceptualization of the bioecological model (Bronfenbrenner, 2005). Context includes five interconnected systems that directly or indirectly influence development: microsystem, mesosystem, exosystem, macrosystem, and chronosystem. The current research will focus primarily on microsystems, mesosystems, and elements of the macrosystem contexts.

The microsystem describes environments where the developing individual spends significant amounts of time interacting with other people or their surroundings (e.g. home, neighborhood). Mesosystems refer to the interrelations that occur between microsystems (i.e. interactions at home may influence interactions in the neighborhood and vice versa). The macrosystem refers to the culture or subculture that an individual identifies with, and the shared values and beliefs that accompany those identities (i.e., racial identity, socioeconomic class).

Adolescent Weight, Family Systems Theory, and the Bioecological Model. Adolescents' propensity towards obesity is shaped by multiple contexts of development (Kitzmann & Beech, 2006b; Kitzman-Ulrich et al., 2010), and an appreciation of family systems is crucial to the understanding of adolescent weight and weight-related behaviors. It also is necessary to acknowledge broader environmental contexts in which family systems are situated, as the functions of family systems do not operate in isolation from these bioecological contexts. Understanding adolescent weight from the perspective of FST requires an attention to the concepts of system outputs, family goals, self-regulation, and rules of behaviors. Thus, this framework is useful for understanding family and adolescent behavior relative to setting health goals, behavioral control strategies over weight-related behaviors, and parenting practices and behaviors regarding adolescent health habits.

Adolescent weight and weight-related behaviors can be viewed substantively as 'outputs' of the family system that are shaped by proximal interactions and processes occurring within the system, and by more distal interactions and processes occurring

between the family system and the neighborhood it inhabits. ‘Outputs’ are the results obtained as a function of a larger series of system processes (Bowen, 1966; White, 1995), and are produced by the system or its members when ‘inputs’ are transformed within the system. In order to yield and maintain a desired output (i.e., healthy weight), certain inputs produced by the system (i.e., parenting behaviors) or received from the environment (i.e., available neighborhood resources) influence the function of the system and the extent to which progress is made towards achieving a desired output. If the resultant output is not evaluated as desirable or beneficial to the system and its members (i.e., unhealthy weight status), this information may feedback into the system as a new input that amplifies, dampens, or maintains the processes that were conducted in the initial attempts to achieve the desired output.

Processes and behaviors within the family system (i.e., the family microsystem) such as parenting and adolescent weight-related behaviors are influenced by actual and perceived processes occurring both within the family system and within the neighborhood context (i.e., the community microsystem). Acknowledging the interaction between the family and neighborhood microsystems (i.e., the family-neighborhood mesosystem) also is important and potentially could explain the development or resistance to certain health behaviors across contexts. FST posits that family systems seek balance and resist interactions that might disrupt the equilibrium of the system. Thus, parents may choose to socialize their children around certain nutrition and physical activity behaviors based on their reactions to factors and processes occurring within and outside of the family system. Parents may create boundaries and rules for their children’s

weight-related behaviors based on how they perceive their communities, which in turn may influence the type and extent to which adolescents are exposed to information and processes external to the family system. Neighborhood factors may influence adolescent weight and behaviors indirectly through parental behaviors (i.e., interaction of microsystems; mesosystem). For example, a parent may choose to limit the amount of time their adolescent spends engaging in unsupervised activities outside the home or engage in more controlling parenting strategies if the parent perceives the neighborhood to be unsafe or does not believe their child can autonomously manage certain stressors.

In the context of the family system and in response to neighborhood disadvantage, parenting may influence adolescents' abilities to develop autonomous self-regulatory behaviors pertinent to development and maintenance of a healthy body weight (i.e., calorie intake and energy expenditure) (Grolnick, Farkas, & Bornstein, 2002; Grolnick, 2009; Grolnick, Kurowski, & Gurland, 1999; Grolnick & Ryan, 1989). Adolescent self-regulation of calorie intake refers to attitudes and behaviors that are self-determined and initiated by the adolescent to manage a healthy diet. Self-regulation occurs when adolescents monitor, plan, guide, and control their behavior in an effort to achieve a particular goal (Maes & Karoly, 2005). Volition or willful participation in certain behaviors are the hallmarks of self-regulation, where such participation is undertaken without being explicitly asked to do so. Self-regulation is distinct from compliance or adherence with rules and directives; it occurs without the necessity of supervision (Whiting & Edwards, 1988), external contingencies (Deci & Ryan, 2008), or coercion. Self-regulation of weight-related behaviors refers to a higher-order psychological

function that stems primarily from interactions with caregivers and implies behavioral competency and the experience of autonomy to behave in a particular manner (Grolnick et al., 2002; Grolnick, 2009; Grolnick et al., 1999; Grolnick & Ryan, 1989) when specific values or beliefs of the surrounding system become internalized (Miller, Deci, & Ryan, 1988).

Theoretical Mechanisms Underlying Adolescent Weight Disparities

Mechanisms underlying disparities in obesity prevalence are both numerous and complex, and likely operate along the same pathways that perpetuate the existence of various other social and health disparities. Health outcomes such as obesity are nested within dynamic social and biological systems that accompany accumulations of exposures and risks via interactions with causal factors overtime (Hertzman & Boyce, 2010). Behavioral, environmental, cultural, and socioeconomic factors linked to the development of obesity also are responsible for the perpetuation of obesity-related health disparities. Racial and ethnic disparities in childhood obesity have been linked primarily to socioeconomic disadvantage and disparate access to affordable and healthy foods, opportunities for physical activity, food insecurity, and general inequities in healthcare (Frederick et al., 2014). Mechanisms of disparities in obesity can be described from the contexts of the home or family environment, the neighborhood or neighborhood environment, and the larger social, economic, and political environments. Multiple theoretical frameworks exist to facilitate conceptualization of the mechanisms of social inequalities and health disparities (Braveman, 2006). Drawing on these theories for support and guidance, it is my position that the higher prevalence of obesity among

adolescents who are ethnic minorities is a physically harmful byproduct of structural racism and its implements.

Social inequality and discrimination, from legal or non-legal systems, assist in forming social hierarchies in which dominant groups have greater levels of power in comparison to secondary and non-dominant groups. This power differential influences behaviors and perceptions in various political, economic, social, and personal spheres, and shifts access to necessary resources and services in the direction of the power gradient (Adler & Newman, 2002; Angrist & Krueger, 2001). The persistence of inequalities in the United States occurs through repeated personal and institutional exposures to discrimination that characterize opportunities, or a lack thereof, for adolescents from less powerful groups (e.g., adolescents of color).

At an institutional level, the mechanisms primarily responsible for determining differences between dominant and non-dominant groups are based on differentials in (a) material conditions and resources such as poverty, education, employment, and access to medical services, and (b) power to access information, influence media, and control political and economic policy (Sanders-Phillips, Settles-Reaves, Walker, & Brownlow, 2009). Racism, discrimination, and inequalities at this level have become structuralized within the United States social system, as these factors have been codified and engrained within our institutions, our laws, and our customs. Legal discriminations that challenge or obstruct the rights and privileges of non-dominant groups foster high stress, which has been linked consistently to poorer health outcomes amongst members of oppressed groups (Adler & Newman, 2002; Evans, 2003; Gallo & Matthews, 2003).

In accordance with Bronfenbrenner's bioecological model (Bronfenbrenner, 2005; Simons et al., 2002), it is necessary to evaluate the interactions and relationships that occur within microsystems (e.g., home, school, church) and macrosystems (e.g., social environments, government) in order to gain a more complete understanding of disparities in health outcomes for children (Quintana et al., 2006; Spencer & Adams, 1990). Institutions within, and policies promoted by the macrosystem, influence stereotypes of social groups that have the capacity to influence child development through variables in the microsystem, such as family functioning and neighborhood quality (Gee, 2002; Simons et al., 2002).

Due to the pervasiveness of racial, ethnic, and social discrimination across multiple levels of society, it is difficult to measure and examine the distinct mechanisms that promote and perpetuate inequality (Sanders-Phillips et al., 2009). Empirical evidence and theoretical principles support the notion that racial, ethnic, and socioeconomic disparities in obesity originate in similar mechanisms. With guidance from socioecological interpretive and theoretical frameworks, the current work reflects on the neighborhood circumstances potentially stemming from the marginalization of particular groups via racism, inequities, and unequal distribution of power in society, as well as the disparities in adolescents' weight-related health outcomes resulting from these circumstances. Given the importance of racial and social disadvantage in the understanding of health disparities such as adolescent obesity, it also is necessary to draw upon and organize this study around two frames: critical race theory (CRT) and intersectionality.

Critical Race Theory. Critical race theory developed in part out of critical legal studies in the 1970's in the United States and has been integral in shaping the legal system and how people conceptualize racial categories and privilege (Caldwell, 1996; Delgado & Stefancic, 2001). CRT is concerned with race and the ways in which racism is deeply and structurally entrenched within American society (Parker & Lynn, 2002), particularly social constructions of racial subordination, prejudice, and inequity (Graham, Brown-Jeffy, Aronson, & Stephens, 2011). With a focus on race relations through the experiences of ethnic minorities and their communities of origin (Delgado & Stefancic, 2001), CRT facilitates recognition of the complex relationships and intersections characterizing race, class, gender, and sexuality differences in the social world of ethnic minorities (Graham et al., 2011; Parker & Lynn, 2002). From this framework it is possible to scrutinize the direct and indirect effects of institutionalized and systematic racism on ethnic minorities at various levels (Stovall, 2005; Yosso, 2005), particularly within the realm of population health research (Ford & Airhihenbuwa, 2010; Graham et al., 2011), by attending to three main objectives described by Parker and Lynn (2002). These objectives are to: (a) present the experiences of discrimination and marginalization from the viewpoint of ethnic minorities; (b) simultaneously acknowledge race as a social construct and the need to eradicate racial subjugation, and (c) develop ways to address experiences of injustice within neighborhoods and manage social problems pertaining to dissimilarities in race, class, gender, and sexuality.

This work is based, in part, on the premise that health issues like adolescent obesity may exist as personal and social consequences of racial stratification and

marginalization of ethnic minorities. Thus, research in the areas of population health and epidemiology stand to gain from a dialogue rooted in CRT (Brown, 2003; Ford & Airhihenbuwa, 2010), which might then offer a more complete understanding of the complex and enigmatic mechanisms linking race and adolescent health outcomes, and help establish a nexus for new research agendas pertinent to the health consequences of racial inequality in America. Drawing on the work of Crenshaw (1988), Delgado and Stefancic (2001), and Graham et al. (2011), I propose the following as a core set of CRT tenets pertinent to population health and adolescent obesity research among ethnic minorities.

1. *Partiality to dominant cultural standards propagates White privilege and discrimination against ethnic minorities.* Institutional and neighborhood inequalities persist as a function of subjective bias and systematic privileging of certain norms and cultural orientations over others. This hegemony occurs simultaneously with the devaluing of cultural norms held by or attributed to people of color. These inequalities are realized via a lack of culturally diverse and representative institutional and neighborhood values, and partiality to Eurocentric standards that impairs ethnic minorities from accessing resources and achieving equivalent social success. The ways in which dominant and privileged cultural orientations influences the lives and experiences of people of color differently than European American people likely bears significantly on adolescent health outcomes by affecting access to healthcare and resources necessary for healthy

growth and development. The history and permanence of inequalities also may explain differences in cultural and family values between privileged groups and ethnic minorities, which may in turn explain racialized disparities in adolescent obesity prevalence.

2. *Decision making, race relations, and perspectives on race are rooted in individual and group interpretations of racial experiences.* Americans navigate racial and ethnic terrains based on the degree to which they subscribe to particular ways of thinking. These perceptions and considerations regarding race issues may affect physical and psychosocial health outcomes depending on the extent to which such considerations shape their health behaviors. Subscribing to a particular outlook or way of thinking may therefore serve to protect against or increase the risk for developing a given health outcome. CRT describes a number of approaches that inform how race and ethnic perceptions influence the health of individuals and groups: color-blind liberalism, race-consciousness (Peller, 1990), interest convergence (Bell, 1980), economic or material determinism, and structural determinism (Delgado & Stefancic, 2001).
3. *Existential grounding of narratives provides a forum in which the intersections of race, ethnicity, class, sex, and sexual orientation can be examined across contexts to illustrate the realities of individuals and groups.* Race, ethnicity, class, sex, and sexual orientation each play unique and collective roles in shaping a person's or a group's perspective of reality (Delgado & Stefancic, 2001). Collecting intricate accounts of personal and group experiences and contexts are valuable for

articulating and interpreting the complex combination of factors potentially responsible for adolescent health behaviors.

4. *History provides a context for understanding current experiences of race and racism.* Interpretation and meaning of individual and group experiences must be informed by social and historical contexts, as their perspectives are positioned in history and sensitive to the implications of history (Lawrence, 1995).
5. *Investigators should acknowledge their own biases and experiences, and candidly disclose the subjectivity of their own research.* CRT acknowledges that research is influenced by investigators' own experiences and perspectives, which are inexorably intertwined with the research. Whereas conventional scholarly writing necessitates that investigators detach themselves from participants and the research overall, it is futile for researchers to achieve an impartial relationship with their research. CRT calls investigators to be forthcoming about the subjectivity of their own perspectives regarding research design, data collection, analysis, and interpretation.

By challenging the norms of the dominant culture and the structures it governs, CRT provides a strategy for understanding health disparities such as adolescent obesity and the multiple dimensions of oppression that exist within groups and neighborhoods. Incorporating cultural theory frameworks such as CRT in population health research would enhance understanding of adolescent obesity, draw attention to health inequities in

America, and improve the quality of investigations that serve to protect the well-being of ethnic minority individuals and families.

Intersectionality. Though CRT provides a way of thinking about marginalized groups and systems of oppression, it is necessary to expand this notion further to acknowledge that individuals may identify with multiple groups at a single point in time (Crenshaw, 1988; Delgado, 2011; Sumi, Crenshaw, & McCall, 2013). These multiple identities must be taken into account in order to fully understand how the social world is constructed. This concept of intersectionality provides a lens through which we can recognize the complex combination of identities that shape the ways individuals and groups experience bias, marginalization, and vulnerability to social disadvantages. This prism also allows the opportunity to glimpse the mechanisms and consequences of social health problems in order to identify possible ways to remedy them.

Intersectionality is an analytic tool often deployed for theorizing identity and mechanisms of oppression that refer to 'subjectivity' as a product of reciprocally reinforcing vectors of race, sex, class, and sexual orientation (Nash, 2008). Intersectionality posits that social disadvantages and marginalization are a function of multiple interacting factors and not on any one single or separable group constituency (e.g., racial and social class categorizations) (Crenshaw, 1991; Delgado, 2011; Sumi et al., 2013). Race, gender, and socioeconomic status, for example, operate together to explain why certain groups historically have been marginalized and underserved in the American public health system. As identities and constituencies are multiply-determined and multiply-constituted, examining social problems in exclusionary terms (i.e., on the

basis of race alone) would lack significant explanatory power. Intersectionality provides an important multidisciplinary, theoretical contribution for examining and understanding identity and experiences of oppression (McCall, 2005), and includes the following core features:

1. Intersectionality subverts race and other identity categorizations as binary constructs and rather views human beings as subjects who exist in the simultaneously overlapping margins of multiple identities (Delgado, 2011; Nash, 2008).
2. Intersectionality draws attention to individuals whose identities contest socially and politically constructed racial, gender, and class categorizations, and exposes differences within identity categorizations by demonstrating racial variation within them (e.g., racial variation within socioeconomic class).
3. Intersectionality centers on the experiences of individuals and groups who historically have been ignored, marginalized, and underserved (Matsuda, 1993; Nash, 2008), and fashions a normative vision of equity by drawing on the unique and ostensible epistemologies of those who have been marginalized.

Critical Race Theory, Intersectionality, and Adolescent Weight. It is important in population health and disparity research to consider socioecological perspectives that incorporate cultural attitudes within and across all levels of society—individual, interpersonal, and neighborhood (Graham et al., 2011). Cultural studies of

racial and ethnic identify are highly relevant in the study of public health, particularly in studies that serve to address marginalized and underrepresented groups and how the intersections of race, sexuality, gender, and socioeconomic class explain variation in health outcomes across groups. However, these critical perspectives often are excluded from medical and health literatures. Keeping in mind that racial and ethnic identities and cultural beliefs play a major role in understanding the complex and transdisciplinary nature of population health and disparity research, the tenets of critical race theory and intersectionality have much to offer as theoretical frameworks in this field. At their core, CRT and intersectionality allow interpretations of social problems and the issues of illness, power, hostility, and struggle that accompany circumstances of inequity of social disadvantage (Ladson-Billings & Donnor, 2008). Acknowledging these problems from the perspectives of CRT and intersectionality provides an opportunity to recognize the intense entrenchment of racism in American society and the complex intersections of race, sex, gender, and class that feature so prominently in the social world of people of color (Graham et al., 2011; Parker & Lynn, 2002). A foundation of research built upon these notions can then work to empower human beings to challenge and overcome the restraints that have been placed upon them by race, gender, and class.

From the perspectives of CRT and intersectionality, the racially disproportionate rates of adolescent obesity prevalence can be considered the result of a history of racial injustice in the United States. In turn, racism, discrimination, and prejudice are structuralized and institutionalized in ways that promote poor health outcomes and obesity ultimately by limiting marginalized groups from equitably accessing the goods,

resources, and opportunities otherwise available to privileged groups. The degree to which people of color identify with their race and the extent to which these identifications influence how they are able to navigate the world around them bears significantly on health outcomes through the positive or negative mediation of biopsychosocial stressors to which they are exposed (Graham et al., 2011). Thus, these perspectives provide a strong foundation for exploring the impact of neighborhoods on adolescent weight status, as it can be hypothesized that these injustices are in part conferred through neighborhood disadvantages and modified in part through parenting behaviors.

Among adolescents of color, parents play a critical role in shaping how well their children cope with the adverse effects of prejudice and structural inequality (Elmore & Gaylord-Harden, 2013). Parental socialization of children and adolescents around issues of race and injustice often is done in an attempt to buffer children and adolescents from the harmful effects that exposure to racial discrimination and disadvantage may have on well-being, but the nature in which parents socialize their children is influenced differentially by parental experiences and exposure to contextual factors. Parental support and warmth towards their children and adolescents is influenced by parents' own exposure to discrimination and disadvantage, and is particularly important among families from under-resourced communities (Adam et al., 2011; Gaylord-Harden et al., 2010; Rodriguez, McKay, & Bannon, 2008).

