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Factors related to obesity and overweight among Black adolescent girls in the United States

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Abstract

In the United States, Black adolescents have the highest prevalence of pediatric obesity and overweight among girls. While Black girls are disproportionately affected, the reasons for this health disparity remain unclear. The authors conducted a systematic review to investigate the factors related to obesity and overweight among Black adolescent girls. The authors searched four databases for relevant English-language publications using all publication years through 2015. Fifty-one studies met the inclusion criteria and were used for this review. Using a configuration approach to synthesis, three categories were identified, paralleling the bioecological theory of human development: (1) individual, (2) interpersonal, and (3) community and societal factors. A description of each factor's association with obesity among Black adolescent girls is presented. From this review, the authors identified a diverse and vast set of individual, interpersonal, and community and societal factors explored for their relationship with obesity and overweight. Given the insufficient repetition and limited significant findings among most factors, the authors believe that multiple gaps in knowledge exist across all categories regarding the factors related to obesity and over-weight among Black adolescent girls. To improve the quality of research in this area, suggested research directions and methodological recommendations are provided.

Keywords

Adolescent; associated/risk factors; Black/African American; female; obesity

Introduction

Obesity is a major health problem in the United States and disproportionately affects Black adolescent girls who have the highest prevalence of overweight among male and female Black, White, and Hispanic high school students (Kann et al. 2014). Forty-two percent of Black girls meet or exceed the Centers for Disease Control and Prevention (CDC)

overweight classification (Ogden et al. 2014). Further, Black females demonstrate the highest risk of developing obesity/overweight in adolescence (Huh et al. 2012), and 95% of adolescent Black females with obesity remain obese in adulthood (Gordon-Larsen, The, and Adair 2010). This persistence of obesity, along with 82% of Black women meeting the CDC overweight classification (Ogden et al. 2014), suggests that focusing on the adolescent period is important to our understanding of the prevention of childhood and adult obesity among Black females.

To date, few interventions to address this disparity have produced meaningful reductions in weight or obesity at the individual or population level (Kumanyika, Whitt-Glover, and Haire-Joshu 2014). At the individual level, prevention and treatment interventions using family involvement or out-of-school time approaches have yielded unchanged or undesired changes in body mass indexes (BMIs; Barr-Anderson et al. 2013, 2014). At the population level, obesity rates continue to climb among Black females (Flegal et al. 2012; Madsen, Weedn, and Crawford 2010), indicating that the most important obesity drivers may yet to be targeted through previous intervention and policy efforts. The authors suggest that to design more effective approaches aimed at closing this significant health disparity, a comprehensive evaluation of the multidimensional factors contributing to obesity among Black adolescent females is an essential first step.

Therefore, the purpose of this critical, systematic review was to examine the factors related to obesity and overweight among Black adolescent girls in the United States (hereafter referred to as Black girls). The authors defined *factors related to obesity and overweight* to include broadly: (1) studies that addressed associated factors, covariates, and other statistical descriptions (e.g., prevalence of factor by weight status, bivariate analyses) that have been related to obesity, overweight, and/or increases in BMI or adiposity in Black girls, and (2) studies that reported individuals' understanding and/or experience of factors related to obesity, overweight, and weight gain among Black girls. As qualitative reports using interviews and thematic analysis approaches often produce findings similar in interpretive depth to the descriptive findings in quantitative reports, the authors definition appropriately promoted the inclusion of both quantitative and qualitative investigations (Voils et al. 2008).

Methodology

Search strategy

We searched four databases (PubMed, CINAHL, PsychInfo, and SocINDEX) to identify relevant articles from any publication year through August 2015 (Figure 1). Search terms were identified in response to each database's article indexing vocabulary (Figure 1). Limits to language, sex, and age were applied as available. We included the 6–12-year age range in addition to the 13–18-year range to capture the entire adolescent age group. Articles using any childhood obesity definition (e.g., BMI-for-age, percent body fat, and skin fold measurements) were included. After duplicates were removed, titles and abstracts were screened for relevance. The majority of articles excluded were reporting results from studies of an inappropriate age group or did not include obesity, overweight, or increases in BMI or adiposity as an outcome of interest. We further scrutinized 283 articles by review of the full text and excluded studies examining consequences of obesity (comorbidities) and other

physiological factors. Those maintained for the review met the following criteria: (1) primary source (i.e., original data analyses) of peer-reviewed study; (2) reported results separately through tables, charts, or text for Black girls 12 years of age or for 10 years of age if the author defined this age as adolescence; and (3) at minimum, met the quality standards set for this review, including clear and appropriate research aims, adequate sampling and data analysis descriptions, and ethical issues suitably addressed for publication year (Thomas et al. 2004). A total of 51 studies met all selection criteria.

Data analysis

Each article was carefully read and its contents systematically abstracted into a matrix. To accommodate the diversity of factors explored, our synthesis began by grouping findings that were topically similar and focused on producing a configuration of findings. This data-inspired synthesis did not require repetition of a factor to be included, and findings were viewed as complementing but not confirming each other (such as in meta-analyses; Voils et al. 2008). Through the synthesis process it became evident that the bioecological theory for human development (Bronfenbrenner 2005) was a valuable approach to configure the findings. This theory promotes understanding of human development through complex relationships between a person and the contexts in which the person lives and has been previously used to describe factors associated with childhood overweight (Davison and Birch 2001; Pate et al. 2013). The theory is most recognized for its several encircling contexts that influence a developing person, including the micro-, meso-, exo-, and macro-systems, in which changes in one context ripple through others to affect a person (Bronfenbrenner 2005).

Synthesis of the literature revealed three categories of factors related to obesity and overweight among Black girls that paralleled the bioecological theory of human development (Figure 2; Bronfenbrenner 2005): (1) individual factors (e.g., the developing person), (2) interpersonal factors (e.g., microsystem), and (3) community and societal factors (e.g., exo- and macro-systems). Studies that reported relationships with behaviors and psychosocial concepts were placed into the individual factors category; studies that described associations with peer or familial variables were categorized under interpersonal factors; and studies that described relationships with community environments and larger social structures were grouped under community and societal factors.

Results

Across the 51 included studies, a variety of methodologies were employed: six used a qualitative design and 45 studies used a combination of quantitative descriptive, comparative, and correlational non-experimental designs (Table 1). Less than one-fifth ($n = 8$) of the studies provided longitudinal findings, and 27 studies used large national or state datasets. Thirty-eight articles measured heights and weights during recruitment or data collection, and methods for assessing factors included physiologic instrumentation; individual- or group-interviews; and self-, parent-, teacher-, and interviewer-reported questionnaires. Sample size ranged from $n = 7$ to $n = 31,122$ adolescents, and the percentage of Black female participants also varied from 4%–100%.

More than 160 different factors were explored across the studies. Below, each category is presented with a narrative synthesis of the factors' associations with obesity and overweight among Black adolescent girls, along with a brief description of study designs. For each category, a table is provided to help present the results more fully, which is ordered by category and sub-category, factor type, outcome (weight status, BMI, adiposity, or waist circumference), and the factor's association to the outcome (inferential results presented first, descriptive findings last).

Individual factors

Ninety-six individual factors were explored for their relationship to obesity and overweight and were sub-categorized into behavioral and psychosocial factors (Table 2).

Behavioral factors

Activity practices: Four types of activity practice factors were explored for their relationship to obesity and overweight, including physical activity; sedentary activity; physical activity knowledge, attitudes, and beliefs; and sports team participation. Reduced physical activity among Black girls was associated with obese weight status (Gordon-Larsen 2001; Gordon-Larsen, Adair, and Popkin 2002), higher BMIs and adiposity (Kimm et al. 2005), and greater increases in BMI than White girls for equivalent declines in activity (Kimm et al. 2005). No clear relationship existed between obesity and sedentary activity, as watching television was not significantly associated with BMI or weight status over time (Gordon-Larsen, Adair, and Popkin 2002; Henderson 2007); yet one cross-sectional study reported greater hours of inactivity among Black girls with obesity compared to their normal weight peers (Gordon-Larsen 2001). Additionally, no clear association with obesity was identified with sports team participation and physical activity knowledge, attitude, and beliefs; however, more overweight than normal weight Black girls reported sports team participation (Ali, Rizzo, and Heiland 2013), and overweight girls described their limited participation in physical activity was due to time constraints and personal aesthetic concerns, such as becoming sweaty (Boyington et al. 2008).

A combination of cross-sectional ($n = 11$) and longitudinal ($n = 5$) designs, large national datasets, and varied measures of activity were used across the activity practices investigations. Confounding was addressed among two-thirds of the studies using inferential statistics. Most of the literature was less than 10 years old; however, all the longitudinal findings used data that were 15–30 years old. In general, the activity practice literature demonstrated that limited physical activity via self-report was associated with obesity among Black girls, though the relationship with sedentary activities, such as television watching, was less clear.

Dietary practices: Five types of dietary practice factors—including food types; macro-nutrients; eating occasions, locations, and patterns; dietary knowledge, attitudes, and beliefs; and other dietary behavior—were examined for their relationship to obesity and overweight among Black girls. While Black girls with an overweight status described consuming sugary beverages and “unhealthy” foods (Cassidy et al. 2013), only lower intakes of the food type fruits and vegetables were significantly associated with obesity (Brogan et al. 2012). Among

macronutrients, increased protein calories (Reed et al. 2012) and lower calories per kilogram of body weight (Gordon-Larsen 2001) were associated with an obese versus normal weight status, while daily calories either demonstrated an inverse or non-significant relationship with obesity and overweight (Black et al. 2006; Brogan et al. 2012; Kimm et al. 2001, 2005; Reed et al. 2012). The association with eating frequency was significantly inverse, with higher BMIs and waist circumferences associated with lower meal and snack frequencies (Ritchie 2012)—a finding further supported by the reports of meal skipping by Black girls with an overweight weight status (Cassidy et al. 2013).

Findings related to dietary knowledge, attitudes, and beliefs were more varied. Black girls who were overweight perceived healthy food as less filling and described a high importance of taste, texture, and appearance when selecting foods rather than the food's perceived healthfulness (Boyington et al. 2008). However, Black girls with an obese weight status also reported greater intentions to eat healthier and a higher self-efficacy for healthy eating compared to normal weight peers (Brogan et al. 2012; Chen and Wang 2012). Similar inconsistencies existed among other dietary behavior, as binge/loss of control eating was associated with obesity (Cassidy et al. 2013; Neumark-Sztainer et al. 1997); yet, dietary weight-loss behaviors, such as dieting and fasting, were also related to obesity and overweight (Neumark-Sztainer et al. 1997; Paxton, Valois, and Drane 2004).

More than 75% of the 15 studies that examined dietary practices employed a cross-sectional approach, and all the investigations relied on self-reports of dietary behaviors. Half of the quantitative investigations used small samples ($n = 43$ –118 Black girls) to explore inferential associations between dietary behavior and weight outcomes, which may have accounted for some of the non-significant findings, and nearly two-thirds of studies with significant findings did not control for potential confounders. Overall, low meal and snack frequency was associated with obesity among Black girls, while the findings related to food types and macronutrients were inconsistent or obscure.

Other behavioral factors: A variety of other behaviors, comprising sleep, substance use, sexual behaviors, and employment status, were investigated for their associations with obesity and overweight. No obesity/overweight associations were identified for substance use, work status, or sexual practices among Black girls. Adolescent pregnancy demonstrated an inverse relationship with BMI (Kimm et al. 2005), while sleep revealed a positive association with BMI—a finding opposite of the sleep relationship observed among White, Asian, and Hispanic males and not observed among White, Asian, and Hispanic females (Reither et al. 2014). Minimal literature explored these other behavioral factors, and although two-thirds used large samples, the majority of studies ($n = 5$) reported data collected 12–29 years ago.

Psychosocial factors—A variety of psychosocial factors were explored for their relationship to obesity and overweight among Black girls, and were divided into the following factor types: body image, weight perceptions, and weight intentions; self-esteem; depression and suicidal ideation; stress, emotions, and emotional expressions; perceived health; interpersonal skills; and other psychosocial factors. Among body image, weight perception, and weight intention factors, Black girls with obesity and overweight accurately

perceived themselves as overweight (Foti and Lowry 2010; Paxton, Valois, and Drane 2004; Wang, Liang, and Chen 2009), intended or desired to lose weight (Banitt et al. 2008; Black et al. 2006; Paxton, Valois, and Drane 2004; Porter et al. 2012; Strauss 1999), and were more frequently weight dissatisfied (Gordon-Larsen 2001; Neumark-Sztainer et al. 1997). However, overweight was significantly associated with a larger ideal body image (Chen and Wang 2012), and Black girls with overweight described body self-satisfaction as more important than actual size (Boyington et al. 2008) and used framing practices so that weight perceptions were congruent with self-valuations (Williams, Wyatt, and Winters 2012). No relationship was identified with self-esteem or depression/suicidal ideation factors. Among the stress and emotion factors, associations were observed between obesity and both poor emotional well-being and worry (Neumark-Sztainer et al. 1997). In addition, chronic stress had a positive relationship with increasing BMI across adolescence, which was stronger than the relationship among White girls (Tomiya et al. 2013). Among the remaining psychosocial factor types, Black girls with obesity and overweight had worse perceptions of their health (Neumark-Sztainer et al. 1997; Whaley, Smith, and Hancock 2011), had varied associations with interpersonal skills (Chang and Halgunseth 2015; Granberg, Simons, and Simons 2009), and did not reveal an association with mastery orientation or learned helplessness when using generally accepted adiposity outcomes (i.e., triceps skinfold; Johnson et al. 1997).

Among the 26 articles investigating psychosocial factors, 24 reported cross-sectional associations with adiposity, BMI, or weight status. While the large majority used self-reports of factors, four investigations used reported perceptions of parents or teachers. Though temporal associations are unclear in cross-sectional studies, relationships with obesity and overweight among Black girls were identified for overweight self-perception, intention to lose weight, weight dissatisfaction, poor perceived health, and chronic stress. However, confounding was considered by only half of the 12 studies exploring inferential associations.

Interpersonal factors

The second category identified was interpersonal factors, involving 46 family and peer factors that related to higher weight statuses among Black girls (Table 3).

Family factors—Four types of family factors were explored for their relationship to obesity and overweight, including dietary practices family factors; physical activity family factors; weight status and body image family factors; and parenting, parent health, and family structure. Among the family dietary practices, two factors were inversely associated with obesity/overweight: higher caregiver monitoring of adolescent's eating (Brogan et al. 2012) and never eating with the family in the past week (Reed et al. 2012). In addition, Black girls articulated a sense of obligation to eat "grandma's cooking," despite its unhealthy preparation (Boyington et al. 2008), and that family practices of overfeeding were related to overweight (Barroso et al. 2010). In terms of physical activity, higher caregiver monitoring of adolescent's exercise was inversely associated with obesity, while greater parental rewards for exercise was positively associated (Brogan et al. 2012). A factor strongly related to obesity or high BMI among Black girls was a mother's or caregiver's high BMI/obese weight status (Brogan et al. 2012; Morrison et al. 1994), and the way

weight was communicated to Black girls in families may also be related. For instance, Black girls described not receiving constructive feedback about weight from parents like that received by Black boys (St George and Wilson 2012) and that family members often desired for them to have a large body size as they believed it was healthier (Barroso et al. 2010). Finally, no obesity and overweight associations were identified with family structure, though positive associations were identified among higher caregiver distress (Brogan et al. 2012), higher paternal warmth (Simons et al. 2008), lower parenting quality, and lower amounts of family activities that promote learning the meaning of being African American (Granberg, Simons, and Simons 2009).

Of the 12 family factor investigations, a variety of factors were explored but with limited repetition. In addition, all studies were cross-sectional, and few controlled for any social class variables. Altogether, the consensus was that a caregiver's obesity, family's weight communication, and certain parenting approaches were associated with higher weights among Black girls in some studies; while the family factors related to dietary and activity practices were less certain.

Peer factors—Three types of factors related to peers—comprising health behavior factors, weight-related interactions, and general peer relationships—were examined for their relationship to obesity and overweight among Black girls. While no relationships with obesity were identified among the physical activity health behavior factors, less peer support for healthy eating was associated with obesity (Brogan et al. 2012). Black girls with obesity or overweight also reported diverse weight-related peer interactions from weight-related teasing (Boyington et al. 2008) to receiving honest feedback about their weight (St George and Wilson 2012). Among general peer relationship factors, having concerns about how friends would treat them was associated with obesity (Neumark-Sztainer et al. 1997).

Of the evidence exploring peer factors associated with Black girls' obesity, few peer factors were examined and no studies were longitudinal. In general, due to the narrow number of investigations ($n = 7$) and varied results, little is known about the associations between peer factors and obesity and over-weight among Black girls.

Community and societal factors

Community and societal factors related to obesity among Black adolescent girls was the final category (Table 4). This category included socioeconomic status; neighborhood and community resources; culture; and neighborhood density of African Americans, perceived attractiveness, and school reputation. Socioeconomic status (SES) was diversely operationalized among Black girls, as parental education, family income, poverty income ratio, receipt of financial assistance, and family social class. Though three studies demonstrated an inverse relationship between obesity and SES (Henderson 2007; Reed et al. 2012; Tate et al. 2015), others demonstrated an increased proportion with obesity among high-SES Black girls—a finding not observed among other racial/ethnic adolescent groups (Granberg, Simons, and Simons 2009; Wang and Zhang 2006; Zhang and Wang 2007). Among the neighborhood and community resources factor type, no significant differences between the availability of weight-management neighborhood and community resources

were identified by weight status, though the availability of neighborhood full-service grocery stores was inversely associated with obesity (Brogan et al. 2012). Culture, another community and societal factor type, was described by Black girls as related to overweight, particularly cultural attraction (Barroso et al. 2010), and Black girls who were overweight also described it as related to unhealthy eating and low levels of exercise (Boyington et al. 2008). While no significant associations with weight status were identified in the final factor type, Black girls with obesity were consistently viewed by outsiders as less attractive, candid, and well-groomed than their normal weight peers (Ali, Rizzo, and Heiland 2013).