The present study will employ critical race theory and intersectionality to explore the racial dynamics of the social construction of the obesity epidemic in America, and the physically harmful outcomes of structuralized racism.

CHAPTER III

LITERATURE REVIEW

Adolescent Obesity Epidemic and Disparities in Obesity Prevalence

More than one-third of children and two-thirds of adults in the United States are considered either overweight or obese (Ogden et al., 2014; Ogden, Carroll, & Flegal, 2008)—conditions that engender considerable disability and diminished quality of life, and accompany numerous comorbid health conditions with high associated health care costs. Increasing prevalence of overweight and obesity are significant public health concerns with potential to affect individuals across both genders and all ages, races, and socioeconomic groups (Hedley et al., 2004; Ogden et al., 2014; Wang & Beydoun, 2007). The adolescent period is critical for the development of overweight and obesity as it is during this time that pubertal growth occurs (Jasik & Lustig, 2008). Weight gain during adolescence is accompanied by a heightened risk for the development of weight-related comorbidities, and overweight adolescents are 18 times more likely to become obese by early adulthood compared to their normal-weight peers (Field, Cook, & Gillman, 2005; Singh, Mulder, Twisk, Van Mechelen, & Chinapaw, 2008). In light of the consequences of overweight and obesity during adolescence and the associated long-term health risks, there is a great need for researchers, educators, and health care professionals to better understand the development of overweight and obesity during adolescence and the factors that might promote unhealthy weight gain or protect against it. Though the cause

of obesity and accrual of excess body weight over time can be explained rather simply as disproportionately greater energy consumption relative to energy expenditure, the factors influencing what is consumed (diet) and what is expended (activity) are multifaceted and interdependent (Grafova, 2008). These obesity determinants also vary considerably by socioeconomic status and race (Jackson, Knight, & Rafferty, 2010), and the ways in which these factors unevenly load the obesity 'equation' for different racial and socioeconomic subpopulations.

Obesity prevalence remains disproportionately higher among children and adolescents of color (Wang & Beydoun, 2007), with the highest risk among African American, Hispanic, and American Indian adolescents. Despite evidence indicating plateaus or declines in obesity rates among some groups, obesity rates continue to remain significantly higher among adolescents of color compared to European American youth. NHANES data reflect significant racial and ethnic disparities in obesity among youth in the United States. Recent estimates indicate that 14.3% of European American children aged 2 to 19 are considered obese compared to 20.2% of African American children, and 22.4% of Hispanic American children (Ratcliffe, McKernan, & Zhang, 2011). Not only are obesity rates higher among African American and Hispanic American children compared to European American children, but they also accelerate faster and do so at earlier ages. As a result, the prevalence of severe obesity (BMI percentile > 120%) is significantly higher among African American (8%) and Hispanic American (6.6%) children compared to European American children (3.9%) (Skinner & Skelton, 2014). This is particularly troubling, as the most dramatic increases in mean BMI are attributable

to children and adolescents who already exist at the upper tail of the BMI distribution (Zhang & Wang, 2007).

Though there is evidence suggesting that genetic composition contributes to individual susceptibility to weight gain, rates of overweight and obesity have increased in recent years whereas genetic characteristics have not changed appreciably over the same period of time (Dodor, Shelley, & Hausafus, 2010). Thus, development of overweight and obesity is less likely to be attributable to genetics and more likely to be related to significant increases in obesogenic behaviors (Herrera & Lindgren, 2010).

Overall national prevalence of obesity is similar among boys and girls, though large gender differences have been found specifically among African Americans and Mexican-American children compared to European Americans (Ogden et al., 2014). NHANES data indicate that African American girls aged 12 to 19, and Mexican-American boys aged 6 to 11 had the highest prevalence of obesity, whereas European American boys and girls had the lowest prevalence. This sample, however, did not represent children of color who identified as Asian Americans or American Indians. Data from the National Longitudinal Study of Adolescent Health (Add Health, 1995-1996) indicate that American Indian boys had the highest prevalence of obesity (39%), and Asian American boys (10%) and girls (4%) had the lowest prevalence of obesity compared to boys and girls from European American (14 and 10%), African American (14 and 18%), American Indian (girls 14%), and Hispanic American (15 and 13%) groups (Gordon-Larsen, Adair, & Popkin, 2003a). A study of 1,704 American Indian school children in grades two and three also indicated that the prevalence of overweight

and obesity is dramatically higher among this group of children compared to the United States national average (30.5% of girls and 26.8% of boys) (Caballero et al., 2003). Among Hispanic American youth, current estimates indicate 40% of boys and 36% of girls are considered to be at least overweight. Compared to all other gender-ethnic groups, obesity rates are now highest among Hispanic American boys, as obesity prevalence in this group has doubled from 14 to 26% within the last two decades (Ogden et al., 2014).

Historically, differences in obesity prevalence across racial groups have been interpreted as differences in biological potentials or genetic vulnerabilities rather than social disparities. There is much evidence to assert the contrary. Biological and genetic differences contribute relatively little, if at all, to the vast majority of health disparities, including pediatric and adolescent obesity (Merikangas & Risch, 2003), and are more likely attributable to social factors. From a deficit-oriented research perspective, however, adolescent obesity has been conceptualized and explained as a socially structured health problem (L. R. Young & Nestle, 2002) influenced by the additive and multiplicative effects of various negative factors at the individual, family, and neighborhood levels (Crawford, Story, Wang, Ritchie, & Sabry, 2001; Karlsen & Nazroo, 2002; Karlsen, Nazroo, & Stephenson, 2002; Wickrama et al., 2006). This perspective overlooks that root causes of oppression by localizing health problems within racial and ethnic groups, and does so in comparison to populations of privilege (European Americans).

Extant research has elucidated specific proximal and distal factors relevant to adolescent health behaviors, but little is known about the specific factors and mechanisms that may protect against obesity and promote healthy weight for adolescents, particularly in the context of adversity or disadvantage and within the families and neighborhoods of adolescents of color. Without such knowledge the field has limited ability to employ evidence-based strategies for the purpose of reducing socially-constructed disparities pertinent to adolescent overweight and obesity. Empirical studies and theoretical applications are necessary to clarify the complex, interdependent factors that have systemic effects on weight-related health behaviors among adolescents of color and should include a consideration of individual-, family- (i.e., parenting) and neighborhood-level (i.e., disadvantage) influences (Merten, 2010; Nicholson & Browning, 2012) without comparisons to populations of privilege.

Factors Influencing Adolescent Weight

The adolescent period is particularly important in the determination of adolescent health outcomes, as health promoting and health risk behaviors observed during adolescence are fairly stable throughout the life course (Kwon & Wickrama, 2014). Health promoting behaviors are those that promote healthy habits such as eating appropriate types and amounts of nutritious foods and engaging in adequate physical activity (Umberson, Crosnoe, & Reczek, 2010). Health risk behaviors are those that undermine good health, such as watching excessive amounts of television or excessive consumption of high calorie foods. Note, health promoting and health risk behaviors are not mutually exclusive and are not reflective of the presence or absence of health; rather,

each of these adolescent behavioral constructs have potential to provide a unique understanding of adolescent weight.

Physical Activity. The links between adolescent physical activity and adolescent weight outcomes have been well supported (Hills, Andersen, & Byrne, 2011; Y. Kim & Lee, 2009). Though the benefits of physical activity are commonly recognized, most adolescents in the United States do not participate in enough physical activity to meet national public health recommendations (Pratt, Macera, & Blanton, 1999), but exceed recommendations for daily television viewing (Robinson, 2001). Previous studies indicate that time spent engaging in sedentary activities such as television viewing are strongly associated with increased BMI (Müller, Koertringer, Mast, Languix, & Frunch, 1999), likely due to reduced or inadequate energy expenditure and excessive caloric intake during sedentary pursuits (Robinson, 2001).

Nutrition. Adolescent eating behaviors are key contributors of adolescent weight (Majem et al., 2003), and eating habits formed during childhood and adolescence often continue into adulthood (Branen & Fletcher, 1999; Lindsay, Sussner, Kim, & Gortmaker, 2006; Stein et al., 2006). Skipping meals, eating away from home, lower frequency of family meals, higher consumption of fast food, eating large portion sizes, and snacking all have been found to be related to overweight and obesity among adolescents (M M Davis & et al., 2007; McConahy, Smiciklas-Wright, Mitchell, & Picciano, 2004; Piernas & Popkin, 2010; Videon & Manning, 2003). The United States Department of Agriculture (USDA) Health Index Ratings released for the years 1994 to 1996 (the same time period as Wave I of Add Health) indicated that 94% of adolescents aged 13 to 18

had poor quality diets characterized by high caloric intake and low nutrient value (Kennedy, Ohls, Carlson, & Fleming, 1995; Kennedy, Ohls, Carlson, & Fleming, 1995; Taylor, Evers, & McKenna, 2005). Meal skipping and inadequate breakfast consumption, which are common during the adolescent period (Gross, Bronner, Welch, Dewberry-Moore, & Paige, 2004; Videon & Manning, 2003), have been linked to adverse physical and mental health problems, as well as higher risk for the development of obesity by adulthood (Ma et al., 2003). Meal skipping, particularly breakfast skipping, leads to increased hunger and greater consumption of calories during afternoon and evening hours compared to others who do not skip meals (Levitsky & Pacanowski, 2013).

The Present Study

The present study relies on the perspectives of family systems theory and bioecological models, and critical race theory and intersectionality to explore the family and neighborhood dynamics of obesity from early to late adolescence. Table 1 describes key elements of these perspectives pertinent to the current study, and includes the available constructs from Add Health which can be analyzed to explore the hypotheses and research objectives described here. To guide this investigation using these key elements, I have adapted a model of critical race theory (based on Anderson's Medical model of Critical Race Theory) (Figure 1), which integrates the core tenets of these theoretical perspectives into a framework for understanding the interaction of various factors at various levels on adolescent BMI outcomes. Using data from Add Health, I examine the influence of parenting and neighborhood in adolescence as factors influential to weight change over the adolescent period and into early adulthood, and demonstrate

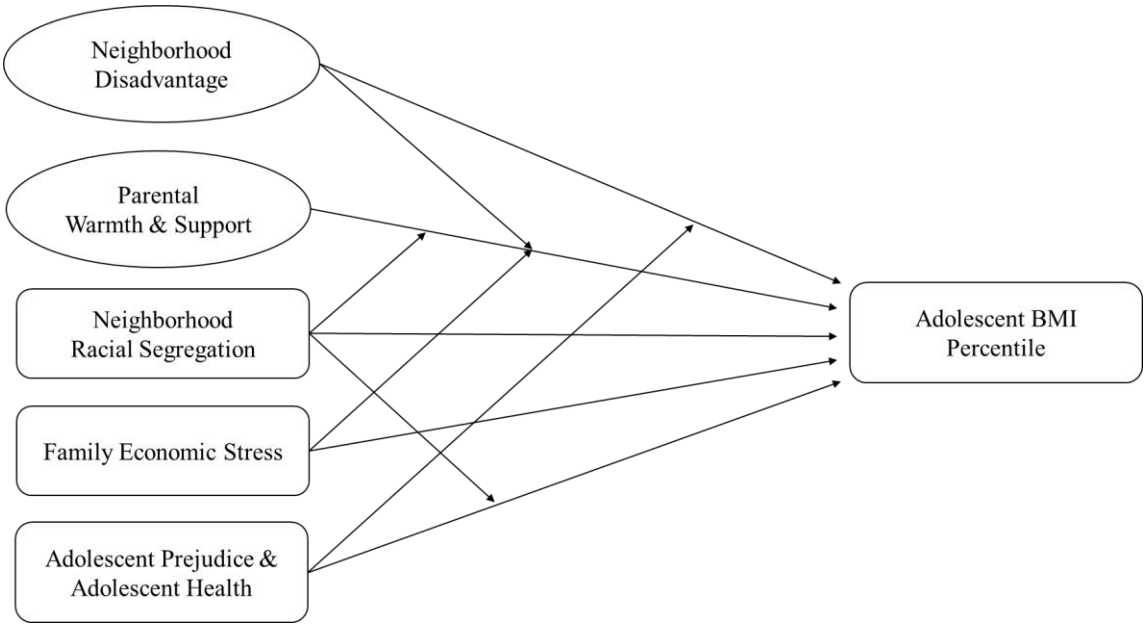
how the interaction between parental support and neighborhood disadvantage might explain weight-related health disparities among adolescents.

Table 1. Multilevel Factors Influencing Adolescent Health Outcomes: An Adaptation of Critical Race Theory

	Distal Macrosocial Influences*	**Predisposing Factors**	**Proximal Resources**	**Mechanisms**	**Outcomes**
Theoretical Constructs	*Social Stratification* *Labor Market Characteristics* *Racial Discrimination*	Age Gender Perceptions of Racism	Social support systems and relationships Neighborhood characteristics	Stressors Perceived health risk	Health behaviors Health status Disease susceptibility
Add Health Variables		Age Gender Adolescent perceived prejudice	Parental warmth and support Neighborhood Disadvantage Neighborhood Segregation	Family economic stress Adolescent health	Adolescent BMI Outcomes

**Note.* These constructs are not directly assessed due to the nature of this study and the data available for analysis.

Figure 1. Conceptual Model of Integrated Theoretical Perspectives and Adolescent Weight Outcomes



Parenting as a Context for Adolescent Weight

Relevant to the factors described in Table 1, the concept of parenting, particularly parental support and warmth, relates to the theoretical constructs of social support and relationships. Given that parents are most often the first individuals to socialize children around nutrition and activity behaviors (Patrick et al., 2013), it is likely that the propensity for becoming overweight or obese begins in childhood and becomes solidified overtime through persistent engagement in obesogenic behaviors. Thus, parents are uniquely positioned to intervene upon the lifestyle behaviors of children either prior to or early on in the development of weight problems. Targeting families and parents in the treatment of adolescent overweight and obesity has been successful and is well

established in the literature (Davis et al., 2007; Kaplan, Arnold, Irby, Katherine, & Skelton, 2014; Kitzmann & Beech, 2006b; Kitzman-Ulrich et al., 2010; Skelton et al., 2012), though the relationship between parenting and adolescent weight status warrants further study.

A recent review of studies evaluating the role of various aspects of parenting on adolescent risk taking and health outcomes suggests that supportive or positive parenting strategies are associated with better adolescent outcomes, and parental support has been linked consistently to more positive adolescent health behaviors over time (Ryan et al., 2010). Supportive parenting behaviors and warmth each have been linked to positive adolescent outcomes within specific domains, and represent key parenting dimensions with salience to adolescent health behaviors (Kwon & Wickrama, 2014). Though the majority of research investigating supportive parenting behaviors has focused on benefits to adolescent academic performance and risk-taking behaviors, there is some evidence to support the relevance of these parenting behaviors to adolescent weight outcomes.

Parental support refers to parental encouragement and acceptance of their adolescent (Lamborn & Steinberg, 1993; Ryan & Lynch, 1989; Supple, Ghazarian, Peterson, & Bush, 2009), and includes provision of opportunities for adolescents to participate in decision-making processes (Fuligni & Eccles, 1993; Silk et al., 2003; Steinberg et al., 1992; Steinberg, 1990; Supple et al., 2009). Parental support has been shown to foster adolescent self-esteem and self-reliance by affording adolescents the freedom to explore and interact with their environments (Beyers & Goossens, 1999; Bumpus et al., 2001). As it relates to adolescent weight and weight-related behaviors,

higher levels of parental support may empower adolescents to adopt healthy behaviors and disengage from behaviors that might be detrimental to their health (Finkenauer, Engels, & Baumeister, 2005). Parental support has been linked to improvement in obesity-risk behaviors as it enhances adolescents' personal agency and self-regulation of eating and activity (Contento, Basch, & Zybert, 2003; Contento, Koch, Lee, & Calabrese-Barton, 2010; Contento, Koch, Lee, Sauberli, & Calabrese-Barton, 2007).

Parental warmth describes the extent to which a parent is loving, nurturing, and affectionate towards their child (Amato, 1990; Baumrind, 1972; Conger et al., 1994; Kwon & Wickrama, 2014; Maccoby & Martin, 1983; Suchman et al., 2007). Though abundant research indicates the salutary benefits of parental support and warmth on various aspects of adolescent adjustment (Benson & Buehler, 2012; Kim & Cain, 2008; Kim et al., 2003; Mogro-Wilson, 2008; S. M. Ryan et al., 2010) and adolescent health (Kwon & Wickrama, 2014; Wickrama, Lorenz, & Conger, 1997), there remains relatively little research investigating the role of parenting behaviors in shaping adolescent weight outcomes.

Parenting provides a framework for the development of overweight and obesity among children and adolescents (Rhee, 2008), and a few studies have presented evidence to suggest that parenting behaviors, particularly parental warmth, are linked to adolescent weight-related behaviors and weight status. In a 5-year longitudinal population-based study of adolescents from diverse ethnic and socioeconomic backgrounds, Berge, Wall, Loth, and Neumark-Sztainer (2010) found that parental warmth may be an important factor influencing adolescent's healthy dietary intake. Among 44 children and early

adolescents with overweight and obesity participating in a 16 week family-based obesity treatment program, Rhee et al. (2016) also found that children and adolescents receiving higher levels of parental warmth during treatment were 1.28 times more likely to experience a decrease in or stabilization of BMI compared to those exposed to lower levels of parental warmth over the same treatment period. A prospective population study conducted from 1974 to 1984 in Copenhagen (Lissau & Sorensen, 1994) indicated that adolescents who were exposed to parental neglect, as compared to adolescents who received "harmonious support" from parents, had more than seven times the odds of becoming obese by young adulthood independent of age, childhood BMI, sex, or socioeconomic status. The CARDIA study, a large national study of African American and European American young adults, made similar assertions, indicating that early family environments characterized by low warmth (hostility) and poorer quality of social interactions were predictive of obesity in young adulthood (Lehman, Taylor, Kiefe, & Seeman, 2005). Of these studies, all but one (Berge et al., 2010) included racially and socioeconomically diverse samples of adolescents. No longitudinal studies to date, however, have tested whether parental warmth during adolescence is predictive of long-term weight-related outcomes among adolescents transitioning into adulthood.

As the prevalence of adolescent obesity rose in recent years, so, too, has the interest in examining the connection between parenting and adolescent weight status (Jelalian, Hart, & Rhee, 2009; Lindsay, Sussner, Kim, & Gortmaker, 2006; Rhee, 2008). To place the concept of parenting into the context of adolescent obesity, it is important to note that the bulk of the research in this area has focused primarily on parenting styles

(rather than particular parenting behaviors), and a growing body of research has now associated parenting styles with adolescent overweight, obesity, nutrition habits, and physical activity participation (De Silva-Sanigorski et al., 2010; Gerards, Sleddens, Dagnelie, de Vries, & Kremers, 2011; Kremers, Brug, De Vries, & Engels, 2003; Tinsley, Markley, Ericksen, Ortiz, & Kwasman, 2002; Van Der Horst, Paw, Twisk, & Van Mechelen, 2007; Van Der Horst, Oenema et al., 2007). These studies have primarily conceptualized parenting as styles or typologies based on high and low dimensions of responsiveness and demandingness (Baumrind, 1989; Maccoby, 2000), and have indicated that the characteristics of an authoritative parenting style (high responsiveness and high demandingness) provides adolescents with the necessary structure and support to internalize and maintain positive health behaviors, whereas the characteristics of permissive and neglectful parenting styles have been shown to interfere with children's ability to self-regulate eating (Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006).

Though the research on parenting and adolescent weight outcomes has produced useful results, the literature has a number of limitations: (a) the vast majority of studies investigating the relationship between parenting and adolescent weight outcomes has focused primarily parenting typologies rather than individual parenting behaviors such as warmth and support, (b) most studies also have been cross sectional in nature, which has limited inferences, and (c) the research has included primarily European American, and middle- to high-income youth and families. Studies of parenting style including samples with more racial and ethnic diversity and other outcomes than weight status have demonstrated significant variability in the effects of parenting style as a function of

cultural background and across different racial and ethnic groups (Chao, 1994; Chaudhuri, Easterbrooks, & Davis, 2009; Deater-Deckard, Dodge, Bates, & Pettit, 1996; Quintana et al., 2006; Steinberg, Dornbusch, & Brown, 1992).

Neighborhood Disadvantage as a Context for Adolescent Weight

Consistent with the theoretical constructs presented in Table 1 regarding the role of neighborhood characteristics in the development of health outcomes, this work posits that adolescent health is uniquely influenced by an array of neighborhood conditions, specifically indicators of neighborhood disadvantage. Disadvantageous neighborhood conditions appear to have the most powerful effect on development during the adolescent period (Hayward & Gorman, 2004). Adverse structural conditions within neighborhoods operate as clusters of mutually reinforcing characteristics that shape health and health behaviors of neighborhood residents (Elliott et al., 1996). It is important, therefore, that multiple elements of neighborhood disadvantage be examined in order to understand the combination of neighborhood factors most relevant to adolescent weight status. There is growing interest in the role of neighborhood and environmental factors that influence adolescents' weight and weight-related behaviors (Grow et al., 2010; Saelens, Sallis, Black, & Chen, 2003), as neighborhood disadvantage likely generates several adverse neighborhood processes contributing to an increased risk of obesity among adolescents. As such, a number of behavioral and environmental factors within neighborhoods have been linked to the development of adolescent obesity through effects on nutrition and activity behaviors, and these factors also may be responsible for the perpetuation of obesity-related health disparities (Frederick et al., 2014).

Neighborhood economic structure is a critical indicator of the health of neighborhood residents, yet definitions of neighborhood economic disadvantage vary greatly across studies. These varying definitions may obscure conclusions about the impact of neighborhood poverty on family processes and adolescent outcomes. Overwhelmingly, though, exposure to chronic poverty has been shown to exert a negative effect on various adolescent outcomes, particularly when compared to episodic poverty (Duncan & Brooks-Gunn, 2010; Duncan, Connell, & Klebanov, 1997). Health and disease are in part determined by aspects of the physical and social environment in which adolescents live, ability to access to resources, and individual biological and behavioral responses. As it relates to adolescent weight outcomes, adolescents living in low-income neighborhoods tend to have more physical and mental health problems than do their peers from middle-income neighborhoods, and neighborhoods characterized as impoverished impose limitations and barriers to healthy lifestyles by decreasing resource availability (Leventhal et al., 2009; Leventhal & Brooks-Gunn, 2005).

Compared to more affluent neighborhoods, neighborhoods characterized by poverty impose greater structural constraints on resource availability and influence poorer adolescent weight outcomes by limiting family and adolescent access to healthy nutrition and opportunities for activity (Gordon-Larsen, Adair, et al., 2003a; Morland, Diez Roux, & Wing, 2006; Office of the Surgeon General (US), 2001; Sorensen, Emmons, Hunt, & Johnston, 1998; Vaughan et al., 2013). These impositions and structural constraints may hinder how well neighborhoods are able to meet the nutritional needs of their residents (Holsten, 2009; Kaplan, 1995) due to high costs of nutritious foods and greater exposure

to fast-food establishments (Morland, Wing, Diez Roux, & Poole, 2002). Compared to higher-income neighborhoods, lower-income neighborhoods also have fewer grocery stores (Galvez et al., 2008; Moore & Diez Roux, 2006; Morland & Evenson, 2009; Ploeg et al., 2009), fewer playgrounds, and fewer sidewalks (Drewnowski, 1998; Ploeg et al., 2009; Vaughan et al., 2013), factors which have been linked to an increased likelihood (30% more likely) of overweight and obesity among children and adolescents (independent of race, age, or SES) due to the negative impact of these factors on nutrition and physical activity behaviors (Shea et al., 1991). Such outcomes also may be a function of fewer financial resources and a lack of political power necessary to create safe and accessible infrastructure conducive for physical activity and local grocery businesses.

Disadvantaged neighborhoods often are characterized by poor nutrition (Bhattacharya, Currie, & Haider, 2004). Adolescents from socioeconomically disadvantaged neighborhoods tend to eat fewer balanced meals and have less healthy dietary practices (Fitzgibbon et al., 1998). Coupled with lowered participation in physical activity and exercise in these neighborhoods (Wickrama et al., 1999), the risk for overweight and obesity may be increased due to an imbalance in the ratio of calories consumed to calories expended. As it pertains to the accessibility of healthy nutrition resources in lower-income American neighborhoods and communities, there exists a nutritional paradox rooted in categorical inequality and diminished access to proper nutrition: there is greater access to food, more food variety, and better food storage compared to all other countries, but families from oppressed social classes have limited access to high quality foods due to the politics of grocery store placement, wide-spread

availability of high-calorie fast food restaurants in predominantly low-income neighborhoods (Ayala, Baquero, & Klinger, 2008), and unaffordable healthy food options (Drewnowski & Specter, 2004). This paradox is likely one of the largest contributors to the precipitous increase in obesity among adolescents of color (Abraído-Lanza, Dohrenwend, Ng-Mak, & Turner, 1999).

Residential Segregation. Residential segregation has been characterized as a fundamental cause of race-related disparities in health outcomes, as the physical separation of racial groups by enforced residence is an institutionalized mechanism of racism designed to shelter whites from social interactions with other racial groups, primarily African Americans (Williams & Collins, 2001). According to Williams and Collins (2001), residential segregation determines access to education and employment opportunities which has resulted in dramatic racial differences in SES. Given that SES remains fundamental to health, residential and social segregation serves to create conditions inimical to health and well-being.

Among highly segregated residential areas (higher ratio of people of color to European Americans) there tends to be a higher obesity prevalence compared to areas of lower segregation (more equal distribution of people of color to European Americans) (Kershaw, Albrecht, & Carnethon, 2013). Kershaw, Albrecht, and Carnethon (2012) also indicated variability in the relationship between residential segregation and obesity across groups of color. U.S. Census data shows a clear trend for ethnic minorities, particularly African Americans and Hispanic Americans, to occupy neighborhoods primarily constituted by their own race (D S Massey & Denton, 1988; Douglas S. Massey &

Fischer, 2000; Douglas S. Massey, 2012). Given the disproportionate prevalence of obesity in these groups compared to European Americans, it is not surprising that measures of residential segregation have been liked with overweight and obesity among people of color, particularly African Americans. When intersected with poverty, the level of residential segregation then serves as a determinant of health behaviors that shapes weight status (such as dietary intake and energy expenditure) (Corral et al., 2012), such that higher levels of residential segregation indicate poorer health and higher BMI.

Associations between Parenting and Neighborhood Contexts

Several studies have indicated that living in economically disadvantaged neighborhoods is associated with lower levels of parental support and warmth (Bradley & Corwyn, 2002; Gonzales et al., 2011; Simons et al., 2002), which in turn is linked to less positive adolescent developmental outcomes. When exposed to disadvantage, however, studies have shown that children and adolescents may benefit even more from supportive parenting behaviors compared to those raised in wealthier, less-disadvantaged neighborhoods (Brody et al., 2001; Hanson, McLanahan, & Thomson, 1998), suggesting that there may be an interaction between supportive parenting and neighborhood disadvantage in the relationship with adolescent outcomes. In response to experiences living in economically-marginalized neighborhoods (Ambrose & Millar, 2002; Elliott & Aseltine, 2012; Jarrett, 1999), parents may gauge the nature of their parenting based on environmental conditions, particularly if parents perceive their children to be exposed to risks above and beyond that which would be considered typical during childhood and adolescence (Nelson, 2010; Scott et al., 1998).

There is conflicting evidence, however, regarding whether the influence of parental warmth on adolescent outcomes may be altered by neighborhood factors. One study has shown that neighborhood factors have little impact on parental warmth and the relationship between parental warmth and adolescent outcomes (Earls, McGuire, & Shay, 1994), though a number of other studies have shown the detrimental role of neighborhood poverty on parenting (Wilson, 1987; Wilson, 1991) and parental warmth (Felsman & Vaillant, 1987; Jarrett, 1997; Klebanov et al., 1994; Luthar, 1999; Ronald L Simons, Johnson, Conger, & Lorenz, 1997; Smith & Prior, 1995). Given that parenting behaviors might be influenced by neighborhood contexts, it is plausible that parenting may influence adolescent weight outcomes differently depending on how parenting behaviors (e.g., parental warmth and support) interact with neighborhood level factors.

Adolescent Prejudice

According to CRT and consistent with the theoretical constructs presented in Table 1, people of color experience chronic exposure to diverse forms of everyday prejudice, discrimination, and racism that may or may not be detected or acknowledged due to the subtlety and "ordinariness" of such prejudice in post-civil rights society (Ford & Airhihenbuwa, 2010). In fact, the concept of ordinariness in CRT posits that contemporary racial prejudice is both a normal and integral element of the social environment, and the ways in which people of color detect and react to prejudice informs research hypotheses regarding the health behaviors and outcomes of people of color. Exposure to prejudice may have lasting impacts on health as these experiences with prejudice may become internalized and lead to higher levels of psychosocial and

physiological stress (Williams, Neighbors, & Jackson, 2003). In the context of adolescent weight, stress from chronic exposure to prejudice may influence biological responses that stimulate appetite and reduce motivation for physical activity, which may ultimately promote weight gain (Gee, 2002).

Based on CRT, the current study operationalizes the concept of prejudice as a ubiquitous aspect of adolescents' social environments. Adolescents' reported exposure to prejudice is conceptualized as an individual-level factor indicative of adolescents' detection of such prejudice. A small number of studies have investigated the role of interpersonal prejudice and discrimination as social determinants of adolescent risk behaviors (Respress, Small, Francis, & Cordova, 2013), but this area of research remains underdeveloped, particularly as it may pertain to adolescent weight outcomes.

Few studies have explored the role of prejudice and discrimination as potential determinants of weight-related outcomes, particularly among adolescents, and most studies within the field of overweight and obesity research are germane only to the concept of weight-based discrimination rather than other forms of prejudice on the basis of race or gender. However, there is some evidence to assert that experiences with any form of prejudice and discrimination may be an important factor related to weight gain among marginalized racial and ethnic groups and people of color. Among a multi-ethnic sample of 1,425 American adults followed for 9 years, Hunte (2011) found that experiences of everyday discrimination may be associated with increases in waist circumference over time. Hunte and Williams (2009) also found that Irish, Jewish, Polish, and Italian Americans who reported chronic exposure to racial discrimination were 2 to 6

times more likely to have high-risk waist circumference. These same associations, however, were not significant among other European American Whites, African Americans, or Hispanic Americans. Among 1,956 Latino Americans and Asian Americans participating in the National Latino and Asian American Study, racial discrimination was associated with obesity and increases in BMI over time, and this relationship strengthened with increasing time in the United States. Findings presented by Gee (2002) also suggest that interpersonal and institutional racial discrimination is associated with poorer health status among a sample of 1,503 Asian Americans. Specifically, Gee's work indicated that the probability of being obese was doubled, from 4.6% to 9.3%, among those who reported experiences of discrimination compared to those who did not. Paired with the tenets of CRT, these findings raise a provocative question regarding the harmful effects of racism on health, and suggest that studies of weight-related behaviors and outcomes should incorporate measures of exposure to prejudice and discrimination as factors pertinent to health.

Other Relevant Factors

When investigating effects of parenting and neighborhood-level factors on the individual physical health of adolescents it also is important to account for factors with which they are likely to be correlated with adolescent weight, including indicators of family economic distress and parental education. Assessing these additional factors may demonstrate whether adolescent weight outcomes are explained more so by the effects of particular parenting behaviors or by aspects of neighborhood disadvantage. Including these measures also minimizes the likelihood that unmeasured individual or family

characteristics will account for the observed effects of neighborhood on adolescent weight (Leventhal & Brooks-Gunn, 2005). Leventhal and Brooks-Gunn (2000) proposed that parental attributes, family characteristics, and family interactional processes are the mechanisms through which neighborhood adversity influences adolescent obesity.

Overweight and obesity are more prevalent among families with higher levels of poverty and lower parental education attainment (Goodman et al., 2003). Adolescents living in poverty also are at a greater risk for developing poor physical and mental health outcomes (Miller & Korenman, 1994) due to limited availability of and access to quality health care services. Adolescents from low-income homes also tend to have poorer diets with little fruit or vegetable consumption and higher levels of physical inactivity due to the costs of accessing such resources. Thus, family economic hardship may have a direct influence on adolescent weight and weight-related behaviors as a result of limited access to health care and proper nutrition. However, though there is a wealth of evidence demonstrating links between income and adolescent outcomes, the effect of income on adolescents appears to be selective. Evidence suggests that family income level has less to do with adolescent physical health than compared to the effects of income on adolescents' academic achievement, and these effects are likely to be more apparent during earlier childhood and in the presence of persistent (rather than transitory) poverty. Thus, inclusion of family economic distress may serve as a better indicator of adolescent health outcomes than a measure of family income level.

Based on the premises of critical race theory (Table 1), additional adolescent level variables also may have bearing on adolescent weight outcomes such as adolescents'

evaluations of their own health status. Thus, these variables will be included in analyses as they have potential to explain variance in adolescent weight outcomes according to theoretical models.

Adolescent Health. In the adaptation of CRT described in Table 1, adolescents' social and personal resources influence their health behaviors and health outcomes by acting, in part, on adolescents' own evaluations of their risk for poor health. In the current study, the theoretical construct of perceived health risk will be assessed conceptually as adolescents' own evaluations of their general health. Such evaluations ultimately may influence adolescent weight outcomes by informing adolescents' decisions to engage in certain health behaviors. Though poorer self-evaluations of health are associated with more attempts to engage in diet control behaviors for the purpose of curbing weight gain (Piko, 2007), which could lead to improvement in weight outcomes, most evidence suggests that poorer perceptions of one's health are associated with lower levels of physical activity, infrequent consumption of fruits and vegetables, and increased odds for obesity compared to adolescents with more positive evaluations of their own health status (Tremblay, Dahinten, & Kohen, 2003).

Summary and Hypotheses

Though limited in number and design, previous studies have suggested that parenting is influential to adolescents' weight status. In addition, neighborhood disadvantage also affects adolescent weight. Neighborhood disadvantage represents a proximal factor associated with adolescent weight that likely interacts with even more proximal factors at the individual-level to have a more substantial influence adolescent

weight outcomes over time. Despite significant associations between specific parenting behaviors and adolescent health outcomes, most studies are faced with challenges that limit interpretations of findings in several important ways. Inconsistencies regarding conceptualization of parenting complicate the literature and make it difficult to draw conclusions about the mechanisms linking parenting and adolescent weight outcomes.

To rectify the limitations of previous studies, the current study utilized measures with established internal consistency that have been employed in other reputable studies with the same Add Health data set. Similar items assessing parental warmth as the items used here have yielded an alpha of 0.85 in prior studies (Pong, Hao, & Gardner, 2005), and the variables used to construct the neighborhood disadvantage construct have been used in previous studies yielding a high Cronbach's alpha of 0.91 (Merten, 2010).

Many previous studies investigating the relationship between parenting and adolescent weight outcomes have not included nationally representative samples. The current study addresses this limitation to generalizability by using the National Longitudinal Study of Adolescent Health (Add Health), which is a large, nationally representative sample of adolescents followed for multiple decades in the United States.

The current study also extends the literature pertaining to adolescent obesity first by acknowledging that adolescent weight-related behaviors and weight outcomes may not only be influenced by independently operating factors relative to parenting and neighborhood disadvantage, but through the intersection of these factors among adolescents of color.

Finally, the current study accounts for the interdependence of individual- and neighborhood-level factors on adolescent weight outcomes, which has remained relatively absent in previous studies on this topic. Thus, this study investigates the varying effect of individual-level factors (adolescent characteristics and perceptions of parenting), and neighborhood-level factors on adolescent weight outcomes in adolescence and in young adulthood. This study explores the potential influences of supportive parenting behaviors and neighborhood disadvantage on adolescent weight outcomes, and attempts to explain if these influences have a more marked impact on adolescent weight outcomes when intersected with one another.

I propose the following research questions and hypotheses:

1. *Controlling for the effects of all covariates (including Wave 1 BMI in prospective and change models), does parental support have an impact on adolescent BMI percentile at Waves I and III, and increase in BMI percentile over time?* Hypotheses: Higher levels of Wave I parental support will be associated with (a) lower adolescent BMI percentile scores at Wave I, (b) lower adolescent BMI percentiles at Wave III, and (c) and less increase in BMI percentile scores over time compared to adolescents reporting lower levels of parental support.
2. *Controlling for the effects of all covariates (including Wave I BMI in prospective and change models), does neighborhood disadvantage have an impact on adolescent BMI percentile at Waves I and III, and increase in BMI*

percentile overtime? Hypotheses: Lower levels of Wave I neighborhood disadvantage will be associated with (a) lower adolescent BMI percentile scores at Wave I, (b) lower adolescent BMI percentiles at Wave III, and (c) and less increase in BMI percentile scores over time compared to adolescents from neighborhoods with higher levels of neighborhood disadvantage.