Diverse community and societal factors were explored in the literature, and SES was considerably the most frequently examined factor type. Though varied SES results occurred, the literature that demonstrated an inverse association with obesity either used a small, convenience sample to test for differences by weight status or reported data nearly two decades old. Due to the few investigations that explored the 18 community and societal factors and to the rare control of potential confounders, little consensus can be made about the results. Nonetheless, these findings bring light to the community and societal factors associated with obesity among Black adolescent girls.

Discussion

A significant health disparity in childhood obesity and overweight exists, placing Black adolescent girls at disproportionate risk (Ogden et al. 2014). Most research exploring the associated factors have concentrated on individual-level factors and behaviors, demonstrating that Black girls with obesity and overweight were less physically active, had fewer daily eating occasions, and were dissatisfied with their weight compared to normal-weight peers. Despite these findings, limited knowledge remains on other individual factors associated with obesity, such as food types, macronutrients, sedentary activity, and sleep practices.

Moreover, the results examining interpersonal and community/societal factors related to obesity are less conclusive. For instance, families had an important role with significant mother–daughter weight correlations and a relationship with certain obesity-associated behaviors. Yet, the interpersonal processes by which these significant associations occurred were unclear. Further, the limited exploration of community and societal factors, along with variance in certain factor types (e.g., SES), further complicated knowing not only which factors but why certain factors were associated with greater obesity among Black girls.

Several reasons helped to explain this limited understanding. First, several categories had a disparate and limited composition of factors explored (e.g., community and societal factors), and for certain categories (e.g., peer factors) a dearth of investigations existed. In addition, nearly half of the significant findings were from bivariate quantitative analyses that did not control for other potentially confounding variables, and among the significant findings that considered covariates, merely one-third controlled for SES. Not controlling for SES leaves findings related to racial health disparities unfinished as the independent contribution of SES to racial disparities in the outcome of interest cannot be determined. While the plethora of cross-sectional, quantitative investigations ($n = 37$) in this review helped to establish the

occurrence of certain factors across or within racial groups for a specific point in time, they cannot provide insights into why these associations existed or whether the temporal relation of the factors indicated a causal or reverse causal relation. Two important approaches to elucidate these relationships better—yet under-used in the literature reviewed—are the application of: qualitative designs, which could help develop more in-depth theoretical insights and illuminate other potentially significant factors; and longitudinal designs that would establish the temporal relation of factors to obesity and overweight and help determine which are likely to be causal and thus should be the focus of preventive strategies.

However, one of the primary explanations for our limited understanding may relate to the lack of updated literature devoted to the Black female population, which is most affected by childhood obesity. Given the broad definition of *factors related to obesity and overweight* used in this review, an abundance of literature was initially expected; however, only 51 studies met our inclusion criteria—two-thirds of which reported findings from data collected one to three decades ago. Further, only eight studies recruited Black adolescent female samples, leading to a presentation of findings derived mostly from large multi-racial/ethnic male and female samples. Conducting investigations for specific population groups is critical, as the lived social experience for Black adolescent females is significantly different than that of other groups, including younger or older Black females. Further, without additional investigations to provide insight into the within ethnic heterogeneity among Black girls that is frequently overlooked, significant and potentially unique factors that contribute to obesity may be missed.

From this review we identified multiple gaps in knowledge, exposing our restricted grasp of factors related to obesity and overweight among Black girls. First, adequately powered longitudinal studies are clearly needed to establish the temporal relation of factors associated with obesity in Black adolescent girls. Second, while updated and additional longitudinal investigations are significantly needed to explore individual factors, studies are also needed to explore the more distal causes (Link and Phelan 1995) of obesity, such as the built environments and social factors at the interpersonal and societal levels. Examples include: investigating through an integration of indicators (e.g., parental education, family income, neighborhood economic status) whether Black girls of high SES are at greater risk for obesity than low- and middle-SES girls; discerning the family interactions that result in significant correlations between mother and daughter weights; and exploring whether other societal and community factors interact to produce a higher prevalence of obesity among Black girls. Further, additional research should answer the questions: Does culture influence the individual behaviors and family dynamics associated with obesity? What and how do community and societal factors influence dietary and activity behaviors of Black girls? Do other societal factors, such as structural inequalities (i.e., institutionalized racism) contribute to obesity-related behaviors? Do these societal and environmental factors influence obesity-related physiological factors, such as metabolic rates and hormones? Answering these and other questions will ultimately allow us to understand what places Black adolescent girls “at risk for the risks” associated with childhood obesity (Link and Phelan 1995).

Limitations

The findings from this synthesis need to be interpreted with caution for a few reasons. First, each investigation demonstrated specific methodological limitations (e.g., cross-sectional designs that could not address temporal relations between factors and outcomes; small sample sizes for inferential statistics, which may have provided inadequate statistical power to detect meaningful associations as statistically significant and may have thus accounted for some of the non-significant findings). In addition, using the primary keywords for obesity and overweight, we searched a limited number of databases, which may have omitted other relevant articles. However, the databases searched represented a variety of disciplines; the highest order search term for obesity and overweight was used in each database search; and all keywords aligned with medical subject headings recommended by the National Institutes of Health. We also excluded studies that presented comorbidity and physiological factors related to obesity and overweight and consequently may have under-addressed these factors' important contributions and complex interactions with obesity. Finally, our inclusive definition for studies reporting factors related to obesity and overweight in Black adolescent girls resulted in a wide range of explored constructs and methodologies employed, making it highly challenging to compare results directly. While this created challenges for our synthesis—which was resolved through creating a cohesive configuration of findings—we were able to maintain our aim of obtaining the most comprehensive findings on our phenomenon and avoided being dictated only by constructs that have been explored in greater quantities.

Conclusion

Based on the synthesis of findings in this review, we believe a significant gap remains in understanding the factors that relate to obesity and overweight among Black adolescent girls. In addition to the longitudinal investigations needed to explore the temporal associations with individual-level behaviors, we believe an additional focus is needed which extends beyond individual factors. We argue that the lack of studies focused on this population and the limited significant associations identified in this review reveals a more important general need for further descriptive, non-experimental work across all levels (individual, interpersonal, community, and societal). Only when we better understand the factors related to obesity and obesity-associated behaviors among Black adolescent girls can we begin to realize the reasons for this significant health disparity and the factors that should be pursued for the most successful intervention results.

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Figure 1.
Literature search flow diagram.

Figure 2.
Bioecological theory of human development.

Table 1

Description of included publications ($n = 51$ articles).

	Study sample	Study design	Methods ^a	Outcome
Ali, Rizzo, and Heiland (2013)	5,947 male and female adolescents Black female: $n = 1,599$ (26.9%)	Cross; quantitative, non-experimental	Interviewer-, self-, and parent-reported questionnaires; measured height and weight; Add Health (Wave II, 1996)	Weight status (CDC)
Austin et al. (2013)	24,591 male and female adolescents Black female: $n = 3,218$ (13.1%)	Cross; quantitative, non-experimental	Self-report questionnaires; self-reported height and weight; YRBSS (2005 and 2007)	Weight status (CDC)
Banitt et al. (2008)	265 male and female adolescents Black female: $n = 116$ (43.8%)	Cross; quantitative, non-experimental	Self-report questionnaires; measured height and weight	BMI (percentiles)
Barroso et al. (2010)	8 FGs; 83 male and female adolescents Black female: $n = 17$ (20.5%), 2 FGs	Cross; qualitative, descriptive	Focus groups (gender- and ethnicity-specific grouping)	Weight status (questions posed about overweight ^b)
Black et al. (2006)	118 Black adolescent mothers	Cross (and Long), ^c quantitative, non-experimental	Self-report questionnaires; measured height and weight	Weight status (CDC)
Boyington et al. (2008)	12 Black adolescent females	Cross; qualitative, exploratory	Semi-structured interviews (2005–2006)	Weight status (eligible if overweight ^b)
Brener et al. (2004)	2,032 male and female adolescents Female: $n = 1,075$ (52.9%); Black: $n = 827$ (40.7%)	Cross; quantitative, non-experimental	Self-reported questionnaires; self-reported and measured height and weight; YRBS (2000)	Weight status (CDC)
Brogan et al. (2012)	67 Black adolescent daughter–caregiver dyads	Cross; quantitative, non-experimental	Interviewer-administered questionnaires; self-reported questionnaires; caregiver-reported questionnaires (2005–2006)	Weight status (Obese: BMI > 95th percentile; NW: BMI < 75th percentile)
Cassidy et al. (2013)	7 FGs (Black adolescent females: $n = 21$, 4 FGs; caregivers: $n = 21$, 2 FGs; community leaders: $n = 8$, 1 FG)	Cross; qualitative, descriptive	Focus groups (age-appropriate adolescent, parent, and community leader grouping; 2011)	Weight status (CDC)
Chang and Halgunseth (2015)	6,860 male and female adolescents Female: $n = 3,498$ (51%); Black: $n = 650$ (9%)	Long. (time points: 5th and 8th grade); quantitative, non-experimental	Self-, parent-, teacher-reported questionnaires; measured height and weight; ECLS-K (entered kindergarten 1998–1999)	Weight status (CDC)
Chen and Wang (2012)	402 male and female Black adolescents Black female: $n = 229$ (57%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight (2004)	Weight status (CDC)
Desmond et al. (1989)	341 male and female adolescents Black female: $n = 68$ (19.9%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight	Weight status ^d
Dowda et al. (2007)	1,381 female adolescents Black female: $n = 764$ (55.3%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight; observation of fitness; subset wore accelerometer (2002–2003)	BMI
Emmons (1996)	1,269 male and female adolescents Black female: $n = 203$ (16%)	Cross; quantitative, non-experimental	Self-reported questionnaires; self-reported height and weight	Weight status ^e
Foti and Lowry (2010)	Range for 5 survey years: $n = 13,601$ –15,349	Trend analysis of cross-sectional data;	Self-reported questionnaires; self-reported height and weight; YRBSS (1999, 2001, 2003 2005, and 2007)	Weight status (CDC)

Study sample	Study design	Methods ^a	Outcome
Female: 48.6%–51.3%; Black: 13%–15.1%	quantitative, non-experimental		
Gordon-Larsen (2001) 64 Black adolescent females	Cross; quantitative, non-experimental	Self-reported questionnaires; interviewer-administered questionnaires; measured height and weight	Weight status (NHANES I)
Gordon-Larsen, Adair, and Popkin (2002) 12,759 male and female adolescents Black female: <i>n</i> = 1,423 (11.1%)	Long; quantitative, non-experimental	Self- and parent-reported questionnaires; measured height and weight; Add Health (Wave I and Wave II, 1995–1996)	Weight status (CDC)
Gordon-Larsen, Adair, and Popkin (2003) 13,113 male and female adolescents Female: 46.5%; Black: 21.31%	Cross; quantitative, non-experimental	Self- and parent-reported questionnaires; measured height and weight; Add Health (Wave II, 1996)	Weight status (CDC)
Granberg, Simons, and Simons (2009) 256 Black adolescent females	Cross (and Long); ^c quantitative, non-experimental	Self- and parent-reported questionnaires; Census data; observation of body size; FACHS (Waves 1, 2, and 3, 1997–2001)	Weight status ^f
Hannon (2008) 198 male and female adolescents Black female: <i>n</i> = 61 (30.8%)	Cross; quantitative, non-experimental	Self-reported questionnaire; measured height and weight; pedometers worn during physical education classes (2003)	Weight status (OW: BF 32% for girls)
Henderson (2007) Baseline: 2,379 female adolescents Black female: <i>n</i> = 1,213 (51%)	Long; quantitative, non-experimental	Self- and parent-reported questionnaires; measured height and weight; observation; NGHHS (Waves 1–10, 1987–1998)	BMI
Johnson et al. (1997) 960 male and female adolescents Female: 51.1%; Black: 45.6%	Cross; quantitative, non-experimental	Self- and teacher-reported questionnaire; measured height and weight; Bogalusa (1992–1993)	Adiposity (triceps skinfold; waist/hip ratio)
Johnson (1990) 1,021 male and female adolescents Black female: <i>n</i> = 161 (15.8%)	Cross; quantitative, non-experimental	Self- and teacher-reported questionnaire; measured height and weight (1981–1982)	Weight status ^g and BMI
Kimm et al. (2001) Baseline: 2,379 female adolescents Black female: <i>n</i> = 1,213 (51%)	Long; quantitative, non-experimental	Self-reported questionnaires; measured height and weight; NGHHS (Waves 1–10, 1987–1998)	Adiposity (SST)
Kimm et al. (2005) Baseline: 2,379 female adolescents Black female: <i>n</i> = 1,213 (51%)	Long; quantitative, non-experimental	Self-reported questionnaires; measured height and weight; NGHHS (Waves 1–10, 1987–1998)	BMI and adiposity (SST)
Leech and Dias (2012) 340 sexually-active female adolescents Black female: <i>n</i> = 157 (46.2%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight; NLSY YAS (2000 and 2002)	Weight status (CDC)
Lowry et al. (2002) 15,349 male and female adolescents Black female: <i>n</i> = 2,196 (14.3%)	Cross; quantitative, non-experimental	Self-reported questionnaires; self-reported height and weight; YRBS (1999)	Weight status (CDC)
Mikolajczyk et al. (2012) 13,267 male and female adolescents Black female: <i>n</i> = 1,668 (12.6%)	Cross; quantitative, non-experimental	Self-reported questionnaires; self-reported height and weight; YRBS (2001/2002 school year)	BMI (z-scores)
Mitola et al. (2007) 215 Black male and female adolescents Black female: <i>n</i> = 107 (49.8%)	Cross; quantitative, non-experimental	Self- and parent-reported questionnaires; measured height and weight (2001–2004)	Weight status (CDC)
Morrison et al. (1994) 1,300 mother-daughter dyads Black female dyads: <i>n</i> = 580 (44.6%)	Cross; quantitative, non-experimental	Self- and parent-reported questionnaires; measured height and weight; NGHHS (Wave 1, 1987)	Weight status (NHANES I and II)
Neumark-Sztainer et al. (1999) 50 adolescent females Black female: <i>n</i> = 24 (48%)	Cross; qualitative, descriptive	Individual semi-structured interviews; self-reported questionnaire; measured height and weight	Weight status (eligible if > 85th percentile)
Neumark-Sztainer et al. (1997) 31,122 male and female adolescents Black female: <i>n</i> = 1238 (4%)	Cross; quantitative, non-experimental	Self-reported questionnaires; self-reported height and weight; MAHS (1986–1987)	Weight status (NHANES I)

Study sample	Study design	Methods ^a	Outcome
Paxton, Valois, and Drane (2004) 3,438 male and female adolescents Black female: <i>n</i> = 641 (18.6%)	Cross; quantitative, non-experimental	Self-reported questionnaires; self-reported height and weight; YRBSS for South Carolina (2001)	Weight status (CDC)
Porter et al. (2012) 119 Black male and female adolescents Black female: <i>n</i> = 86 (72%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight	BMI (percentiles)
Reed et al. (2012) 43 Black adolescent daughter-mother dyads	Cross; quantitative, non-experimental	Self- and parent-reported questionnaires; self-reported height and weight (2010)	Weight status (CDC)
Reither et al. (2014) 30,133 male and female adolescents Black female: <i>n</i> = 3132 (10.4%)	Cross; quantitative, non-experimental	Self-reported questionnaires; self-reported and measured height and weight; add health (pooled Waves 1 and 2 into cross section, 1995–1996)	BMI
Ritchie (2012) Baseline: 2,372 female adolescents Black female: <i>n</i> = 1,210 (51%)	Long; quantitative, non-experimental	Self-reported questionnaires; measured height and weight; observation; NGHS (Waves 1–10; 1987–1998)	BMI and waist circumference
Simons et al. (2008) 1,682 male and female adolescents Black female: <i>n</i> = 443 (26.3%)	Cross; quantitative, non-experimental	Self- and parent-reported questionnaires; self-reported height and weight; IYFP (Wave 2, 1990) and FACHS (Wave 2, 1999)	BMI
St. George and Wilson (2012) 9 FGs (Black adolescent females: <i>n</i> = 23, 4 FGs; Black adolescent males: <i>n</i> = 22, 5 FGs)	Cross; qualitative, descriptive	Focus groups (gender-specific grouping)	Weight status (questions posed about weight)
Strauss (1999) 1,932 male and female adolescents Female: not reported; Black: 38.5%	Cross; quantitative, non-experimental	Self- and caregiver-reported questionnaires; measured height and weight; NHANES III (1988–1994)	BMI (percentiles)
Sulemana, Smolensky, and Lai (2006) 172 female adolescents Black female: <i>n</i> = 58 (33.7%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight; accelerometer worn for 7 consecutive days	Weight status (CDC)
Tate et al. (2015) 145 Black male and female adolescents Black female: <i>n</i> = 88 (60.7%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight (2011)	Weight status (CDC)
Taylor et al. (2002) 82 Black adolescent females	Cross; quantitative, non-experimental	Self-reported and interviewer-administered questionnaires; measured height and weight; observation	BMI
Tomiyama et al. (2013) Baseline: 2,379 female adolescents Black female: <i>n</i> = 1,213 (51%)	Long; quantitative, non-experimental	Self- and parent-reported questionnaires; measured height and weight; NGHS (Wave 1–10, 1987–1998)	BMI
Wang, Liang, and Chen (2009) 448 Black male and female adolescents Black female: <i>n</i> = 252 (56.3%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight (2004)	Weight status (CDC)
Wang and Zhang (2006) Range for four waves: <i>n</i> = 6,555–9,731 Female: 48.7%–49.5%; Black: 14.3%–15.6%	Trend analysis of cross-sectional data; quantitative, non-experimental	Self-, parent-, and interview-reported questionnaires; measured height and weight; NHANES (Waves 1–4, 1971–2002)	Weight status (CDC)
Ward et al. (2006) 1,015 female adolescents Black female: <i>n</i> = 453 (44.6%)	Cross; quantitative, non-experimental	Self-reported questionnaires; measured height and weight	Weight status (CDC)
Whaley et al. (2011) 4,834 male and female adolescents Black female: <i>n</i> = 1,430 (29.6%)	Cross-sectional; quantitative, non-experimental	Self-reported questionnaires; self-reported height and weight; YRBS (2009)	Weight status (CDC)
White and Jago (2012) 1,148 female adolescents Black Female: <i>n</i> = 538 (46.9%)	Long; quantitative, non-experimental	Self- and parent-reported questionnaires; interview-administered questionnaire; measured height and weight; NGHS (Waves for ages of 12–14 years)	Weight status (CDC, IOTF, SST)