3. *Controlling for the effects of all covariates (including Wave I BMI in prospective and change models), do both parental support and neighborhood disadvantage simultaneously impact adolescent BMI at Waves I and III, and increases in BMI percentile over time?* Hypotheses: Adolescents reporting higher levels of parental support and lower levels of neighborhood disadvantage will show (a) lower adolescent BMI percentile scores at Wave I, (b) lower adolescent BMI percentiles at Wave III, and (c) and less increase in BMI percentile scores over time compared to adolescents reporting lower levels of parental support and higher levels of neighborhood disadvantage.
4. *Controlling for the effects of all covariates (including Wave I BMI in prospective and change models), is there a cross-level interaction between parental support and neighborhood disadvantage that impacts adolescent BMI percentile at Waves I and III, and increases in BMI percentile over time?* Hypotheses: The effect of parental support on adolescent BMI outcomes will vary at different levels of neighborhood disadvantage, as the effect of parental support on adolescent BMI percentile outcomes will be diminished in the presence of higher levels of neighborhood disadvantage.

CHAPTER IV

METHOD

Data

The present study is a secondary analysis of data obtained from the National Longitudinal Study of Adolescent Health (Add Health) (Harris, 2011; 2013), a nationally representative, school-based study of adolescents in grades 7 to 12, which was funded, in part, by the National Institute of Child Health and Human Development (NICHD). Designed to comprehensively assess the causes of health-related behaviors and the influence of social context on adolescent development, this ongoing study has continued to follow participants over multiple decades and multiple waves of data collection (Chen & Chantala, 2014). Data were collected in-school and in-home to capture information at the school level, at the student level, and at the family level (though weights are not available or needed at the family level). Using the Add Health dataset it is possible to examine a wide array of adolescent and adult outcomes that demonstrate changes in development as a function of numerous individual, interpersonal, and environmental factors. Detailed descriptions of the sample and procedures are provided by Harris and colleagues (2008) at: http://www.cpc.unc.edu/projects/addhealth/design. Beginning in 1994, Add Health administered in-school questionnaires to all students attending school from a nationally-representative sample of middle and high schools (Harris, 2011; 2013). A stratified cluster design was used to select 52 middle schools and 80 high schools in the

United States. School rosters were then used to choose a gender- and grade-stratified sample of adolescents to participate in In-Home Interviews approximately eight months after completion of the In-School Questionnaire in 1995 (Wave I). In-home interviews were conducted again with the same sample of students in 1996 (Wave II). Between 2001 and 2002, participants who completed in-home interviews in Wave I were re-interviewed (Wave III). A fourth wave of data was collected between 2008 and 2009 from original respondents interviewed in Wave I (now between 24 and 32 years old). Data from Wave IV are not be used for the present study as the primary objective of the current study is to determine how parenting and neighborhood disadvantage in early adolescence influences change in weight from early to young adulthood. At the time of Wave IV data collection, all participants were adults, many lived in different neighborhoods than in prior waves, and many now had families of their own. Given that the sample characteristics of participants in Wave IV likely would be very different than in prior waves, this would further complicate the ability to determine the hypothesized relationships and introduce additional variables that are beyond the scope of this work.

Participants

Add Health followed a school-based design with a primary sampling frame derived from the Quality Education Database (QED) (Harris, 2013). The sampling frame included 26,666 schools (public and private), of which 132 sample schools participated from 80 different rural, urban, or suburban neighborhoods.

School Sampling Selection. Eighty high schools were chosen systematically, with selection probabilities proportional to the school's enrollment. Schools with higher

enrollment had a greater chance of selection (Harris, 2013). Prior to selection, schools were sorted by size (fewer than 125 students, between 126 and 350, between 351 and 775, or 776 or more students), type (public, private, or parochial), U.S. census region (Northeast, Midwest, South, West), urbanicity (urban, suburban, rural), and percent white (0, 1-66%, 67-93%, 94-100%). Of the 80 schools selected, 52 were eligible and agreed to participate (Harris, 2013). Twenty-eight schools refused participation and all were replaced by similar schools with matching characteristics using the same initial sorting criteria. Recruited high schools were asked to provide a list of junior high or middle schools expected to contribute at least five students to the entering class of the high school, along with the approximate percentage of the high school's entering class from each feeder school. A single feeder school was selected for each high school, and their selection was proportional to the percentage of the high school's entering class that came from that feeder. Four sample high schools drew their entering classes from a large number of feeder schools and therefore had no eligible feeders. Twenty high schools, though, had grade ranges that included 7th and 8th grade students. These 24 schools were excluded. Fifty-six total feeder schools were selected, of which 4 refused participation, yielding 52 total feeder schools.

Students in grades 7-12 (aged 12 to 19) from the 132 selected schools were asked to complete in-school questionnaires between September 1994 and April 1995 (Harris, 2013). At each sample school, questionnaires were administered to students on a single day during one class period. More than 90,000 students participated.

Waves I and III. Rosters of all enrolled students were obtained from each school and used to select a sample of adolescents to participate in the Wave I in-home interview (Harris, 2013). One parent of each adolescent also was asked to complete an in-home interview. Special samples also were selected to represent "rare" categories identified through in-school questionnaire responses, which included adolescents who identified as Cuban, Puerto Rican, Chinese, African American with highly educated parents, disabled, or adopted, as well as those who had at least one sibling (full-sibling), half-sibling, non-related sibling, or a twin. Students who did not complete in-school questionnaires were still eligible to participate in the in-home interview.

Seventy-nine percent of adolescents sampled (n = 20,745) participated in In-Home Interviews in Wave I, which included 12,105 adolescents from special samples. The total adolescent sample included 55% European Americans, 22% African Americans, 16% Hispanic Americans, 6% Asian Americans, and 1% American Indians. Approximately half of participants (49%) were female.

Wave II was conducted from April through August 1996 with the same in-home sample as in Wave I (Harris, 2013). More than 80% (n = 14,738) adolescents from Wave I completed in-home interviews in Wave II. Wave III was conducted between 2001 and 2002 and included 77% (n = 15,197) of original respondents from Wave I (Harris, 2013). Note that adolescents who were in the 12th grade at the time of Wave I were not followed and are not included in the analysis sample.

Current Study Sample. The present study uses restricted data from in-home adolescent and parent interviews obtained at Waves I and III, and is therefore limited to

those adolescents who have participated in both waves, those with a completed parent questionnaire, and those for whom height and weight data were collected. The analysis also excludes respondents who identified as severely disabled or as pregnant at any time prior to Wave III.

As the focus of the current study pertains specifically to adolescents of color, only adolescents self-reporting as African American (Black), Hispanic American, Asian American, or American Indian were included in the present study (see Chapter V: Results, Sample Description, Table 1).

Procedure

Interviews with adolescents were administered by computer-assisted personal interview (CAPI), and more sensitive questions were administered via computer-assisted self-interview (CASI). These interviews ranged from 60 to 120 minutes in duration depending on the number of questions adolescents completed, as questionnaire sections and the total number of questions asked were tailored to each respondent based on pre-screened criteria (age, gender, and past experiences). Parents completed a 40-minute interviewer-administered paper-and-pencil interview (PAPI).

Data for the present study were collected from Waves I and III. Institutional Review Board (IRB) approval and informed consent were obtained prior to data collection by the Principal Investigators of Add Health. The current study procedures were approved via expedited exempt IRB review processes.

Sampling Weights

As it pertains to the Add Health sampling design, unequal probability of selection requires that selection probabilities be estimated for each element of the population prior to sampling (Schutt, 2012). Sampling weights were assigned to reflect these probabilities. Weighting is necessary when disproportionate sampling occurs with different sampling ratios in the strata, as with oversampling of specific racial and ethnic groups. Typically, the weight will be the inverse of the sampling ratio. If weights are not assigned, this may lead to substantial bias in parameter estimates and incorrect inferences. Failure to incorporate weights also means that findings cannot be generalized beyond the study sample. Weights that are available in the Add Health data set include: single-level cross-sectional and longitudinal weights, multilevel cross-sectional and multilevel weight, and single-level cross-sectional and longitudinal weights for subsamples.

To adjust for the Add Health sampling design, cross-sectional and longitudinal weights were applied in the analyses (Chen & Chantala, 2014). These sample weights allow for estimation of population parameters and standard errors in the analysis depending on the level and type of analysis performed. If design characteristics are not accounted for, point estimates obtained from the data will be affected only by the weights, and variance estimates will be affected by clustering, stratification, weight, and the type of design (Chantala & Tabor, 2010). Using these design weights allowed compensation for differences in selection probabilities (Harris, 2013; Schutt, 2012) due to over-representation of certain groups from larger schools in the resultant analyses (Schutt, 2012). Weighting processes also compensated for differences in response rates

across subgroups within the sample, as nonresponse rates could otherwise result in a dataset less representative of the population.

At the individual level, Add Health provides population estimates for adolescents enrolled in the seventh through twelfth grades during the 1994-1995 academic year, and involves fitting a population-average model with respondent-level data as estimates (Chen & Chantala, 2014). Only a grand sample weight was needed for single-level modeling, which factored in the inverse probability of all levels of clustered sampling, nonresponse, over sampling, and post stratification. Multilevel modeling weights only are available at the school and adolescent levels, not at the level of the parent, family, or the neighborhood. The lack of weighting variables at the neighborhood level impairs the ability to generalize results from level-two data analyses to the broader national population, but the stratified random sampling design and use of census data to characterize neighborhoods help to diminish inference threats.

Cross-sectional analyses address questions of association rather than causation and include a weight that was created for everyone in a probability sample for a given wave of data (Chantala & Tabor, 2010). If an outcome variable is from one wave of data and predictors are from previous or a combination of waves, the correct weight is the 'cross-sectional weight' for the wave from where the outcome variable is derived.

Longitudinal analyses address changes in measurements taken on the same respondents at two or more time points, and included one record per participant per time point, or multiple combined records constructed from the difference in values collected at each time point (Chantala & Tabor, 2010). However, given that measurements are

missing across some time points, sampling weights that incorporate a non-response adjustment were used to compensate for missing data at a particular time. The correct sampling weight in longitudinal analyses was determined by the data collected at the most recent time point.

Weighting variables (assigned to each adolescent by Add Health administrators) were used for Wave I data (*n* = 18,924) to provide a cross-sectional weight for analyzing the sample of 7-12th grade adolescents chosen with a known probability of being selected from school enrollment rosters between the years of 1994 and 1995, and at Wave III (*n* = 10,828) to provide a longitudinal weight for eligible Wave I respondents who were interviewed at Wave III.

Handling Missing Data

Missing data pose a potential difficulty, particularly in longitudinal analyses, as measurements may not have been taken for every subject at every time period (Chen & Chantala, 2014). The aforementioned sampling weights provided by Add Health included and applied to the analyses included a non-response adjustment, which facilitated compensation of missing data at Waves I and III.

In subpopulation analyses it is difficult to predict the magnitude of difference between the variance estimates obtained from the full dataset and the subset (Chen & Chantala, 2014). Given that some respondents did not answer all of the questions pertinent to the research questions specified here, parameters were not estimated from the full sample, yielding a representative subset of the full sample. Add Health administrators Chen and Chantala (2014) recommended that a sub-sample be chosen from the larger

sample, which includes only the subpopulation of respondents with no missing data on any of the major variables of interest (e.g., adolescent BMI percentiles, neighborhood disadvantage, parental support).

Individual-Level Measures

Adolescents' weight outcomes were assessed using Wave I and Wave III data. Parental support is conceptualized based on adolescent perceptions of parental warmth and general supportiveness, which was assessed using Wave I data. Adolescent prejudice and adolescent health also were assessed at the individual-level at Wave I. Indicators of neighborhood disadvantage, and neighborhood-level and individual-level covariates also were assessed at Wave I.

Adolescent Weight Status. Body mass index (BMI) is a measurement tool used to indicate weight status in adults, calculated by dividing an individual's body weight in kilograms by the square of the individual's height in meters (kg/m^2). Among adults over 20 years of age, BMI scores can be used to categorize individuals as underweight, normal weight, overweight, or obese, where an adult BMI between 25 and 29.9 is considered overweight, and a BMI of 30 or greater is considered obese (NHLBI, 1998; WHO, 2000). The International Obesity Task Force approved the use of BMI as an appropriate and accurate proxy for the measurement of body adiposity in pediatric and adolescent populations (Dietz & Bellizzi, 1999). Research has shown that BMI scores are strongly and positively correlated with direct measures of adiposity in adolescents and with weight-related comorbid conditions (Dietz & Robinson, 2005).

Adolescents participating in Add Health were asked to self-report their current height and weight during in-home interviews at Waves I and III. These reports were then used to determine BMI based on International Obesity Task Force cut points. Adolescent BMI percentile was computed first by calculating BMI for each adolescent by dividing weight (kg) by height^2 (m) from anthropometric data collected at Waves I and III. Following CDC guidelines for determining adolescent weight status, age- and sex-specific growth algorithms were applied to determine BMI percentile values for each adolescent at each wave. Individuals with a BMI greater than or equal to the 95th percentile were characterized as obese, whereas individuals with a BMI between the 85th and 95th percentile were characterized as overweight. Individuals with a BMI less than the 85th percentile were characterized as normal weight.

The present study assessed adolescent weight status continuously using BMI percentile scores calculated from height and weight. Change in weight status from Wave I (1995) to Wave III (2001-2002) was assessed to reflect change and continuity in weight status over time, and was calculated by subtracting each adolescent's Wave I BMI percentile from their Wave III BMI percentile (so, a high change score indicates increases in BMI percentile scores over time). For descriptive purposes, change in BMI percentile also was assessed categorically to reflect the nature of adolescents' change in weight status between waves, and included the following categories: "Became Obese" (adolescent was not obese at Wave I but became obese by Wave III); "Remained Obese" (adolescent was obese at both Wave I and Wave III); "Became Overweight via Gain" (adolescent was normal weight at Wave I but overweight at Wave III), "Became

Overweight via loss" (adolescent was obese at Wave I but overweight at Wave III), "Remained Overweight" (adolescent was overweight at Wave I and Wave III), and "Remained Normal Weight" (adolescent was at or below normal weight at Wave I and Wave III).

Parental Support and Warmth. A parental support scale was created by averaging responses (on a 5-point scale, with five indicating high support) to the following questions in Waves I and III: "how close do you feel with your mom/dad; how much does your mom/dad care about you; is your mom/dad warm and loving towards you; are you satisfied with your communication with mom/dad; are you satisfied with your relationship with mom/dad." The measure of parental support has been used in prior studies with adolescents from the Add Health data set. The parental support measure was created separately for mothers and fathers (mother: WI α = .84; father: WI α = .88) (Adam et al., 2011). The higher score from the two parent scales was chosen for analysis in the current study due in part to the large proportion of adolescents reporting on only one parent, and large quantities of missing data for fathers. This measure provides an indicator of the highest level of parental support perceived by the adolescent. The parental support measure described here was conceptualized by Add Health administrators based on the work of Ellis, Thomas, and Rollins (1976), who determined the measure to have adequate alpha coefficients of internal-consistency reliability and fair discriminate and construct validity correlations. Though prior studies have used these scales of parental support to assess the relationship between parental support and adolescent health among European American, African American, Hispanic American,

Asian American, and American Indian adolescents (Adam et al., 2011), measurement equivalence across these cultural and ethnic groups has been limited.

The Add Health measures of parental support used here have been assessed in previous studies to determine measurement equivalence across groups of European American adolescents and Asian American adolescents, across boys and girls, and across parent gender (Berndt, Cheung, Lau, & Hau, 1993; Crockett, Brown, Russell, & Shen, 2007; Crockett, Brown, Iturbide, Russell, & Wilkinson-Lee, 2009; Youniss & Smollar, 1985). Results indicated support for considerable cross-ethnic invariance of the maternal and paternal support measures across European American and Asian American adolescents and across both genders (CFIs were .97 or higher; RMSEA and SRMR were .06 or lower), suggesting that adolescents have similar understandings of maternal and paternal support across racial and ethnic groups, and have a similar frame of reference for the construct under study (Ghorpade, Hattrup, & Lackritz, 1999).

Family Economic Stress. Family economic stress was determined based on parental report and assessed as a covariate at the individual level. Parents were asked, (1) "Do you have enough money to pay your bills?" and, (2) "Last month, did you or any member of your household received social security, supplemental security incomes, aid to families with independent children, food stamps, a housing quality subsidy or public housing, or unemployment?". Determination of family economic stress was made based on a response of "no" to question 1 or "yes" to question 2 from either parent, and was coded as "1" to indicate the presence of family economic stress. This measure has been

used previously in another study of the role of family support on adolescent risk taking behaviors (Rivera & DePaulo, 2013).

Adolescent Prejudice. Adolescent report of prejudice was measured with a single item at Wave I. Adolescents were asked whether they believed other students at their school were prejudiced (Le & Stockdale, 2011; Respress et al., 2013). The item was rated using a 5 point Likert scale ranging from “strongly agree” (1) to “strongly disagree” (5). Responses were reverse coded such that higher scores indicated greater levels of perceived prejudice.

Adolescent Health. Adolescent report of their own general health is a level-one variable assessed at Wave I via a single item. Adolescents were asked, “In general, how is your health?”. The item was scored using a 5-point Likert scale ranging from “excellent” (1) to “poor” (5). Responses were reverse coded such that higher scores indicated better health.

Neighborhood-Level Measures

Neighborhood contextual data were taken from the Add Health contextual database, which links geocoded respondent addresses with information collected for 1990 U.S. Census of Population and Housing. The current analyses focus specifically on data obtained at the census block group level, as this level is the smallest available to approximate neighborhood characteristics.

Neighborhood disadvantage was conceptualized at the census block group level and focused on (a) level of neighborhood poverty, (b) level of neighborhood unemployment, and (c) neighborhood housing quality.

Neighborhoods in this study are defined in geographical units known as census block groups (CBG) (Iceland & Steinmetz, 2003). Whereas a census block is the smallest geographical unit from which census data are drawn, a CBG represents a slightly larger geographical area comprised of multiple census blocks. Multiple CBGs comprise a census tract. Census block groups were chosen as the unit of analysis as they represent a localized context describing the characteristics of adolescents' neighborhoods. Conceptualizing neighborhoods in this manner, rather than as broader census tracts, allows unique neighborhood characteristics influencing adolescent obesity to be examined at levels that are more proximal to their development.

Neighborhood Poverty. Neighborhood poverty data were collected for each CBG at Wave I, and reflect the proportion of families per neighborhood reporting to be below the federal poverty level when U.S. Census data were collected in 1989. According to the U.S. Census Bureau, neighborhoods where the proportion of families below the poverty level is between 10-19% are considered to have low poverty, between 20-29% are considered to have high poverty, and at or above 30% is considered very high poverty (U.S. Census Bureau, 2012). Degree of neighborhood poverty was assessed continuously based on the exact proportion of neighborhood residents below the poverty line reported by the U.S. Census for each census block group. Poverty definitions follow the Office of Management and Budget's Statistical Policy Directive 14 of the U.S. Census Bureau, which is determined based on family size such that if a family's total income is less than the family's money income threshold (estimated by the Census Bureau), then all members of that family are considered to be impoverished.

Neighborhood Unemployment. Neighborhood unemployment was measured at Wave I and reflects the total unemployment rate within each CBG. Neighborhoods with an unemployment rate at or above 10% are considered to have high levels of unemployment (Bureau of Labor Statistics, 2015). Degree of neighborhood unemployment was calculated continuously based on the exact rate of unemployment reported in U.S. Census for each census block group.

Neighborhood Housing Quality. Neighborhood housing quality was assessed at Wave I at the CBG level, and reflects the proportion of vacant housing units to non-vacant housing units within each CBG. Based on U.S. Census Bureau cut-points, neighborhood housing quality is classified as low if 10% or more of all housing units were vacant at Wave I (U.S. Census Bureau, 1996). Neighborhood quality was calculated continuously based on the exact proportion of vacant housing units reported in U.S. Census for each census block group.

Residential Segregation. Using U.S. Census data, a measure of racial segregation was calculated for each Add Health respondent and their census block group areas. Segregation was conceptualized in the current study through a measure of racial dispersion obtained for each census block group. Racial dispersion is a measure of the racial heterogeneity of a given area on a scale of 0 to 1. When equal to zero racial dispersion reflects an area in which all members of that area are of the same racial group (highly segregated from European Americans). When equal to one, racial dispersion reflects an area in which there is an equal distribution of European American, African American, Hispanic American, Asian American, and American Indian inhabitants. In the

current investigation, racial dispersion was reverse coded such that higher proportions (closer to one) indicate higher levels of segregation, and lower levels (closer to zero) indicate lower levels of segregation or more equal distributions of racial groups. As there is no established cut-point value from which to determine high versus low levels of segregation in census block groups; thus, segregation was assessed continuously. This measure is the same that has been linked to overweight-related behaviors among adolescents of color using Add Health data (Gordon-Larsen, Harris, Ward, & Popkin, 2003).

Control Variables and Covariates

Adolescent Gender. Previous research has shown strong gender differences in the association between poverty and obesity, as the effect of poverty is stronger on obesity among females than males (Lee, Harris, & Gordon-Larsen, 2009), and these differences widen as adolescents approach young adulthood (Scharoun-Lee, Adair, Kaufman, & Gordon-Larsen, 2009). In the current study, adolescent gender is constructed based on responses to the adolescent in-home questionnaire in Wave I, which was cross checked with self-reports of sex in interviews at Wave III. For the present analysis, a dummy variable will be used to represent adolescents' self-reported gender, where '0' indicates male and '1' indicates female.

Adolescent Age. Adolescent age was measured continuously based on self-reports of age (in years) provided at Wave I. Age is used as a control variable in the present analysis.

Parental Education. Due to the collinearity of parental education and various other pertinent aggregate measures, it is necessary to control for the effects of parent education in this analysis. Parent education is a level-one variable assessed via parental report from data obtained in Wave I parent questionnaires. Parental education was assessed continuously based on the highest grade level completed by either of an adolescent's reporting parents, such that a higher score indicates a higher level of educational attainment. Given that this study focuses on factors pertinent to adolescent health such as neighborhood disadvantage, it is important to note that low parental education is associated with poorer adolescent health outcomes and neighborhood disadvantage. Approximately 63% of adolescents in this sample have parents with no more than a high school degree.

Adolescent Race and Ethnicity

Adolescent race and ethnicity was assessed only as a grouping variable and or descriptive statistics in the present study. Research suggests that African Americans and Hispanic Americans are at a higher risk for developing obesity, and are more likely to be poor. This risk profile, however, is not shared across adolescents of color, as Asian American adolescents have a lower risk for the development of obesity (Flegal, Carroll, Ogden, & Johnson, 2002). This study includes adolescents' self-reported race and ethnicity collected at Wave I. Though Add Health features rich data on race and ethnicity, this study will focus on adolescents who identified as African American or Black (1), Hispanic American (2), Asian American (3), or American Indian (4). Respondents could report more than one racial/ethnic category, but were analyzed based only on the race or

ethnic category with which they predominantly identified. If adolescents responded “yes” to the question “Are you of Hispanic or Latino origin?” the respondent was coded as Hispanic American and eliminated from any other reported race category. If the respondent reported themselves to be “black or African American” in response to the question “What is your race?” they were designated as African American and eliminated from other reported categories. The same process was repeated among adolescents reporting to be Asian American and American Indian.

Data Analytic Strategy

Considering that the Add Health dataset was generated from a nationally representative sample of more than 20,000 adolescents, the number of individuals and neighborhoods to be analyzed in the present study is likely to exceed suggestions for substantial power to obtain a medium effect size of 0.05 at an alpha level of 0.05 (Cohen, 1992). Thus, no power calculations were performed.

Descriptive statistics, zero-order correlations, and general linear models analyses were examined using SAS Proprietary Software 9.4. Multilevel regression models were tested using MPlus 7.4 (Muthén & Muthén, 2015) to test the hypotheses.

Given that the data are nested (individuals within neighborhoods), it was assumed that individual error terms might be correlated within neighborhoods, and regression estimates (particularly standard errors) might be biased (Raudenbush & Bryk, 2002). To account for this dependency among adolescents within neighborhoods, I estimated multilevel models using the multilevel regression procedures. Group characteristics can then be included in models of individual-level outcomes to improve estimates of effects

within groups and to allow hypothesis testing across levels. This statistical method also allows for the partitioning of variance and covariance components across levels (within- and between-groups), while calculating reductions in variance with the addition of independent variables in additional models.

The first level of the multilevel analysis was conducted to estimate the main effects of individual-level variables (i.e., parental support, economic stress, and adolescent health, access to care, and prejudice) on adolescent weight outcomes (BMI percentile at Wave I and III, and increases in BMI percentile from Wave I to Wave III). The second level of the multilevel analysis consisted of census block group level variables—the neighborhood disadvantage index and the level of neighborhood segregation. Intraclass correlation coefficients closer to one indicate higher levels of statistical dependency between clusters or groups, whereas ICC values closer to zero indicate that the variance in the dependent variable is explained more so at the individual level.

As it as has been suggested for two-level nested designs (Algina & Swaminathan, 2011; Enders & Tofighi, 2007; Wang & Maxwell, 2015), level-1 variables were centered around the group mean in order to estimate level-1 effects without consideration of level-2 variables, and for estimating cross-level interactions. Level-2 variables were grand mean centered to estimate the effect of level-2 variables controlling for level-1 variables. This transformation of the predictor variables gives the intercept parameters more useful interpretations (Raudenbush & Bryk, 2002).

CHAPTER V

RESULTS

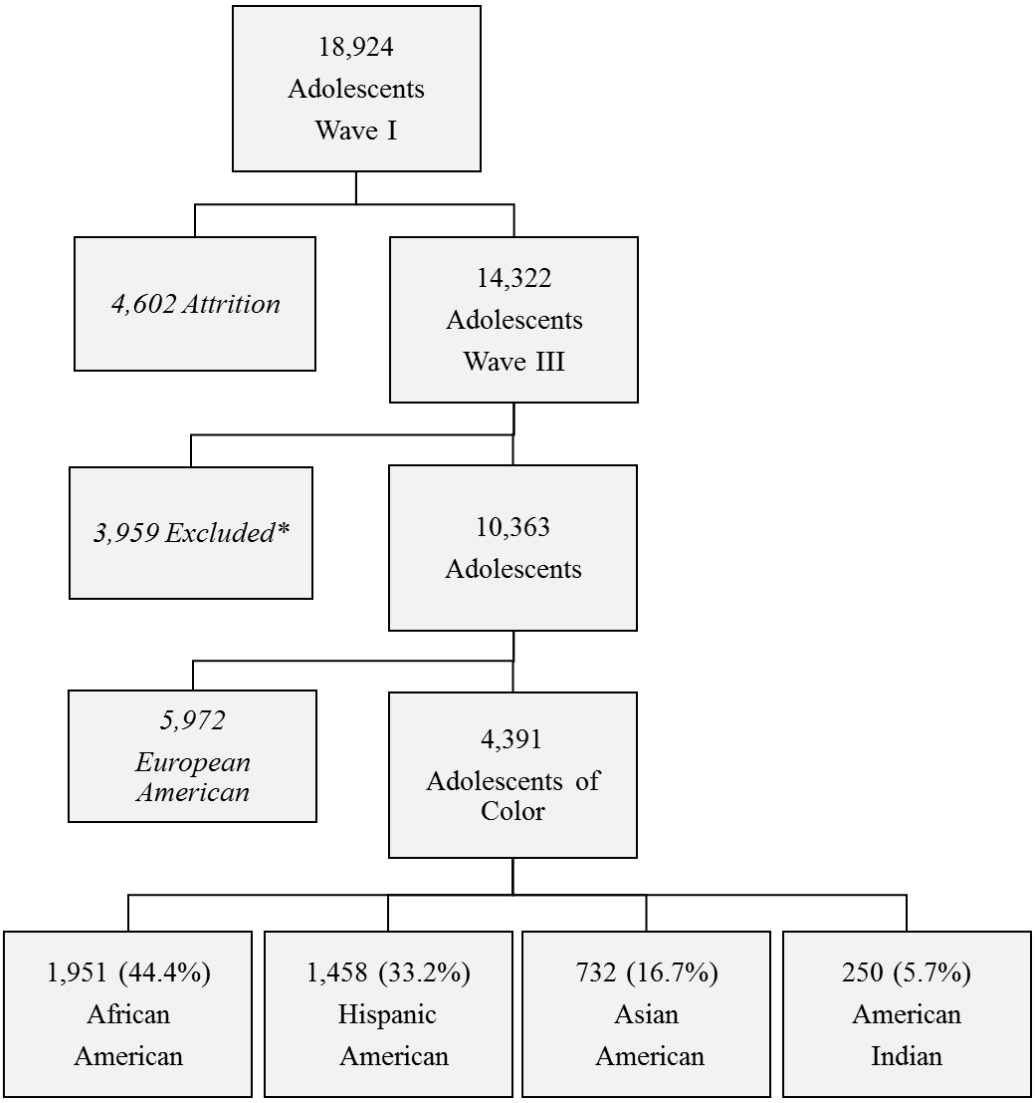
All analyses were conducted using either SAS 9.4 or Mplus version 7 (Muthén & Muthén, 2015). Survey design effects were accounted for and survey weights were incorporated to compensate for differences in selection probabilities of cases, differential rates of non-response, and the chance of fluctuation of the sample from the population as a whole. Applying weights therefore increases confidence that the Add Health sample under study here is representative of the U.S. population. Given that no weighting variables were assigned by Add Health to adjust for selection probabilities at the neighborhood level, weights were only applied for descriptive statistics and level-1 analyses.

Sample Population

The analyses and results of the current study were drawn from data obtained from the 20,440 adolescents who participated in in-home interviews as a part of the Add Health study. Of these, Wave I sampling weights were available for 18,924 adolescents. A subset of this study population was analyzed in the current study based on the specified inclusion criteria previously described. Figure 1 depicts a flow diagram of adolescents included in the current sample (n = 4,391) and the distribution of adolescents reporting from each racial/ethnic category. To ensure national representativeness of study participants, sample weights provided by Add Health were used in each analysis. The

sum of weights of the 4,391 participants suggests that the data presented here are representative of a total of 3,676,470 adolescents. Data from the 1990 U.S. Census were used to describe neighborhood-level characteristics (census block groups) from a total of 2,038 census tract areas, 53 of which are analyzed here to provide neighborhood-level context in the multilevel analyses.

Figure 2. Participant Flow Diagram



**Note. Adolescents were excluded if they had not been assigned a weighting variable, if they did not specify race, if they did not have BMI data for both Waves, or if they were older than 18 at Wave I.*

Preliminary Analyses

First, descriptive statistics of study variables were conducted. Table 2 describes the characteristics of the final sample of adolescents included in this study.

Table 2. Sample Characteristics	
Age, mean ± SD (range)	
Wave I	15.8 ±1.4 (12-18)
Wave III	22.1 ± 1.5 (18-25)
Female, % (n)	
Female	52.0% (2286)
Male	48.0% (2105)
Race, % (n)	
African American	44.4% (1951)
Hispanic American	33.2% (1458)
Asian American	16.7% (732)
American Indian	5.7% (250)
Grade at Wave I, % (n)	
7th	12.3% (538)
8th	14.9% (653)
9th	19.5% (854)
10th	26.8% (1176)
11th	24.9% (1095)

Note: N = 4,391. Data are from Waves I and III of the National Longitudinal Study of Adolescent Health.

Zero-order correlations among all major study variables were examined (Table 3). From data obtained for each census block group, proportion of individuals in poverty, proportion of unemployment, and proportion of housing vacancies were significantly correlated ($p < .001$). These variables were averaged together to form a neighborhood disadvantage index score, which served as a level-two variable in multilevel regression analyses. As the neighborhood disadvantage index score increased, so too do the prevalence of adolescent obesity. Neighborhood disadvantage, neighborhood segregation, economic stress, and self-reporting as African American all were positively correlated (*p*

< .01) with BMI percentile at Wave I, whereas parental support, adolescent health, and self-reporting as Asian were negatively correlated with Wave I BMI percentile ($p < .01$). Similarly, neighborhood disadvantage, neighborhood segregation, economic stress, and self-reporting as either African American or Hispanic American were positively correlated with adolescent BMI percentile at Wave III ($p < .01$). Parental education, adolescent health, and self-reporting as Asian American were negatively correlated with BMI percentile at Wave III ($p < .01$). Increases in BMI percentile from Wave I to Wave III was positively correlated with self-reporting as Hispanic American ($p < .001$) and negatively correlated with parental support ($p < .05$), parental education, adolescent health, and self-reporting as African American ($p < .01$). Small-to-medium range correlation coefficients suggests that multicollinearity among predictor variables is not a concern (Wickrama et al., 2006).

Table 3. Zero-order Correlations Among Study Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.NbhdDis	-----													
2.Segregate	.39‡	----												
3. Par Supp	.02	.00	----											
4. EcoStress	.20‡	.10‡	-.02	----										
5. Par Educ	-.17‡	-.01	.05‡	-.19‡	----									
6. Prejudice	.12‡	-.15‡	.09‡	.02	.04*	----								
7. Health	-.00	-.03	.14‡	-.03*	.06‡	-.13‡	----							
8. African Am	.32‡	.43‡	.02	.14‡	.19‡	.17‡	-.06‡	----						
9. Hispanic	-.11‡	.32‡	-.01	-.01	.33‡	-.10‡	.03*	-.63‡	----					
10. Asian	-.29‡	-.06‡	-.02	-.17‡	.17‡	-.04†	.02	-.40‡	-.32‡	----				
11. Am Indian	.01	.17‡	.01	.00	-.00	-.09‡	.02	-.22‡	-.17‡	-.11‡	----			
12. Female	.06‡	.05‡	-.14‡	.02	-.03*	.00	.09‡	.07‡	-.03	-.05†	-.01	----		
13. BMI% 1	.05†	.05†	-.04†	.05†	-.03	.01	-.15‡	.08‡	.02	-.14‡	.00	-.02	----	
14. BMI% 3	.06‡	.05‡	.02	.05‡	-.07‡	-.00	-.11‡	.05†	.07‡	-.15‡	.01	-.00	.68‡	----
15.BMI%Inc	.02	.01	-.04*	.00	-.05†	-.02	-.05†	-.04†	.05‡	-.01	.00	.02	-.38‡	.41‡

Note. NbhdDis = Neighborhood disadvantage index (*mean* = .11, *SD* = .08). Segregate = Reverse code of racial dispersion in each census block group (*mean* = .53, *SD* = .32). Par Supp = Parental support scale (*mean* = 4.52, *SD* = .57). EcoStress = Family economic stress (*mean* = .39, SD = .49). Par Educ = Highest level of parental education of either residential parent (*mean* = 5.63, *SD* = 2.57). Prejudice = Adolescent perceived prejudice among peers at school (*mean* = 3.12, *SD* = 1.19). Health = Adolescent self-perceived general health status (*mean* = 2.15, *SD* = .93). African Am = Adolescent identifies as African American. Hispanic = Adolescent identifies as Hispanic/Latino American. Asian = Adolescent identifies as Asian American or Pacific Islander. Am Indian = Adolescent identifies as American Indian. Female = Adolescent reports to be biologically female. BMI% 1 = Adolescent BMI percentile at Wave I. BMI% 3 = Adolescent BMI percentile at Wave III. BMI%Inc = Increase in adolescent BMI percentile from Wave I to Wave III.

*p < .05, †p < .01, ‡p < 0.001

Table 4 shows the distribution of adolescent BMI percentiles by weight status category (normal weight, overweight, obese) at Wave I (1994-1995) and Wave III (2001 2002) and by adolescents' self-reported racial/ethnic group.