Study sample	Study design	Methods ^a	Outcome
Williams, Wyatt, and Winters (2012)	Cross; qualitative, interpretive phenomenology	Semi-structured individual interviews; semi-structured conjoint interviews	Weight status (eligible if OW or obese) ^b
Zhang and Wang (2007)	Trend analysis of cross-sectional data; quantitative, non-experimental	Self-, parent-, and interview-reported questionnaires; measured height and weight; NHANES (Waves 1–4, 1971–2002) and HHANES (1982–1984)	Weight status (CDC)

Note. Add Health = National Longitudinal Study of Adolescent Health; BF = body fat; BMI = body mass index (weight in kilograms/ height² in meters); Bogalusa = The Bogalusa Heart Study; CDC = used or follows Centers for Disease Control and Prevention definition for weight statuses at the year manuscript prepared (the 2000 CDC growth charts categorize weight status as a BMI-for-age and—sex percentile 95th = obese, 85th–94th = overweight, and 5th–84th = normal or healthy weight); Cross = Cross-sectional; ECLS-K = Early Childhood Longitudinal Study-Kindergarten; FACHS = Family and Community Health Study; FG = focus group; HHANES = Hispanic Health and Nutrition Examination Survey; IOTF = International Obesity Task Force; IYFP = Iowa Youth and Families Project; Long. = Longitudinal; MAHS = Minnesota Adolescent Health Survey; NGHS = National Heart, Lung, and Blood Institute Growth and Health Study; NHANES = National Health and Nutrition Examination Surveys; NLSY YAS = National Longitudinal Survey of Youth Young Adult Survey; NW = normal weight; OW = overweight; SST = sum of skinfold thicknesses across measured sites; YRBS/S = Youth Risk Behavior Surveillance System.

^aDescribes the methods, years of data collection, and source of dataset as available for each article.

^bDefinition of overweight not specified.

^cOnly cross-sectional findings reported; longitudinal findings used weight status as a predictor.

^dHeavy: >75th percentile, Normal Weight: 25th–75th percentile, Thin: <25th percentile.

^eUnderweight: <15th percentile, Below Median: 15th–50th percentile, Above Median: 50th–85th percentile, Overweight: >85th percentile.

^fDetermined by observer rating 1–9 scale; large body size 7–9 rating.

^gUnderweight: <20% ideal weight, Normal Weight: ±5% ideal weight, Overweight >20% ideal weight.

Table 2

Individual factors ($n = 44$ articles)^a by sub-category, factor type, outcome, and association.