Table 4. Adolescent BMI Percentiles[1] and Corresponding Weight Status Categories

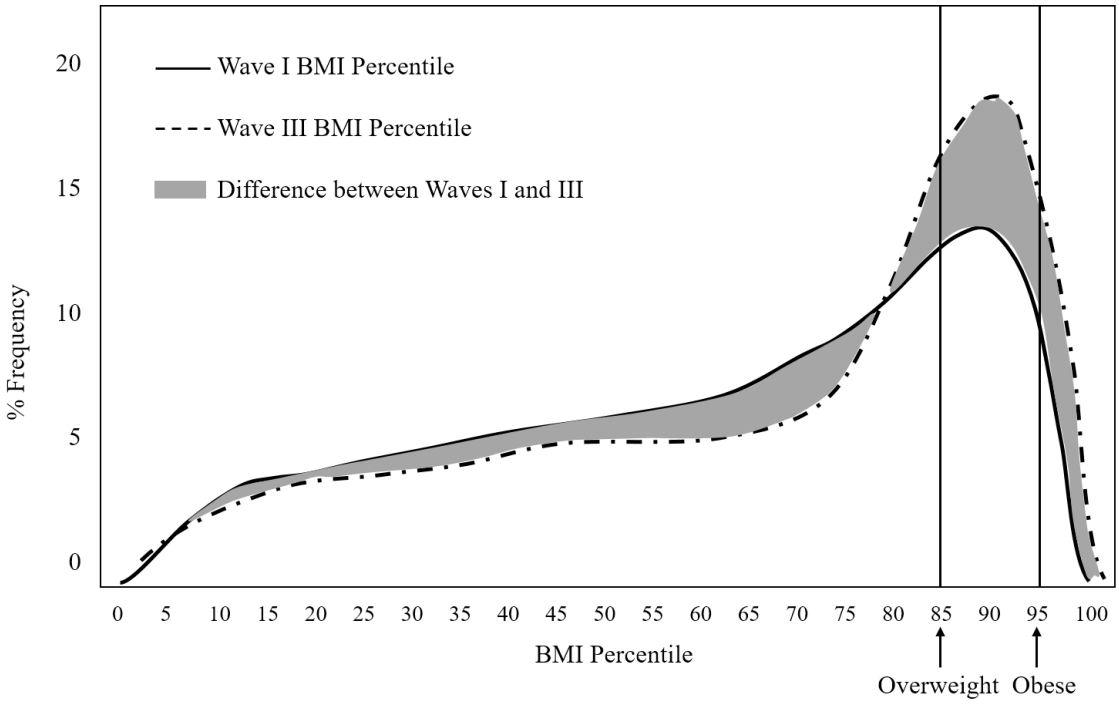
	Wave I (mean = 62.45)			Wave III (mean = 67.28)		
	≤ Normal	Over weight	Obese	≤ Normal	Over weight	Obese
Total Sample	71.7% (3,148)	15.3% (672)	13.0% (571)	62.0% (2,722)	19.1% (839)	18.9% (830)
Race/Ethnicity						
African American	69.2% (1,350)	16.6% (324)	14.2% (277)	59.6% (1,163)	19.7% (384)	20.7% (404)
Hispanic American	71.4% (1,041)	16.0% (233)	12.6% (184)	59.4% (866)	22.0% (321)	18.6% (271)
Asian American	80.3% (588)	10.9% (80)	8.8% (64)	74.7% (546)	11.5% (84)	13.8% (101)
American Indian	67.7% (169)	13.5% (34)	18.8% (47)	59.3% (148)	19.7% (49)	21.0% (53)

[1] From CDC Growth Charts; Normal weight = < 85%, overweight = 85 ≤ 94.99%, obese = ≥ 95%.

These obesity rates are based on age- and gender-specific CDC growth charts for children and adolescents. Failure to follow age- and gender-specific CDC guidelines for computing overweight and obesity among children and adolescents may lead to underestimation of actual overweight and obesity prevalence among American adolescents. At both waves of data collection the percentage of adolescents with overweight (15.3% and 19.1%) or obesity (13.0% and 18.9%) either resembled or exceeded current national averages (15.5% and 16.9%, respectively) (Ogden, Carroll, Kit, & Flegal, 2012). As expected, adolescents' BMI percentile scores were higher at Wave III than at Wave I (Figure 4). Figure 4 depicts the distribution frequency of BMI

percentile scores at each wave and indicates a greater positive shift in percentile scores at the upper end of the distribution at Wave III compared to Wave I.

Figure 3. Distribution Frequency of BMI Percentiles from Waves I (1994) and III (2001)



T-tests were conducted to compare differences in mean adolescent BMI percentile scores at the two waves of data collection, indicating Wave III BMI percentile scores were significantly higher compared to BMI percentile scores recorded at Wave I, with a mean difference of 4.99 ± 22.55 (t = 14.66, p < .0001). As expected, these results suggest that time (increasing age) has an effect on weight status over the course of adolescence.

Table 5 and Figures 4 and 5 show the distribution of adolescent BMI percentiles by weight status category at Wave I and Wave III by adolescent race and gender. Chi-

square analyses and T-tests were conducted to compare differences in mean adolescent BMI percentile scores by gender within and between each race and ethnic category. In the total sample, no significant differences were found in adolescent BMI percentiles between male and females at Wave I or Wave III.

When analyzed by race and ethnicity, results indicated significant differences within and between groups. At Wave I, African American females ($p < .001$) and Hispanic American males ($p = .03$) were more likely to be overweight compared with all other adolescents, Asian American females were more likely to be normal weight compared with all other adolescents ($p < .001$), and American Indian females were more likely to be obese ($p < .01$). At Wave III, African American males and Asian American females were more likely to be normal weight compared to all other adolescents ($p < .001$), and African American females were more likely to be overweight or obese ($p < .0001$).

Between genders and within racial and ethnic groups, African American female adolescents were more likely to be obese than African American males at Wave III ($p < .001$). Hispanic American males were more likely than female adolescents to be obese at Wave I ($p < .001$), and at Wave III were more likely to be overweight ($p < .05$). At Waves I and III, Asian American males were more likely to be overweight and obese compared with Asian American females ($p < .001$), and American Indian males were more likely than American Indian females to be overweight.

Table 5. Adolescent BMI Percentiles[1] and Corresponding Weight Status Categories by Gender and Race

	Wave I (mean = 62.45)			Wave III (mean = 67.28)		
	≤ Normal	Over weight	Obese	≤ Normal	Over weight	Obese
Total Sample						
Female	72.5% (1,657)	15.0% (342)	12.5% (286)	64.5% (1,474)	15.1% (345)	20.4% (466)
Male	70.8% (1,490)	15.5% (326)	13.6% (286)	59.4% (1,250)	23.4% (492)	17.2% (362)
African American						
Female	72.63% (788)	17.6%* (191)	9.8% (106)	46.3%† (502)	27.2%* (295)	26.5%*† (288)
Male	76.8% (659)	15.6% (134)	7.7% (65)	52.5%*† (450)	27.9% (239)	19.7%† (169)
Hispanic American						
Female	76.6% (559)	17.3% (126)	6.2%† (45)	54.3%† (396)	23.4%† (171)	22.3% (163)
Male	71.6% (520)	17.8%* (129)	10.6%† (77)	40.9%† (297)	37.7%† (274)	21.4% (155)
Asian American						
Female	88.7%† (305)	7.6% (26)	3.8%† (13)	77.0%†* (265)	11.6%† (40)	11.3%† (39)
Male	78.8%† (305)	13.4% (52)	7.6%† (30)	52.2%† (202)	30.5%† (118)	17.3%† (67)
American Indian						
Female	73.0% (89)	11.5%† (14)	15.6%* (19)	54.1%† (66)	18.9%† (23)	27.1% (33)
Male	69.1% (87)	21.4%† (27)	9.5% (12)	42.1%† (53)	34.9%† (44)	23.0% (29)

[1] CDC Growth Charts; Normal weight = < 85%, overweight = 85 ≤ 94.99%, obese = ≥ 95%.
* denotes significant differences across groups, $p < .05$.
† denotes significant differences between female and male adolescents, $p < .05$.

Figure 4. Distribution of BMI Percentiles at Waves I (1994) and III (2001) by Race Among Female Adolescents

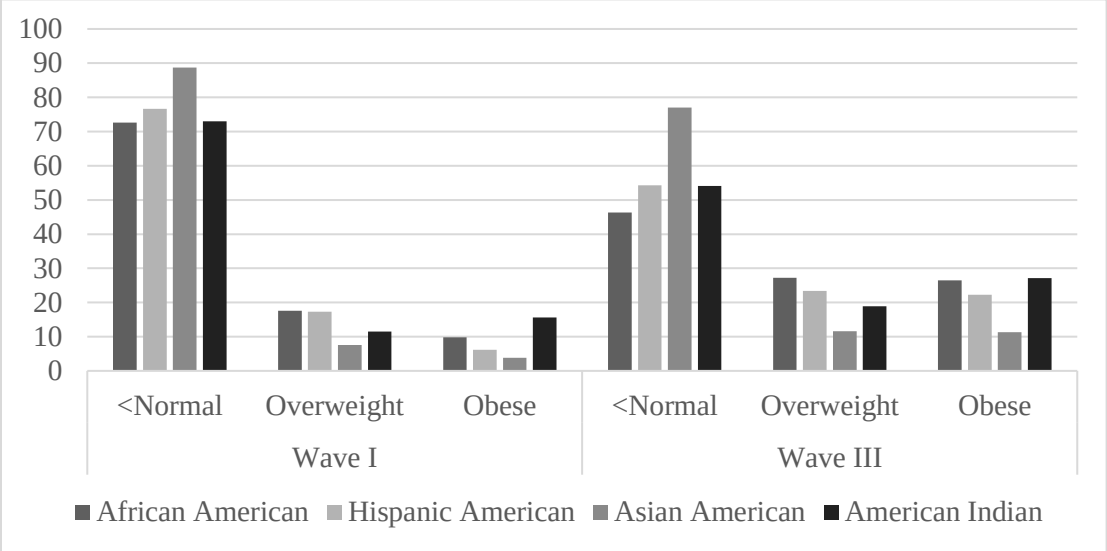
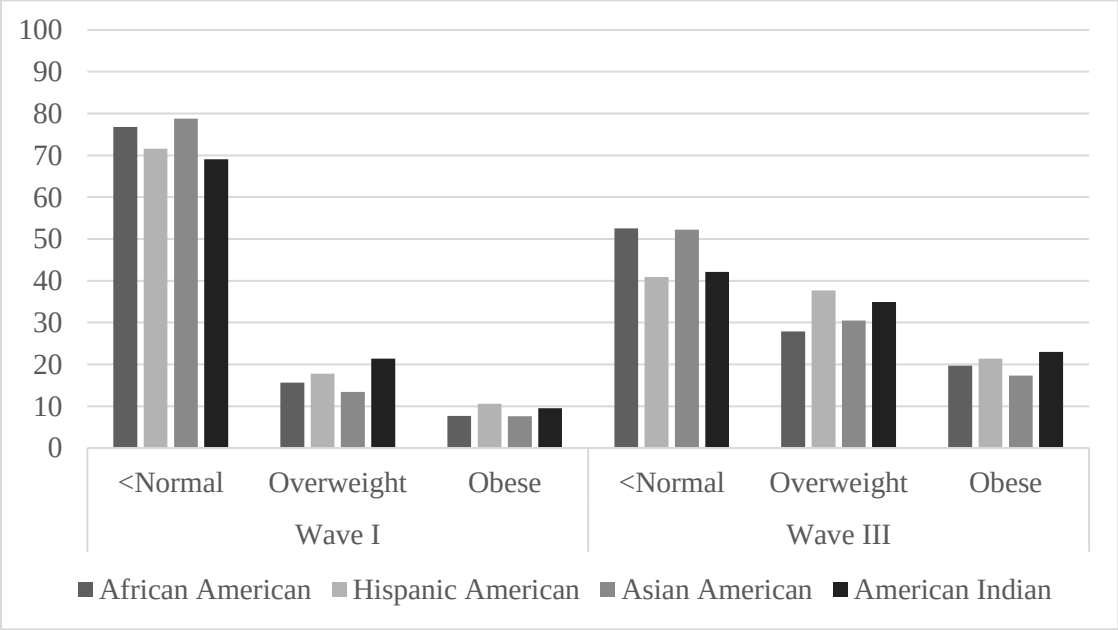


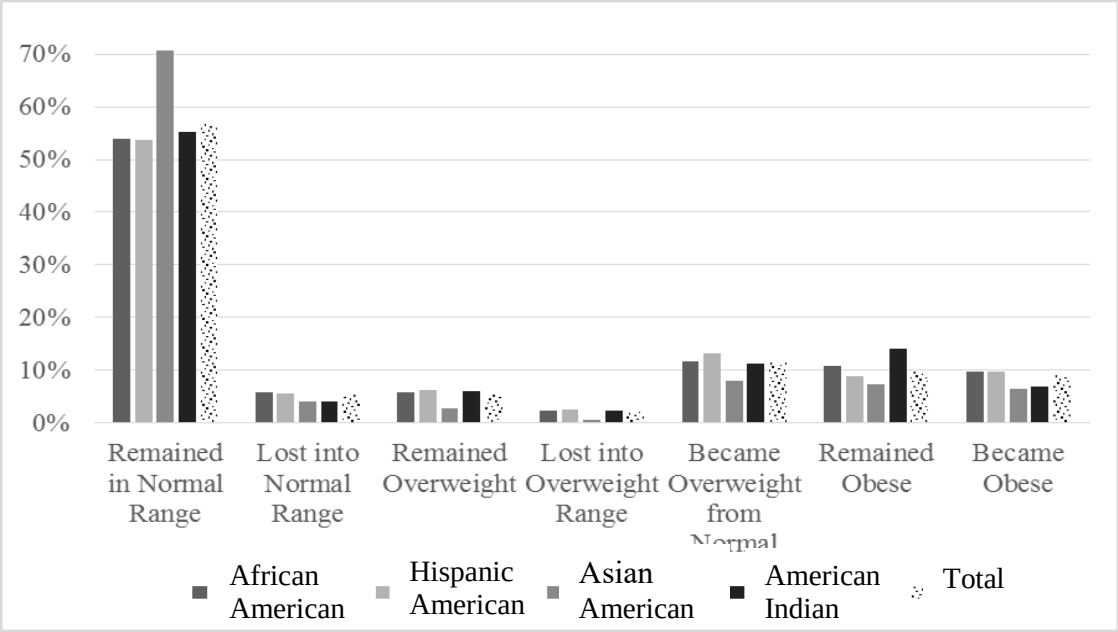
Figure 5. Distribution of BMI Percentiles at Waves I (1994) and III (2001) by Race Among Male Adolescents



GLM procedures were conducted to compare continuous differences in BMI percentile scores across the four race and ethnic minority groups over the two time points. Results indicated significant differences in BMI percentile scores across the four race and ethnicity categories at Wave I ($F = 16.67$, $p < .0001$) and Wave III ($F = 34.98$, $p < .001$). Bonferroni tests indicated significantly lower mean BMI percentile scores over time among Asian adolescents (*mean* = 57.59) compared to African American (*mean* = 68.69, difference = 11.1, *CI*: 7.88-14.33, $p < .05$), Hispanic American (*mean* = 69.97, difference = 12.38, *CI*: 9.01-15.75, $p < .05$), and American Indian (*mean* = 68.13, difference = 10.55, *CI*: 5.10-16.00, $p < .05$) adolescents. There were no significant differences in adolescent BMI percentile scores at Wave I, III, or in BMI percentile change among African American, Hispanic American, or American Indian adolescents. Results did indicate a significant interaction between time and race ($F = 4.37$, $p = .0045$), suggesting that Asian American adolescents experienced less rapid growth in BMI percentile scores over time compared to other adolescents.

Analyses also were performed to assess the nature of change in BMI percentile scores from Wave I to Wave III (Figure 5). Logistic regression and chi-square analyses indicated significant differences between race categories regarding the nature of BMI percentile change over time ($F = 16.26$, $p < .0001$; $X^2 = 61.01$, $p < .0001$), such that Asian adolescents who were within the normal weight BMI percentile range at Wave I were 1.87 times more likely to maintain BMI percentile within the normal range at Wave III compared to African Americans, Hispanic Americans, or American Indians ($p < .0001$).

Figure 6. Distribution of the Nature of Change in BMI Percentile Scores by Race



Also as a prelude to using multilevel regression to test study hypotheses, GLM procedures modeling both neighborhood disadvantage and parental support on adolescent BMI percentile at Wave I, while controlling for race and sex, indicated neighborhood disadvantage ($F = 9.49$, $p = .002$) and parental support ($F = 5.87$, $p < .01$) were each unique significant indicators of adolescent weight status ($F = 16.67$, $p < .0001$, $R^2 = .022$). A second model examining change over time, indicated that neighborhood disadvantage ($F = 14.58$, $p < 000.1$) was associated with increases in BMI percentile scores over time, and parental support was associated with decreases in BMI percentile scores over time ($F = 3.96$, $p < .05$). An interaction between parental support and time also was found significant ($F = 5.85$, $p < .01$), indicating that they effect of parental support on adolescent weight diminished over time.

Hypothesis Testing using Multilevel Regression Analyses

Multilevel regression models with random effects (2-level random intercepts models) were conducted in Mplus to account for potential statistical dependency among adolescents living in the same neighborhoods. Models were computed for each of the specified hypotheses. A total of 4,391 adolescents were analyzed at level 1, representing 56 neighborhoods at level 2 (mean of 77.52 adolescents per neighborhood cluster). Table 6 shows the means, standard deviations, and ranges of the major study variables at each level of analysis included in two-level regression models.

Table 6. Descriptive Statistics of Multilevel Study Variables (Wave I)

Variable	Mean	SD	Range
Level One: Adolescent			
Parental Support	4.52	0.57	1.20-5.00
Family Economic Stress	0.39	0.49	0.00-1.00
Adolescent Prejudice	3.12	1.19	1.00-5.00
Adolescent Health	2.15	0.93	1.00-5.00
Level Two: Neighborhood			
Disadvantage[1]	0.11	0.079	0.00-0.39
Segregation	0.53	0.32	0.00-1.00

[1]Neighborhood disadvantage is an index score created by averaging percent poverty, percent unemployment, and percent of vacant housing units in each census block group for each adolescent.

Parental Support and Adolescent Weight (Hypothesis 1). Regression analyses were conducted to estimate the effect of parental support on adolescent BMI percentile at Waves I and III, and increases in BMI percentile over time (Hypotheses 1a, b, c). Table 7 displays the results of only level-one variables on each of the three adolescent BMI percentile outcomes indicated. All three models were significant. However, parental

support was only a significant predictor of adolescent BMI percentile at Wave I ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 0.088$, $p < .01$). Family economic stress, adolescent health, and adolescent age also were significant predictors of Wave I BMI percentile scores. At Wave III, family economic stress, adolescent age, and prior BMI percentile were significant predictors of Wave III BMI percentile scores. Increase in BMI percentile scores over time were significantly predicted by adolescent prejudice, adolescent age, parental education, and prior BMI percentile score.

Table 7. Hypothesis 1: Unstandardized and Standardized Multilevel Regression Coefficients for the Effects of Parental Support on Adolescent Weight Outcomes

	Wave I BMI Percentile $R^2 = .037$*		Wave III BMI Percentile $R^2 = .477$*		Increases in BMI Percentile $R^2 = .040$*	
	Unstand.	Standard	Unstand.	Standard	Unstand.	Standard
Level One:						
Parent Support	.088*	.046*	.260	.006	.058	.014
Econ. Stress	.071*	.036*	1.66*	.028*	.439	.075
Prejudice	.009	.011	-.380	-.007	.196*	.085*
Health	.175*	.167*	-.167	-.012	.003	.001
Age	-.061*	-.082*	1.61*	.086*	.160*	.085*
Female	-.069	-.034	1.08	.019	.214	.037
Par. Educ.	-.004	-.015	-.254	-.025	-.121*	-.118*
WI BMI Pct	--	--	.799*	.690*	-.006*	.058*

* denotes significance, $p < .05$.

Neighborhood Disadvantage and Adolescent Weight (Hypothesis 2). Table 8 reflects the results from regression analyses conducted at level-two, controlling for level-one factors (except for parental support), in order to estimate the effect of neighborhood disadvantage on adolescent BMI percentile at Waves I and III, and increases in BMI percentile overtime (Hypotheses 2a, 2b, 2c). All three models were significant. Results indicated that neighborhood disadvantage significantly predicted adolescent BMI

percentile outcomes at Wave I ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 0.866$, $p = .03$) and Wave III ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 1.05$, $p = .001$), and increases in BMI percentile scores over time ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 3.12$, $p = .01$). Residential segregation did not contribute uniquely to explaining the variance in adolescent weight outcomes.

Table 8. Hypothesis 2: Unstandardized and Standardized Multilevel Regression Coefficients for the Effects of Neighborhood Disadvantage on Adolescent Weight Outcomes

	Wave I BMI Percentile Level One $R^2 = .035$* Level Two $R^2 = .451$*		Wave III BMI Percentile Level One $R^2 = .490$* Level Two $R^2 = .438$*		Increases in BMI Percentile Level One $R^2 = .043$* Level Two $R^2 = .047$*	
	Unstand.	Standard	Unstand.	Standard	Unstand.	Standard
Level One						
Econ. Stress	.060*	.030*	.014	.007	5.30*	.031*
Prejudice	.006	.010	-.008	-.010	-2.25*	-.032*
Health	.167*	.160*	-.001	-.003	-.001	.000
Age	-.064*	-.093*	.067*	.095*	.998	.016
Female	-.082	-.041	.032	.016	-.457	-.003
Par. Educ.	-.002	-.005	-.010*	-.026*	-.094	-.003
WI BMI Pct	--	--	.694*	.700*	-16.9*	-.200*
Level Two						
Nbhd. Dis.	.866*	.680*	1.05*	.662*	3.12*	.003*
Segregation	-.094	-.045	.011	.006	2.15	.030

* denotes significance, $p < .05$.

Parental Support and Neighborhood Disadvantage Predicting Adolescent Weight (Hypothesis 3). Table 9 presents results of the two-level regression models testing the simultaneous effects of parental support at level-one and neighborhood disadvantage at level-two on adolescent BMI percentile outcomes (Hypotheses 3a, 3b, 3c). All three models were significant. These results indicated that both parental support ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 0.087$, $p = .005$) and neighborhood disadvantage ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 0.828$, $p = .04$) were significant predictors of adolescent BMI percentiles at Wave I. Parental support did

not remain significant as a unique predictor of adolescent BMI at Wave III or of increases in BMI percentile over time, whereas neighborhood disadvantage was significant for Wave III BMI percentile score ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 1.05$, $p = .001$) and increases in BMI percentile score over time ($\hat{\gamma}_{10} = \hat{\beta}_{1j} = 3.15$, $p = .002$).

Table 9. Hypothesis 3: Unstandardized and Standardized Multilevel Regression Coefficients for the Effects of Parental Support and Neighborhood Disadvantage on Adolescent Weight Outcomes

	Wave I BMI Percentile Level One $R^2 = .037$* Level Two $R^2 = .459$*		Wave III BMI Percentile Level One $R^2 = .490$* Level Two $R^2 = .438$*		Increases in BMI Percentile Level One $R^2 = .043$* Level Two $R^2 = .047$*	
	Unstand.	Standard	Unstand.	Standard	Unstand.	Standard
Level One:						
Parent Support	.087*	.044*	-.010	-.003	.076	.001
Econ. Stress	.062*	.030*	.014	.007	.123*	.031*
Prejudice	.003	.006	-.010	-.010	-.050*	-.032*
Health	.174*	.165*	-.020	-.003	.167	.000
Age	-.060*	-.087*	.066*	.095*	1.00	.016
Female	-.070	-.035	.031	.016	-.500	-.003
Par. Educ.	-.030	-.006	-.010*	-.026*	-.090	-.003
WI BMI Pct	--	--	.695*	.700*	-16.9*	-.020*
Level Two:						
Nbhd. Dis.	.828*	.677*	1.05*	.662*	3.15*	.006*
Segregation	-.100	-.050	.011	.006	-.387	-.145

* denotes significance, $p < .05$.

Cross-level Interaction of Parental Support and Neighborhood Disadvantage Predicting Adolescent Weight (Hypothesis 4). Table 10 displays the results of the multilevel modeling analyses determining a cross-level interaction between parental support and neighborhood disadvantage. This test shows whether the effect of the level-one variable (parental support) varies across level-two units (neighborhoods); that is, whether neighborhood disadvantage moderated the relationship between parental support

and adolescent weight outcomes (Hypotheses 4a, 4b, 4c). All three models were significant. Results from these models predicting adolescent BMI percentile at Waves I and III and increases overtime do not support the hypothesis of a significant cross-level interaction, though the effect of the interaction term between parental support and neighborhood disadvantage approaches significance (p = .06) when predicting increases in adolescent BMI percentile scores over time.

Table 10. Hypothesis 4: Unstandardized and Standardized Multilevel Regression Coefficients for the Effects of a Cross-level Interaction of Parental Support and Neighborhood Disadvantage on Adolescent Weight Outcomes

	Wave I BMI Percentile Level One R^2 = .037* Level Two R^2 = .459*		Wave III BMI Percentile Level One R^2 = .49* Level Two R^2 = .44*		Increases in BMI Percentile Level One R^2 = .043* Level Two R^2 = .047*	
	Unstand.	Standard	Unstand.	Standard	Unstand.	Standard
Level One:						
Parent Support	.087*	.044*	-.010	-.002	.119	.001
Econ. Stress	.061*	.030*	.013	.007	.122*	.030*
Prejudice	.003	.006	-.010	-.010	-.049*	-.033*
Health	.174*	.165*	-.020	-.003	.036*	.001
Age	-.06*	-.087	.066*	.095*	.972	.016
Female	-.070	-.035	.031	.016	-.560	-.003
Par. Educ.	-.030	-.006	-.010*	-.026*	-.104	-.004
WI BMI Pct	--	--	.695*	.700*	-16.9*	-.200*
Level Two:						
Nbhd Dis.	.828*	.677*	1.05*	.663*	3.04*	.005*
Segregation	-.100	-.040	.011	.005	2.21	1.01
Cross-Level Interaction:						
Parent Support x Nbhd. Dis.	.047	.004	.116	.009	.153	.017

* denotes significance, $p < .05$.

CHAPTER VI

DISCUSSION

The vast majority of research on childhood and adolescent weight trends in the United States has employed a deficit lens through which people of color have been compared against European American counterparts. Though such a perspective paints a grim and compelling portrait of the significant race-, ethnicity-, and social-related disparities in rates of overweight and obesity compared to more privileged populations, this approach to understanding the obesity epidemic challenges the ability to fully understand the influence of larger social contexts on health outcomes. Research approaches rooted in a deficit perspective are based within and perpetuate a long-established system of power imbalance that continues to shape contemporary social issues. It is imperative that researchers go beyond a deficit perspective to discuss conceptualizations of health and well-being from the vantage points of people of color. Such an approach may prove useful for understanding the ways in which individual experiences and different aspects of racial- and social-identities intersect to shape adolescent weight-related health and public health responses to various social interests. Adolescent overweight and obesity are not limited to any one particular age, gender, race, or ethnic group, which suggests that the unique behaviors of individual members of various racial and ethnic subgroups may be less predictive of weight outcomes (Crawford et al., 2001). This assertion, paired with data from numerous studies indicating lower

rates of overweight and obesity among European American adolescents, implies that larger contextual and social factors may be central.

Guided by the tenets of the bioecological model and critical race theory, the present study responds to this call by investigating individual- and neighborhood-level contexts of adolescents of color. Specifically, adolescent weight outcomes were examined as a function of neighborhood-level economic disadvantage and segregation, adolescent perceptions of parental support, and adolescent perceptions of prejudice and their own general health status. Moreover, the current study fills a noteworthy gap in the understanding of contextual influences on adolescent growth and development during the transition into young adulthood.

Adolescent BMI Percentiles and Change Over Time

The results here show that the overweight and obesity status of U.S. adolescents of color continues to increase across adolescence, and the distribution of BMI percentile scores indicates greater positive shift towards the upper end of the BMI percentile distribution across 6 years of adolescence. This finding is not unique; it is a well-documented phenomenon in previous research studies (Gordon-Larsen, Adair, Nelson, & Popkin, 2004). The increase in BMI percentile scores in the overweight and obese ranges from adolescence to young adulthood reflects growth that is over and above that which would be expected as adolescents approach adulthood, though this growth follows a similar pattern to trends reported in other nationally representative samples between 1999 and 2010 (NHANES) (Flegal et al., 2002; Hedley et al., 2004; Ogden, Carroll, Kit, & Flegal, 2013). The population shift in BMI percentile scores is most evident within the

higher BMI percentile ranges. This indicates an increase in both the prevalence and the severity of excess body mass.

Differences Across Adolescents of Color BMI Percentile by Race and Ethnicity

Differences across adolescents of color were observed at both Waves I and III, but only between Asian American adolescents and other adolescents of color. Significantly lower BMI percentile scores among Asian American adolescents, and the finding that Asian American adolescents experienced less rapid growth in BMI percentile scores over time, was not unexpected. Prior studies using Add Health data have shown that Asian American and Pacific Islander adolescents show substantially lower rates of obesity compared to other youth (Gordon-Larsen, Adair, & Popkin, 2003b; Popkin & Udry, 1998). These findings may be due to the common and racialized portrayal of Asian Americans and Pacific Islanders as "honorary Whites" or "model minorities," which align Asian Americans more closely to European Americans in the American social landscape than with other groups characterized by darker skin tones (African Americans and Hispanic Americans), lower mean SES, and lower mean rates of intermarriage with European Americans (Blau & Bonilla-Silva, 2002; Kim, 2007; Lamont & Gans, 1999).

An alignment with "whiteness" as a cornerstone of privilege, access, and social mobility in the American national identity may be an explanation for lower rates of overweight, obesity, and disadvantage seen among Asian American adolescents as a whole. It would be dangerous, though, not to question this concept further, as racial mobility and alignment with European Americans is based in a long-established system of White-American hegemony that exercises power and privilege over all people of color

(Kim, 2007). Though some Asian American groups may be able to meet certain aesthetic and social criteria that some Americans perceive as necessary for shoring up status as authentic 'White' Americans with racial dominance, this is not a likely reality for most Asian American youth and hinges on the ability of individuals within the Asian American population to racially assimilate. Thus, it is imperative to note a key flaw in the conceptualization of race portrayed here and in many other studies—diversity and social stratifications within racialized groups should be disaggregated rather than lumped.

Differences in Adolescent BMI Percentile by Adolescent Gender

Biological (sex) differences among male and female adolescents are evident in the patterning of body fat composition, metabolic requirements and expenditures, and the health consequences of excess body fat on physiology (Legato, 1997). However, genetic studies of weight status often report differences between male and female individuals that are generally small or inconsistent, as biology explains only a small portion of the difference between male and female weight outcomes (Sweeting, 2008). A true understanding of weight status among male and female adolescents requires a focus on differences attributed to society and culture (gender differences). Though both terms 'sex' and 'gender' have relevance when describing adolescent BMI percentile outcomes, the two should not be used interchangeably as 'sex' refers to purely biological differences and 'gender' refers to socially constructed differences (Bird & Reiker, 1999). Consistent with the specific theoretical underpinnings from which this work is derived, the term 'gender' is used here to acknowledge that differences among male and female

adolescents are unlikely to have solely biological origins and are shaped by a complexity of social and cultural factors (Krieger, 2003).

Results from preliminary analyses indicate no significant differences in adolescent BMI percentile outcomes in adolescence or young adulthood between male and female adolescents of color from the total sample. When examined more specifically by race and ethnicity, however, results indicated that African American females were more likely to be obese in young adulthood compared to African American males, and African American males were more likely to be normal weight. Hispanic American males were more likely to be obese in earlier adolescence compared to Hispanic American females, and in young adulthood Hispanic American females were more likely to be normal weight and Hispanic American males were more likely to be overweight. Among Asian American males and females, Asian American males were more likely to be obese in adolescence and young adulthood, and Asian American females were more likely to be normal weight. In young adulthood, Asian American males were more likely than female adolescents to be overweight. Among American Indian males and females, male adolescents were more likely to be overweight in adolescence and young adulthood, and female adolescents were more likely to be normal weight in young adulthood.

Parental Support and Adolescent Weight (Hypothesis 1)

Parental support, family economic stress, adolescent health, and adolescent age were significant in the model assessing the effect of parental support on BMI percentile score in earlier adolescence (i.e., Wave I). Adolescent age, parental education, and prior BMI were the significant predictors of BMI in later adolescence (i.e., Wave III), and

family economic stress, adolescent prejudice, and prior BMI were the significant predictors of increase in BMI percentile scores over time.

When controlling for all level-one variables, the parental support coefficient switched from a negative to a positive association, indicating that higher levels of parental support uniquely predicted higher adolescent BMI percentile in earlier adolescence. This was not expected and may indicate that the meaning of parental support, as it was assessed here, varies with other level-one variables such as family economic stress, adolescent health, and adolescent age. Though it was hypothesized that parental support would demonstrate effects on adolescent weight at both time points and on increases in BMI percentile over time, it is not surprising to find that the effect of parental support is limited only to Wave I outcomes. Given the age of the sample studied here and the interval between waves of data collection, it is likely that the effects of parental support are more dramatic among adolescents when they are younger compared to when they are older adolescents, as adolescents are likely to have greater reliance on their parents for support and warmth at younger ages. Over time, adolescents' reliance on parental support and warmth may diminish as they become more independent and gain more autonomy over their own behaviors. By Wave III the sample of adolescents were between 18 and 25 years old, and the effects of parental support may not have been dramatic or pervasive enough to persist over the long interval between data collection periods, or the effects of parental support may persist more acutely. Had indicators of parental support been available during the Wave III data collection period it might have been possible to estimate the cross-sectional association between parental support at each

wave and BMI outcomes at each wave, as well as the influence of change in parental support over time.

Studies investigating the role of general parenting (in particular parenting styles) and adolescent obesity risk and weight-related outcomes have yielded mixed results, and insights into the long-term effects of parenting on adolescent weight over time have been limited (Boles, Reiter-Purtill, & Zeller, 2013; Gable & Lutz, 2000b; Kremers et al., 2003; Lytle, 2009; Rhee et al., 2006; Rhee, 2008; Agras, Hammer, McNicholas, & Kraemer, 2004; Young, Fors, & Hayes, 2004; Zeller, Boles, & Reiter-Purtill, 2008). Most assessments of the relationship between parenting and adolescent weight outcomes have been cross-sectional in nature (Gable & Lutz, 2000; Kremers et al., 2003; Zeller et al., 2008) or limited to very brief assessment periods (Berge, Wall, Loth, et al., 2010; Rhee et al., 2006; Agras et al., 2004). One study (Lissau & Sorensen, 1994) has indicated that lack of parental care during childhood and young adolescents is associated with an increased risk of obesity among older adolescents and young adults, and another (Lehman et al., 2005) showed that young adults with obesity were more likely to have been raised in environments characterized by lower levels of parental affection. No studies to date, however, have examined whether parenting during childhood or adolescence is predictive of longer-term weight-related outcomes among adolescents transitioning into adulthood. The results from the current study call into question the unique role that general parental support might play in adolescent weight outcomes. Guided by the theoretical distinction between general parenting behavior and specific parenting practices, future research might need to consider examining supportive

parenting practices focused on effective coping, healthy food choices, and physical activity.

Neighborhood Disadvantage and Adolescent Weight (Hypothesis 2)

In the model assessing the effect of neighborhood disadvantage on BMI percentile scores earlier in adolescence (controlling for level-one variables), family economic stress, adolescent health, and neighborhood disadvantage were significant predictors. In later adolescence, adolescent age, parental education, prior BMI, and neighborhood disadvantage were significant predictors of adolescent BMI percentile scores. Family economic stress, adolescent prejudice, and neighborhood disadvantage were significant predictors of increase in adolescent BMI percentile scores over time.

Controlling for individual factors (level one), adolescents living in neighborhoods characterized by greater levels of neighborhood disadvantage had greater BMI at Wave I and Wave III, and greater increases in BMI across time. These findings are consistent with prior investigations showing that neighborhood poverty levels are linked with greater BMI during adolescence and with weight gain over time (Burdette & Needham, 2012; Lee et al., 2009; Lippert, 2016). One study in particular investigated the role of neighborhood disadvantage among adolescents from Add Health indicating those raised in poor versus non-poor neighborhoods were more likely to become obese as they transitioned from adolescence to adulthood (Lippert, 2016). Though the current study assessed only the effect of neighborhood disadvantage at Wave I on weight outcomes at Wave I and III and on change in BMI over time, Lippert's findings indicate that adolescents who lived in poorer neighborhoods consistently from Wave I to Wave III

were more likely to remain obese or become obese compared to adolescents who lived consistently in lower poverty neighborhoods. Adolescents that lived in impoverished neighborhoods at Wave I who then exited severe poverty by Wave III demonstrated a curtailed risk for obesity, though the risk was expectedly higher compared to adolescents who had never lived in poverty at any point. The results from the current study extend beyond neighborhood poverty given the index that aggregated neighborhood poverty, neighborhood unemployment, and neighborhood housing quality. As such, the literature has been strengthened by a more expansive examination of community contexts.