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
BEHAVIORAL FACTORS: ACTIVITY PRACTICES ($k = 16$) ^e						
<i>Physical activity</i>						
Weight status	Moderate–vigorous activity at baseline; 1-year change in activity	SR	12,759	Base: – (OR = 0.88) ^f 1-yr change: NS	Age, maternal education, family income, household presence of mother, urban, smoking, region	Gordon-Larsen et al. (2002)
	Less hours of light-moderate activity	SR	64	+ $p = .0008$		Gordon-Larsen (2001)
	Activity counts/day	Accel.	1,148	NS	Prior obesity, age, height, height ² , family income, highest parent education, TV, calories, SR activity, puberty	White and Jago (2012)
	Activity counts before, during, after school	Accel.	172	NS	Age, puberty	Sulemana et al. (2006)
BMI	Min. in physical activity	SR	67	NS		Brogan et al. (2012)
	Step counts during three sports activities	Ped.	198	D	OW 0.8–6.3 less steps/min than NW ^g	Hannon (2008)
	Exercises 3+ times/ week	SR	5,947	D	% by WS: OW > OB > NW > UW ^h	Ali et al. (2013)
	Weekly activity (MET) over 9 years	SR	2,379	– $\beta = -0.14$, $p = < .0001$ ⁱ	Activity and energy intake at baseline, childbirth, puberty, smoking, study year, change in energy intake	Kimm et al. (2005)
	Moderate–vigorous activity	SR	82	NS	Dietary fat, puberty, social PA factors, cognitive PA factors	Taylor (2002)
Adiposity	Daily activity (MET) at baseline	SR	2,379	NS	TV, baseline BMI, baseline puberty, parent education, parent income	Henderson (2007)
	Weekly activity (MET) over 9 years	SR	2,379	– $\beta = -0.62$, $p = .0002$	Activity and energy intake at baseline, childbirth, puberty, smoking, study year, change in energy intake	Kimm et al. (2005)
	Daily activity over 9 years	SR	2,379	+ $\beta = 0.0035$, $p = .07$ ⁱ	Age, puberty, energy intake	Kimm et al. (2001)
<i>Sedentary activity</i>						
Weight status	Higher hours of inactivity	SR	64	+ $p = .04$		Gordon-Larsen (2001)
	TV/video watching (at baseline and 1-year change); Computer/video games	SR	12,759	NS (all factors)	Age, maternal education, family income, household presence of mother, urban, smoking, region	Gordon-Larsen et al. (2002)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
BMI	Min. in sedentary activity	SR	67	NS		Brogan et al. (2012)
	Excessive TV watching	SR	15,349	NS		Lowry et al. (2002)
	TV watching	SR	1,015	NS		Ward et al. (2006)
	TV watching (baseline)	SR	2,379	NS	Daily activity, baseline BMI, baseline puberty, parent education, parent income	Henderson 2007
<i>Physical activity, knowledge, attitude, beliefs</i>						
Weight status	Self-efficacy, attitudes, perceived behavioral control, normative beliefs, and enjoyment for PA	SR	1,015	NS (all factors)		Ward et al. (2006)
	Self-efficacy for PA	SR	402	NS	Treatment group, grade	Chen and Wang (2012)
	Exercise (health behavior) knowledge	SR	64	NS		Gordon-Larsen (2001)
	"Exercise too little" belief	SR	341	D	Mean scores by WS: heavy > NW = thin	Desmond et al. (1989)
BMI	Activity beliefs and attitudes	SR	12	Q	OW report: liking group PA (step team); having limited time for PA d/t lack of time and access and "beauty costs" (sweat)	Boyington et al. (2008)
	Cognitive PA (knowledge, perceptions, intentions, benefits, injury fear)	SR	82	NS	Dietary fat, puberty, social PA factors, moderate-vigorous PA	Taylor et al. (2002)
<i>Sport team participation</i>						
Weight status	Sports team participation	SR	1,015	NS		Ward et al. (2006)
	Plays active sport	SR	5,947	D	% by WS: OW > NW > OB > UW	Ali et al. (2013)
BEHAVIORAL FACTORS: DIETARY PRACTICES ($k = 15$) ^e						
<i>Food types</i>						
Weight status	Higher fruit and vegetable intake	SR	67	– OR = 1.957, $p = .09$	Fiber intake; eating confidence; caregiver BMI/distress/child exercise knowledge; grocery store availability, friend unhealthy eating discouragement	Brogan et al. (2012)
	Servings/day: fruits, vegetables, snacks, breads/cereals, dairy, main dishes	SR	118	NS (all factors)	Treatment group, age at childbirth, education attained, breastfeeding history	Black et al. (2006)
	Servings/day: vegetables, fruits, breads/cereals, meat/fish/eggs, dairy	SR	43	NS (all factors)		Reed et al. (2012)
	Sugary beverages and "unhealthy" foods	SR PR	50	Q	OW report consuming sugary beverages and "unhealthy foods"; parents of OW report daughter's weight attributed to eating	Cassidy et al. (2013)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
<i>Macronutrients</i>						
Weight status	Increased protein kcals	SR	43	+ $p = .045$		Reed et al. (2012)
	Lower kcals/kilogram of body weight	SR	64	+ $p = .00001$		Gordon-Larsen 2001
	High fiber intake	SR	67	Before covariates: $p < .05$	Fruit and vegetable intake; eating confidence; caregiver BMI/distress/child exercise knowledge; grocery store availability, friend unhealthy eating discouragement	Brogan et al. (2012)
BMI	Total kcals, carbohydrate kcals, fat kcals, dessert kcals, sugary beverage kcals	SR	43	NS After covariates: NS		Reed et al. (2012)
	Total kcals	SR	67	NS		Brogan et al. (2012)
	Total kcals, fat kcals, kcals/cm of height	SR	64	NS (all factors)		Gordon-Larsen 2001
	Kcals/day	SR	118	NS	Treatment group, age at childbirth, education attained, breastfeeding history	Black et al. (2006)
	Fat kcals	SR	82	NS	Puberty, moderate-vigorous PA social and cognitive factors	Taylor et al. (2002)
Adiposity	Total kcals over 9 years	SR	2,379	NS	Activity and energy intake at baseline, childbirth, puberty, smoking, study year, change in activity	Kimm et al. (2005)
	Kcals/day in early adolescence	SR	2,379	EA: - ($\beta = -.0029$) LA: - ($\beta = -.0038$)	Age, puberty, activity	Kimm et al. (2001)
	Kcals/day in late adolescence	SR	2,379	NS (all factors)	Activity at baseline, childbirth, puberty, smoking, study year, change in activity	Kimm et al. (2005)
<i>Eating occasions, locations, and patterns</i>						
Weight status	Meal frequency/week (breakfast, dinner, snacks), meal location (home vs. out), never ate with family	SR	43	NS (all factors)		Reed et al. (2012)
	Skipping meals, overeating, mindless eating	SR PR	50	Q	OW report skip meals before/during school, overeating after school and during weekend activities (shopping), and mindless eating during computer/TV time; parents of OW report daughter weight related to "mindless" and secretive eating	Cassidy et al. (2013)
BMI	Lower meal frequency	SR	2,372	Meal: +		Ritchie (2012)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
Waist circumference	Lower snack frequency			(<i>p</i> = .0004) Snack: + (<i>p</i> = .022)		Ritchie (2012)
	Lower meal frequency	SR	2,372	Meal: + (<i>p</i> = .052); Snack: + (<i>p</i> = .005); Total: + (<i>p</i> = .01) ^f		
	Lower snack frequency					
	Lower total eating times/day					
<i>Dietary knowledge, attitude, beliefs</i>						
Weight status	Higher healthy eating self-efficacy	SR	67	+ OR = 0.597, <i>p</i> = .035	Fiber intake; fruit and vegetable intake; caregiver BMI/ distress/ child exercise knowledge; grocery store availability, friend unhealthy eating discouragement	Brogan et al. (2012)
	Higher healthy eating self-efficacy	SR	402	Efficacy: + (<i>p</i> < .05)	Treatment group, grade	Chen and Wang (2012)
	Healthier food intentions			Intention: + (<i>p</i> < .05)		
	Healthy food knowledge and perception	SR	402	NS	Treatment group, grade	Chen and Wang (2012)
Other dietary behavior (<i>dieting, binge eating, vomiting</i>)	Eating attitude, healthy food knowledge	SR	64	NS (all factors)		Gordon-Larsen 2001
	“Eating too little” belief	SR	341	D	Mean scores by WS: NW > thin > heavy	Desmond et al. (1989)
	Eating attitudes and beliefs	PR	50	Q	Parents of OW describe daughter’s weight related to eating while bored and simply enjoying eating	Cassidy et al. (2013)
	Healthy food beliefs and perceptions	SR	12	Q	OW report consuming healthy food depends on taste, texture, appearance and healthy food lacks physical satiety	Boyington et al. (2008)
Weight status	Chronic dieting:	SR	31,122	Diet: + (OR = 3.63) ^f	SES, age	Neumark-Sztainer et al. (1997)
	Binge eating			Binge: + (OR = 1.53)		
	Dieting	SR	1,269	+ <i>p</i> < .001		Emmons (1996)
	Eat less calories, fast, diet pills, vomiting/laxatives	SR	3,438	Less: + (OR = 2.29) Fast: + (OR = 2.32) ^f ; Pills: + (OR = 4.18) ^f V/L: + (OR = 2.48)		Paxton et al. (2004)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
	Vomiting	SR	31,122	NS	SES, age	Neumark-Sztainer et al. (1997)
	Loss of control eating	SR	50	Q	OW report loss of control eating episodes and describe it as “being greedy,” “pigging out,” “throwin’ down,” and dissociating during (“it’s going right over your head”); relate episodes with emotions (anger, sadness, happiness, boredom)	Cassidy et al. (2013)
BEHAVIORAL FACTORS: OTHER ($k = 6$) ^e						
<i>Sleep</i>						
Weight status	Sleep activity (minutes)	SR	67	NS		Brogan et al. (2012)
BMI	Sleep	SR	30,133	+	Age, puberty	Reither et al. (2014)
				$\beta = 0.21, p < .05$		
<i>Substance use</i>						
Weight status	Tobacco use, alcohol use, marijuana use	SR	31,122	NS (all factors)	SES, age	Neumark-Sztainer et al. (1997)
BMI	Cigarette smoking	SR	2,379	NS	Activity and energy intake at baseline, childbirth, puberty, year, change in energy intake and activity	Kimm et al. (2005)
Adiposity	Cigarette smoking	SR	2,379	NS	Activity and energy intake at baseline, childbirth, puberty, year, change in energy intake and activity	Kimm et al. (2005)
<i>Sexual behaviors and pregnancy</i>						
Weight status	Older sexual partner, no condom use, multiple sexual partners	SR	340	NS (all factors)		Leech and Dias (2012)
BMI	Older adolescent pregnancy	SR	2,379	– $\beta = -0.63, p = .08$	Activity and energy intake at baseline, smoking, puberty, year, change in energy intake and activity	Kimm et al. (2005)
Adiposity	Early adolescent pregnancy;	SR	2,379	Early: – $(\beta = -4.65)$	Activity and energy intake at baseline, smoking, puberty, year, change in energy intake and activity	Kimm et al. (2005)
	older adolescent pregnancy			Older: – $(\beta = -3.55)$		
<i>Employment status</i>						
BMI	Employed	SR	1,381	NS	Treatment group	Dowda et al. (2007)
PSYCHOSOCIAL FACTORS ($k = 26$) ^e						
<i>Body image, weight perception, and weight intentions</i>						
Weight status	Intend to lose weight	SR	118	+	Treatment group, age at childbirth, education attained,	Black et al. (2006)

Outcome	Factor	Source ^{a,b}	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
BMI	Larger ideal body image	SR	402	+ OR = 6.71 ^k	breastfeeding history	Chen and Wang (2012)
	Weight dissatisfaction	SR	31,122	+ OR = 3.41	Treatment group, age	Neumark-Sztainer et al. (1997)
	Self-perception of overweight, trying to lose weight, stay same weight	SR	3,438	Self: + (OR = 11.96) Lose: + (OR = 5.69) Stay: (OR = .357) ^k	SES, age	Paxton et al. (2004)
	Body dysphoria	SR	64	+ <i>p</i> = .0002		Gordon-Larsen (2001)
	Self-perception of overweight	SR	13,601	D	64.7% of OW perceived self as OW ^k	Foti and Lowry (2010)
	Self-perception of overweight, body dissatisfaction, trying to lose weight	SR	448	D	69.2% of OW perceived self as OW ^k ; % dissatisfied by WS: OB > OW > NW ^k ; % try to lose by WS: OB > OW > NW ^k	Wang et al. (2009)
	Desire to be thinner	SR	215	D	68.8% of OW report desire to be thinner	Mitola et al. (2007)
	Self-perception of overweight	SR	2,032	D	% perceive OW by WS: OB > OW > NW	Brener et al. (2004)
	Self-perception of heavy Self-perception of thin	SR	341	D	% perceive heavy by WS: heavy > NW > thin % perceive heavy by WS: heavy > NW > thin	Desmond et al. (1989)
	Acceptable and preferred body size	SR	12	Q	OW describe a continuum of acceptable sizes; self-satisfaction with size is more important than actual size; and preferred size is one that is large, particularly in breasts and buttocks	Boyington et al. (2008)
Self-esteem	Body image	SR PR	7	Q	OW/OB and their mothers describe framing body size and weight so that perceptions are congruent with self-views and self-valuations and to create a body image that serves to protect body-esteem	Williams et al. (2012)
	Body image discrepancy, body satisfaction	SR	119	BID: + (<i>p</i> < .05) Satisfaction: NS		Porter et al. (2012)
	Self-perception of overweight, trying to lose weight, want to weigh less	SR	1,932	D	% perceive self as OW, trying to lose weight, want to weigh less increases with increasing BMI percentile	Strauss (1999)
	Body image discrepancy	SR	265	D	Mean BMI percentile in BID category: Wants thinner body (88.1) > Stay the same (75.2) > Wants larger body (43.2)	Banitt et al. (2008)
	"Too fat" perception	SR	13,267	D	Proportion consider self "too fat" higher at higher BMI zscores	Mikolajczyk et al. (2012)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
Weight status	Self-esteem	SR	118	NS	Treatment group, age at childbirth, education, breastfeeding	Black et al. (2006)
	Self-image	SR	256	NS		Granberg et al. (2009)
	Self-concept (esteem)	SR	64	NS		Gordon-Larsen (2001)
	Self-esteem	SR	5,947	D	Self-esteem scores similar by WS (range = 25.29–25.87)	Ali et al. (2013)
	Self-esteem	SR	50	Q	Some OW report negative self-perceptions (i.e., low self-esteem)	Neumark-Sztainer et al. (1999)
BMI	Self-esteem	SR	119	NS		Porter et al. (2012)
<i>Depression/suicidal ideation</i>						
Weight status	Depression	SR	118	NS	Treatment group, age at childbirth, education, breastfeeding	Black et al. (2006)
	Suicidal ideation	SR	31,122	NS	SES, age	Neumark-Sztainer et al. (1997)
	Depression, suicidal ideation	SR	4,834	NS (all factors)		Whaley et al. (2011)
	Depression	SR	5,947	D	Mean depression scores ^m by WS; OB > NW > OW > UW	Ali et al. (2013)
BMI	Depression	SR	119	NS		Porter et al. (2012)
<i>Stress, emotions, and emotional expression</i>						
Weight status	Poor emotional well-being; worry about future job concerns	SR	31,122	Well: + (OR = 1.42) Worry: + (OR = 1.37)	SES, age	Neumark-Sztainer et al. (1997)
	General disposition to experience anger	SR	1,021	+ $p < .05$ <i>i,k</i>	Blood pressure, heart rate, smoking, family history of HTN	Johnson (1990)
	Internalizing (anxiety, loneliness) and externalizing (acting out) behaviors	TR	6,860	NS (all factors)	Age, parent and child health, parent education, family structure, poverty level, # of family meals, SLP, TV, sleep, ECAs	Chang and Halgunseth (2015)
	Stress	SR	83	Q	Black females describe stress as a contributor to higher rates of obesity among Black youth; “we have more stress and sometimes we eat when we are stressed out”	Barroso et al. (2010)
BMI	High chronic stress Low chronic stress	SR	2,379	High: + ($\beta = 0.8$) ^j Low: + ($\beta = 0.62$) ^j	Acute stress, puberty, parental income, parental education	Tomiyama et al. (2013)
<i>Perceived health</i>						
	Outward expressions of anger	SR	1,021	– $p < .05$		Johnson (1990)
	Intensity or general disposition to experience frequent anger, anxiety, guilt	SR	1,021	NS (all factors)		Johnson (1990)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
Weight status	Poor/fair perceived health Health concerns	SR	31,122	P/F: + (OR = 3.42 ^{LH}) Concerns: NS	SES, age	Neumark-Sztainer et al. (1997)
<i>Interpersonal skills</i>	Poor physical health	SR	4,834	D	Mean poor health scores by WS: OB > OW > NW	Whaley et al. (2011)
	Good health	SR	5,947	D	% report good health by WS: NW > UW > OW > OB	Ali et al. (2013)
	Higher interpersonal skills	TR	6,860	+ OR = 0.76, $p < .05$	Age, parent and child health, parent education, family structure, poverty level, # of family meals, SLP, TV, sleep, ECAs	Chang and Halgunseth (2015)
<i>Other psychosocial factors</i>	Lower social skills	PR	256	+ $p < .10$		Granberg et al. (2009)
	Lower academic ability	PR	256	+ $p < .10$		Granberg et al. (2009)
	Sexual orientation	SR	24,591	D	% obese by SO: bisexual > lesbian > unsure > heterosexual	Austin et al. (2013)
Adiposity	Learned helplessness, mastery orientation	TR	960	WHR: + ($p < .05$); Triceps SF: NS	Age	Johnson et al. (1997)

Note. BID = body image discrepancy; BMI = body mass index; cm = centimeter; d/t = due to; EA = early adolescence; ECAs = extracurricular activities; HTN = hypertension; kcals = kilocalories; LA = late adolescence; NW = normal weight; OB = obese; OW = overweight; PA = physical activity; Ped. = Pedometer; SES = socioeconomic status; SF = skinfold SO = sexual orientation; SLP = school lunch purchase; TV = television; UW = underweight; V/L = vomiting/laxatives; Waist circum = waist circumference; WS = weight status; WHR = waist-to-hip ratio.

^aNumber of articles that report one or more Individual Factor findings.

^bSource of factor (Accel. = Accelerometer; SR = self- or Black adolescent female-report, PR = parent- or caregiver-report, TR = teacher-report).

^cSample size for study. Value is total participants or dyads at baseline or smallest sample size in cross-sectional trend analyses. Detailed information about samples available in Table 1.

^dAssociation with obesity, overweight, BMI, or adiposity among only Black adolescent females. Significant inferential findings presented first and descriptive findings last; odds ratios (OR) and regression coefficients reported as available; a plus sign (+) indicates a factor significantly ($p < .10$) and positively associated with obesity, overweight, increases in BMI or adiposity; a minus sign (–) indicates a factor significantly ($p < .10$) and inversely associated with obesity, overweight, increases in BMI or adiposity; NS = non-significant statistical finding using inferential statistical approaches, including but not limited to regressions, correlations, t-tests, and other non-parametric approaches; D = descriptive statistics (means, proportions, or percents) by weight status; Q = descriptive findings from qualitative investigations.

^eNumber of articles reporting one or more findings related to the specific Individual Factor Sub-Category.

^fAssociation not observed among White females or Hispanic males and females.

^gLowest steps/minute among normal weight and overweight Black and White males and females.

^hHigher proportions among obese and overweight Black girls than obese, overweight, or normal weight White females.

ⁱAssociation stronger than White females.

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- ^j Association not observed among White, Asian, Hispanic females and opposite associations observed among White, Asian, Hispanic males.
- ^k Association stronger than Black males.
- ^l % overweight that perceive self as overweight by race/gender: White females > Hispanic females > Black females > White males > Hispanic males > Black males.
- ^m Mean depression scores for obese and overweight Black females are higher (range 0.13–1.47) than scores among normal weight, overweight, obese White females.
- ⁿ Association stronger than American Indian females.

Table 3

Interpersonal factors ($n = 14$ articles)^a by sub-category, factor type, outcome, and association.

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/statistical or qualitative descriptions	Reference
FAMILY FACTORS ($k = 12$) ^e						
<i>Dietary practices family factors</i>						
Weight status	Caregiver monitoring/supervision of adolescent's eating	PR SR	67	PR: – ($p < 0.10$) SR: NS		Brogan et al. (2012)
	Never ate with family in past week	PR	43	– $p = .049$		Reed et al. (2012)
	Family encouragement for healthy eating; family discouragement of unhealthy eating	SR	67	NS (all factors)		Brogan et al. (2012)
	Meal and snack frequency; eating at home or out	PR	43	NS (all factors)		Reed et al. (2012)
	Adult female food purchasing, preparation, role modeling, verbal direction	SR	12	Q	OW report eating influenced by mother/grandmother food buying, preparation, and modeling; some describe grandma's cooking supersedes personal desire to eat healthy; some describe resisting direction to improve nutrition; others report verbal support helps	Boyington et al. (2008)
	Overfeeding	SR	83	Q	Girls describe family promotes OW due to their history; "they overfeed because of their experiences with no food"	Barroso et al. (2010)
<i>Physical activity family factors</i>						
Weight status	Caregiver monitoring/supervision of adolescent's exercise	PR SR	67	PR: NS SR: – (OR = 5.746)	Fiber, fruit, vegetable intake; eating confidence; caregiver BMI/distress/rewards; grocery store availability, friend eating influence	Brogan et al. (2012)
	Greater parental rewards and lower punishment for exercise	SR	67	+ OR = 0.545, $p = .062$	Fiber, fruit, vegetable intake; eating confidence; caregiver BMI/distress/monitor; grocery store availability, friend eating influence	Brogan et al. (2012)
	Family participation in exercise	SR	67	NS		Brogan et al. (2012)
	Family support for PA, social provisions for PA, available home PA equipment	SR	1,015	NS (all factors)		Ward et al. (2006)
	Verbal direction	SR	12	Q	Some OW report resisting verbal direction related to improving physical activity while others report verbal support helped	Boyington et al. (2008)
BMI	Social PA related to family	SR	82	NS		Taylor et al. (2002)
<i>Weight status and body image family factors</i>						
Weight status	Higher caregiver BMI	PR	67	+ OR = 0.79,	Fiber, fruit, vegetable intake; eating confidence; caregiver monitor/distress/rewards; grocery store availability, friend eating influence	Brogan et al. (2012)