In a society ruled by White privilege and the power of wealth, where higher income means greater opportunity, the link between neighborhood disadvantage and adolescent weight outcomes is hypothesized to be a function of uneven distribution of social and structural resources such as exercise amenities, sources of healthy foods, and increased exposure to various forms of stress in poorer versus non-poor neighborhoods (Estabrooks, Lee, & Gyurcsik, 2003; Gordon-Larsen, Adair, et al., 2003b; Harris, Gordon-Larsen, Chantala, & Udry, 2006). Thus, neighborhood disadvantage can shape exposure to proximate risks for obesity by influencing behaviors, social interactions, and physiological/psychological stress.

Parental Support and Neighborhood Disadvantage Predicting Adolescent Weight (Hypotheses 3 and 4)

In models assessing both parental support and neighborhood disadvantage as simultaneous predictors of BMI percentile scores in earlier adolescence, parental support, family economic stress, adolescent health, adolescent age, and neighborhood

disadvantage were significant. In later adolescence, however, only adolescent age, prior BMI percentile, and neighborhood disadvantage were significant predictors. Family economic stress, adolescent prejudice, adolescent health, prior BMI percentile, and neighborhood disadvantage were significant predictors of increases in BMI percentile overtime. These models indicate that the effect of parental education no longer was significant, and the effect of adolescent health on BMI percentile in later adolescence became significant when both parental support and neighborhood disadvantage were assessed.

The finding that adolescent age, prior BMI percentile, and neighborhood disadvantage were the only significant predictors of adolescent BMI percentiles in young adulthood suggest that these three variables (as assessed in early adolescence) may have more lasting effects on adolescent outcomes compared to other variables that were significant only in early adolescence (parental support, family economic stress, and adolescent health). It is not surprising that both age and prior BMI were found significant, as numerous studies have shown that prior weight status and adolescent age are two of the strongest predictors of BMI percentile outcomes. The coefficient of multiple determination (R^2) values at the individual and neighborhood level indicate that a much larger proportion of variance is explained at the neighborhood-level (45.9%) compared to the individual-level (3.7%). Thus, additional variables not assessed at level-one account for a much larger proportion of variance in early adolescent BMI percentile outcomes, and most factors (except adolescent age) that had shown unique effects in early adolescence were not robust enough to explain weight outcomes in young adulthood.

This is likely because the factors that influence weight-related behaviors in earlier adolescence are not equivalent to the factors that shape outcomes over time or in young adulthood. Assessment of change in such factors over time should be a focus of future investigations.

As hypothesized, increases in adolescent BMI over time were influenced by family economic stress, such that higher levels of economic stress in early adolescence were predictive of greater increases in BMI percentile. However, adolescent report of greater exposure to prejudice and higher BMI percentile scores in earlier adolescence were predictive of less increase in BMI percentile scores over time, which countered my hypotheses. These findings may suggest the presence of additional factors which could provide a context for understanding how adolescent factors intersect to shape outcomes over time. The R^2 values at the individual-level (.043) and the neighborhood-level (.047) support this assertion that additional explanatory factors would be useful.

In models assessing the interaction between parental support and neighborhood disadvantage as a predictor of BMI percentile scores in earlier adolescence, parental support, family economic stress, adolescent health, adolescent age, and neighborhood disadvantage were significant. In later adolescence, adolescent age, parental education, prior BMI percentile, and neighborhood disadvantage were significant predictors. Family economic stress, adolescent prejudice, adolescent health, prior BMI percentile, and neighborhood disadvantage all were significant predictors of increases in BMI percentile overtime. These models indicate that the effect of parental education on BMI percentile

in later adolescence became significant, and the effect of adolescent health on increase in BMI percentile became significant when the interaction term was added to the models.

As described earlier, parental support significantly predicted higher adolescent BMI percentile scores only in earlier adolescence. When neighborhood disadvantage was considered, parental support was not associated with adolescent's weight outcomes. The effect of neighborhood disadvantage, however, remained significant across early and late adolescence and on increase in BMI percentile scores over time even when all variables were added to the model. Results did not indicate a cross-level interaction between parental support and neighborhood disadvantage as it was hypothesized, suggesting that the influence of parental support (received earlier in adolescence) on adolescent BMI percentile outcomes is not altered by level of community disadvantage.

When assessed simultaneously in the same models predicting adolescent weight outcomes, neighborhood disadvantage and parental support both were significant. Given the lack of a significant cross-level interaction between these factors, these findings suggest that parenting behaviors such as parental support and warmth may not vary by neighborhood context in the relationship with adolescent weight, or the intricacies of parenting behaviors are less vulnerable to indicators of community disadvantage than are adolescent weight outcomes. Given the significant influence of neighborhoods and parenting on adolescent weight, future studies should attempt to estimate whether neighborhood-, parent-, or cross-level factors explain greater proportions of variance in adolescent weight-related outcomes. Such information would be particularly useful for planning appropriate interventions targeting adolescent weight. In addition, it would be

useful to know if the impact of neighborhood- versus parent-level factors may be more or less explanatory for certain subpopulations, and if the meaning of such factors may differ on the basis of individual and group characteristics (e.g., age, race, gender, culture).

Each of the multilevel models presented here indicate significant chi-squared statistics and low ICC values, which can be interpreted to mean that important predictors of weight status were not included in the model, and that there is little statistical dependency at the neighborhood level of analysis. Even so, the findings from the full model including the interaction term indicate several significant predictors of weight outcomes across adolescence with high R^2 values. In sensitivity analyses not detailed here, these results were nearly identical when categorical BMI percentiles were assessed. Though the use of such a large dataset could in part help explain the presence of significant findings in these models, these findings do yield important information about the role of neighborhood disadvantage in the potential prevention of increase in BMI percentiles, as lower levels of neighborhood disadvantage were associated with lower adolescent BMI percentiles and less increase in BMI percentile scores over time.

Neighborhood Segregation and Adolescent Prejudice

In this study neighborhood segregation was positively correlated with neighborhood disadvantage, such that neighborhoods with higher levels of disadvantage also were neighborhoods characterized by more segregation. As expected, segregation also was positively correlated with family economic stress, being African American, Hispanic American, or American Indian, and with BMI percentiles at Waves I and III. MLM analyses did not indicate that higher levels of residential segregation uniquely

predicted higher adolescent BMI percentiles, as it would have been expected based on the theoretical foundations of this study.

Adolescent prejudice significantly predicted increases in adolescent BMI percentiles, but not as hypothesized. Overtime the coefficient for prejudice switched from a positive to a negative association, but was not significant for adolescent BMI percentile scores at Wave I or Wave III—only for increase in BMI percentile. These results suggest that adolescents experiencing lower levels of prejudice earlier in adolescence demonstrated greater gains in BMI percentile, and this relationship persisted even after all variables were added to the models.

Interestingly, segregation was negatively correlated with adolescents' reported exposure to prejudice. The preliminary finding that residential segregation was inversely related to adolescent reports of prejudice is consistent with prior research indicating that perceived racism may be inversely correlated with segregation (Cozier et al., 2014), as adolescents living in highly segregated neighborhoods may be exposed to lower levels of prejudice because such communities are characterized by lower levels of social interaction with European Americans. This might also explain the change in the direction of the relationship between adolescent prejudice and BMI percentile outcomes over time. However, another study has indicated that racial prejudice is lower in more integrated communities (Hewstone & Swart, 2011), though poverty and education levels might play a role in moderating this relationship. Segregation also was negatively correlated with being Asian American, which may be due to the hypothesis that Asian Americans are

more likely to be viewed as “honorary whites” with more social mobility than other groups of color (Kim, 2007).

The persistence of segregated communities and neighborhoods is a function of structural racism that perpetuates the subordination of racialized lower classes (Douglas S. Massey & Fischer, 2000; Douglas S. Massey, White, & Phua, 1996; Douglas S. Massey, 1985, 2012), that likely is exacerbated by poverty level. Within impoverished populations (irrespective of race), where all individuals have fewer choices because of their low socioeconomic status (compared to groups that do not live in poverty), one might assume that such a condition would consign all “poor” people to live in relatively integrated neighborhoods—neighborhoods in which the only defining characteristic is shared poverty. The reality, however, represents quite the contrary, as there tends to be more segregation across impoverished neighborhoods than in economically advantaged communities. The level of poverty itself may play a key role in the maintenance of segregated communities. As mentioned, evidence suggests that adolescents of color experience less racial prejudice and discrimination as they achieve higher socioeconomic status, in part due to the influence of SES on the ability to live in integrated communities. Thus, indicators of SES influence the degree to which adolescents of color experience both prejudice and segregation. Among “poor whites,” the experience of social disadvantage resulting from poverty might encourage individuals and communities to value and protect the one significant attribute that can afford them some social privilege—their birthright of “whiteness.” Maintaining the value of “White” as a superior

racial classification in turn fuels the maintenance of racial distinctions, prejudice, and segregation.

Adolescent BMI Percentiles and Adolescent Gender

It is surprising to find that gender was not significant in any of the multilevel models described here. This could be explained by the findings from the preliminary analyses, which indicated significant gender differences were found only when gender was assessed by race and ethnicity. Thus, multilevel models could have benefited from inclusion of an interaction term between gender and race.

In a review of gendered dimensions of adolescent obesity, Sweeting (2008) reported that differences in weight outcomes observed based solely on gender without controlling for other factors revealed no consistent evidence to assert that higher rates of overweight or obesity predominate among either male or female adolescents. Gender differences become much more pronounced when observed according to sociocultural factors such as racial and ethnic group, suggesting that studies should examine an interaction between gender and racial, ethnic, and cultural factors in order to estimate gender differences in adolescent weight outcomes.

Limitations

Due to the exclusion criteria used in the current study, the effect of neighborhood-level disadvantage on adolescent outcomes could potentially have been underestimated, as the analytic sample used here was slightly less disadvantaged than the full Add Health population. Even so, this only increases confidence in the effects found here, as they may provide more conservative estimates.

The findings presented here (and I suspect in many other investigations) may be masking important and complex differences within subpopulations, as there are multiple ethnic categories and cultural distinctions that exist within each of the main race and ethnicity categories so commonly defined in mainstream research literature. Future work should go a step beyond the results presented here to examine interactions with youth of color. For example, the differences seen in preliminary analyses between Asian American adolescents and other races and ethnicities could be due to additional factors related to nativity, culture of origin, and processes of acculturation (Lowry, Eaton, Brener, & Kann, 2011). Intergenerational patterns of obesity indicate that Asian American adolescents who were born in the U.S. are more than twice as likely to be obese compared to first generation residents of the U.S. (Popkin & Udry, 1998), and prevalence of obesity among Asian-Americans differs by country of origin (Jain et al., 2012). Given the mixed findings in obesity prevalence among Asian American adolescents and the knowledge that rates of adolescent obesity are significantly higher among second and third generation U.S. immigrants, future studies should attempt to account for generational status, parental nativity, and issues of assimilation and acculturation as they may contribute to the understanding of weight-related health disparities. Despite a lack of significant differences between BMI percentile outcomes across African American, Hispanic American, or American Indian adolescents assessed here, these issues can be applied to all subpopulations, particularly Hispanic and Latino American adolescents born in the U.S., as they also are twice as likely to be obese compared to their first-generation counterparts (Popkin & Udry, 1998).

Interpretation of the results presented here are limited by the lack of an assessment of measurement equivalence across racial and ethnic groups for the parental support measure. Parenting and adolescents' perceptions of parenting are influenced by cultural and reference group socialization, which could lead to differences in interpretation of parenting measures (on behalf of respondents and investigators) across groups (Julian, McKenry, & McKelvey, 1994). Lack of measurement equivalence can occur when a construct is not conceptualized in the same manner across groups or is conceptually different at different points in time (Crockett, Randall, Shen, Russell, & Driscoll, 2005). Thus, a measure of parental support developed for one group (e.g., European Americans) might fail to capture aspects of parental support pertinent to other groups (e.g., adolescents of color) (Hui & Triandis, 1985). Given that adolescents of color are influenced by and represent distinct nationalities, historical influences, cultural traditions, and social norms, their understandings of parental support and responses to parental support measures may vary along such distinctions (Chao, Asian American Parenting and Parent-Adolescent Relationships).

This study does not account for continuity or change in predictor variables, but rather suggests that exposure to such variables at any point in time in adolescence may influence future outcomes. Though this concept is similar to the "sensitive periods model," which asserts that insults occurring at developmentally vulnerable stages have more profound effects on outcomes than insults that occur outside of such periods, the current study included adolescents from various developmental stages at each time point. Future studies should attempt to correct for the limitations of point-in-time measures by

accounting for the influence of multiple exposures from various developmental time points. This would be particularly helpful given evidence suggesting that exposure to chronic poverty has been shown to exert a negative effect on various adolescent outcomes, particularly when compared to episodic poverty (Duncan & Brooks-Gunn, 2010; Duncan, Connell, & Klebanov, 1997).

Though Add Health provides a wealth of data on a large and representative sample of adolescents, secondary datasets are limited in a number of ways. Factors pertinent to the incidence of obesity prior to the adolescent period cannot be captured, and it is therefore impossible to study or control for the effect of such factors on adolescent outcomes. Use of secondary analyses also precludes the inclusion of important measures potentially associated with adolescent outcomes that were not obtained by Add Health, and also means that researchers must perform investigations based only on the information provided to them in the dataset. Thus, other factors not studied here may have contributed additional pertinent information to the models, including parent and adolescent immigration status and length of residence in the United States (particularly among Hispanic adolescents).

The multilevel models, though significant, indicated that the factors included explained only a small portion of the variance in adolescent BMI percentile outcomes. These findings suggest that additional factors could contribute to a more robust understanding of BMI percentile outcomes (Lee, Mullan-Harris, & Lee, 2013). Because the preponderance of evidence, including the current results, suggests that the determinants of adolescent weight status are multiple and multilevel, attempts to address

adolescent overweight and obesity as racialized social problems will similarly require multi-faceted and multilevel approaches that are uniquely tailored to the circumstances, contexts, needs, and characteristics of individuals and of neighborhoods.

Racial differences in neighborhood disadvantage were not assessed in the current study, which is a topic deserving of further investigation given that race influences social mobility and the ability to move out of disadvantage. Prior research has shown that the consequences of living in disadvantaged neighborhoods varies by race and gender, which may be because neighborhood environments are more or less consequential for some adolescents over others and different individuals experience disadvantage in different ways (Carvalho & Lewis, 2003; Clampet-Lundquist et al., 2011). To focus on this topic more appropriately, there is a clear need for the disaggregation of group-level socioeconomic data in future analyses. Interestingly, group-level data from the 1970-2000 U.S. censuses could cause one to believe that Asian Americans in particular have achieved "socioeconomic glory" compared to all other groups (including European Americans), as census reports indicate they have the highest education and family income levels, and inhabit the most expensive neighborhoods (Kim, 2007). What these data suffer from is a lack of context and a failure to differentiate between the unique racial and cultural stratifications that exist due to lumping seemingly similar groups into larger racialized categories. A more complete picture of neighborhood disadvantage, then, could be achieved by assessing the social class disparities that exist within specific subpopulations (Bonilla-Silva, 2002; Gans, 1999; Kim, 2007).

Strengths

Strengths of this study include use of a nationally representative sample of adolescents from various racial and ethnic backgrounds and social contexts; use of multilevel methodologies; and the longitudinal design that enabled assessment of change in adolescent BMI percentile across the adolescent period. In addition, prior studies of parenting and adolescent weight outcomes typically have been insufficiently powered to detect group differences by race and gender (Rhee et al., 2006) or have been limited by their use of discrete community or clinical samples (Berge et al., 2010). The current investigation overcomes these limitations as Add Health is a large nationally representative sample that is well poised and powered to examine potentially important factors related to weight. Future research also could profit by expanded attention to the intersections of multiple dimensions of inequality, particularly the interaction between race and gender, as social disparities in body weight and weight-related behaviors may be shaped differently among women and men of color (Ailshire & House, 2011). The study of the intersectionality of gender inequality and racial discrimination has been met with some extensive research to explain gender- and race-related obstacles within economic, political, and social spheres (Bond, 2003), but has been studied only scarcely in relation to the widening social disparities in overweight and obesity (Ailshire & House, 2011).

Conclusion

Results of the current study indicate that higher levels of neighborhood disadvantage at earlier points in adolescence (Wave I) are associated with higher BMI percentile scores in cross-sectional analyses, predictive of higher BMI percentile scores

in later adolescence or early adulthood (Wave III), and increases in BMI percentile scores over time. This is consistent with prior studies suggesting that neighborhood contextual factors during adolescence play a role in shaping outcomes in later adolescence and young adulthood, with differential effects on outcomes depending on whether neighborhood contexts are advantaged or disadvantaged as indicated by poverty, neighborhood unemployment, and housing quality (Kwon & Wickrama, 2014).

This dissertation ultimately provides a critique of adolescent weight status, particularly overweight and obesity, as legitimate public health issues whose higher prevalence among adolescents of color is a function of institutionalized White dominance and an embodiment of racial injustice. Racially and economically delineated groups, neighborhoods, and health problems have been created and maintained by the dominant European American culture throughout American history, and continue to persist, literally and figuratively, as segregated enclaves that preserve oppression and repress well-being through a complex web of factors too numerous to explicate. Indeed, the construction of America's "obesity epidemic" and characterization of obesity as a problem of poor people of color may in and of itself fortify this system of oppression and bolster status quo social hierarchies.

In line with critical race theory, comparisons between European Americans and adolescents of color were not performed in the present analysis. This removal of race is not based on a goal of achieving 'color-blindness' or of viewing race as irrelevant, but rather to emphasize the premise that an understanding of race is critical to the understanding of socially constructed problems—so much so that people of color should

not be assessed against European Americans, as they experience a level of privilege that can never be fully transferred to other groups. Viewing obesity through a deficit lens, as is so common across fields of research, merely serves to blame oppressed peoples for their own oppression and fails to acknowledge the systemic inequities that helped create such oppression (Yosso, 2002). In addition, deficit perspectives propagate distorted ways of thinking about social phenomena and maintain stereotypes that have become engrained in the American social backdrop. Developing an understanding of the issues facing adolescents of color requires an acknowledgement that race does indeed matter and there are issues within groups of color that are masked when these groups are compared to unrealistic White standards.

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