Outcome	Factor	Source ^b	N ^c	Association ^d <i>p</i> = .027	Covariates (when present)/statistical or qualitative descriptions	Reference
	Mother overweight status	Meas.	1,300	+ OR = 1.7, <i>p</i> < .01		Morrison et al. (1994)
	Mother's weight status	PR	43	D	75% of OB daughters had a mother that was obese	Reed et al. (2012)
	Caregiver satisfaction with child's size	PR	215	D	Caregiver satisfaction decreased with child's increasing WS	Mitola et al. (2007)
	Family communication about weight	SR	12	Q	OW describe family compares their size to other family	Boyington et al. (2008)
	Family communication about weight	SR	45	Q	Girls report positive, less honest feedback from parents about weight ("Like there's certain outfits they say look good on you ... and then they be like 'you ain't big' and I know they lying to me") ^f	St. George and Wilson (2012)
	Family beliefs about weight status	SR	83	Q	Girls describe some family desires that you are full-figured because they believe "bigger is healthier" with better well-being	Barroso et al. (2010)
BMI	Mother's BMI	Meas.	1,300	+ <i>p</i> < .001		Morrison et al. (1994)
Adiposity	Mother's triceps skinfolds	Meas.	1,300	+ <i>p</i> < .001 ^g		Morrison et al. (1994)
<i>Parenting, parent health, and family structure</i>						
Weight status	Caregiver distress	PR	67	+ OR = 0.796, <i>p</i> = .048	Fiber, fruit, vegetable intake; eating confidence; caregiver monitor/BMI/ rewards; grocery store availability, friend eating influence	Brogan et al. (2012)
	Parenting quality, racial socialization	SR	256	PQ: - (<i>p</i> < .01) RS: - (<i>p</i> < .01)		Granberg et al. (2009)
	Mother employed, mother health	PR	43	NS		Reed et al. (2012)
	Living with both biological parents	SR	5,947	D	% living with both parents by WS: UW > OB > NW > OW	Ali et al. (2013)
BMI	Paternal warmth	SR	1,682	+ β = .212, <i>p</i> < .05	SES	Simons et al. (2008)
	M/P monitoring, M/P inductive reasoning, M/P problem solving, maternal warmth	SR	1,682	NS (all factors)	SES	Simons et al. (2008)
PEER FACTORS (<i>k</i> = 7) ^e						
<i>Health behavior factors</i>						
Weight status	Less supportive friend behavior around healthy eating	SR	67	+ OR = 0.656, <i>p</i> = .035	Fiber intake; fruit and vegetable intake; eating confidence; caregiver rewards/supervision/distress; grocery stores	Brogan et al. (2012)
	Friend participation in PA, friend encouragement for healthy eating	SR	67	NS (all factors)		Brogan et al. (2012)
BMI	Social PA related to peers	SR	82	NS		Taylor et al. (2002)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/statistical or qualitative descriptions	Reference
<i>Weight-related interactions</i>						
Weight status	Weight-related teasing	SR	12	Q	Some OW describe “conditioned” against weight teasing and does not influence health behaviors; some describe negative support and teasing from male parts directed at body parts	Boyington et al. (2008)
BMI	Peer communication about weight	SR	45	Q	Girls report receiving positive comments and more honest/harsh information from peers (“your stomach big, look like you pregnant”)	St. George and Wilson (2012)
	Teasing (>1/2 questions are weight-related)	SR	119	NS		Porter et al. (2012)
	<i>General relationship with peers</i>					
Weight status	Concerns about treatment from peers	SR	31,122	+	SES, age	Neumark-Sztainer et al. (1997)
	Making/keeping friends of opposite sex	SR	256	NS		Granberg et al. (2009)

Note. BMI = body mass index; M/P = maternal/paternal; NW = normal weight; OB = obese; OW = overweight; PA = physical activity; PQ = parenting quality; RS = racial socialization; UW = underweight; WS = weight status.

^aNumber of articles that report one or more Interpersonal Factor findings.

^bSource of factor (SR = self- or Black adolescent female-report, PR = parent- or caregiver-report, Meas. = measured by study personnel).

^cSample size for study. Value is total participants or dyads at baseline or smallest sample size in cross-sectional trend analyses. Detailed information about samples available in Table 1.

^dAssociation with obesity, overweight, BMI, or adiposity among only Black adolescent females. Significant inferential findings presented first and descriptive findings last; odds ratios (OR) and regression coefficients reported as available; a plus sign (+) indicates a factor significantly ($p < .10$) and positively associated with obesity, overweight, increases in BMI or adiposity; a minus sign (–) indicates a factor significantly ($p < .10$) and inversely associated with obesity, overweight, increases in BMI or adiposity; NS = non-significant statistical finding using inferential statistical approaches, including but not limited to regressions, correlations, t -tests, and other non-parametric approaches; D = descriptive statistics (means, proportions, or percents) by weight status; Q = descriptive findings from qualitative investigations.

^eNumber of articles reporting one or more findings related to the specific Interpersonal Factor Sub-Category.

^fBlack males described receiving more helpful information about weight status than girls (i.e., constructive suggestions to help monitor weight).

^gStronger association than White females.

Table 4

Community and societal factors ($n = 13$ articles)^a by factor type, outcome, and association

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
<i>Socioeconomic status</i>						
Weight status	High-SES vs. medium-SES (using poverty income ratio)	FR	6,555	+ OR = 2.33, $p < .001$ ^e		Wang and Zhang (2006)
	Poverty income ratio	FR	6,555 2,342	+ $p < .05$ ^f		Wang and Zhang (2006)
	Family social class (caregiver work, household income)	FR	256	+ $p < .05$		Zhang and Wang (2007)
	Mother with college degree, receiving financial assistance	PR	43	College: NS; Assist: + ($p = .01$)		Granberg et al. (2009)
	Family income, parental education achieved	FR	13,113	NS (all factors)	Age, pregnancy	Reed et al. (2012)
	Family income	FR	1,300	D	% OW: \$20,000 = 30.2%, \$20,000–\$40,000 = 28.5%, > \$40,000 = 28.4%	Gordon-Larsen et al. (2003) Morrison et al. (1994)
	Mother with college degree, father with college degree, receiving welfare	FR	5,947	D	Similar % across WS (all factors); mother range = 0–2.6%; father range = 0–3.2%; welfare = 34.0%–40.7%	Ali et al. (2013)
	Family income, level of parental education achieved	FR	13,113	D	% OW higher among higher income (\$60,000+) than lower income (\$0–\$59,900) ^g ; % OW by Educ.: no high school diploma > some college > high school diploma > college degree ^g	Gordon-Larsen et al. (2003)
BMI	High SES (using poverty income ratio)	FR	6,555	+ $\beta = 2.22$, $p < .01$ ^f	Age	Wang and Zhang (2006)
	Parent education (high school or less vs. some college or more), parental income (<\$40,000 vs. \$40,000)	FR	2,379	Educ.: $-(\beta = -.12)$ ^g Inc.: $-(\beta = -.12)$	Daily activity, baseline BMI, baseline puberty, daily TV watching	Henderson (2007)
	Free lunch	SR	145	+ $p < .01$		Tate et al. (2015)
<i>Neighborhood and community resources</i>						
Weight status	Availability neighborhood full-service grocery stores	SR	67	– OR = 5.147, $p = .033$	Fiber, fruit, vegetable intake; eating confidence; caregiver BMI/distress/rewards/ knowledge; friend eating influence	Brogan et al. (2012)
	Availability neighborhood full-service grocery stores	PR	67	– $p < .10$		Brogan et al. (2012)

Outcome	Factor	Source ^b	N ^c	Association ^d	Covariates (when present)/ statistical or qualitative descriptions	Reference
Weight status	Neighborhood and community resources for weight-management, availability of convenience stores	SR PR	67	NS (all factors)		Brogan et al. (2012)
	Safe activity spaces, parks/gym availability	SR	1,015	NS (all factors)		Ward et al. (2006)
	Fast food and school food	SR	83	Q	Girls report fast food and school food are barriers to someone OW trying to change eating habits ("It is cheap to get fast food in our communities"; "the food at school is nasty so we get snacks")	Barroso et al. (2010)
	Culture on dietary behaviors, culture on activity	SR	12	Q	OW describe traditional African American foods and food culture (particularly preparation methods: "all the fat in it") were determinants of current nutrition behaviors; report that exercise is not a culturally-valued practice and perceive it as low-priority, optional behavior that demands too much time and resources	Boyington et al. (2008)
Weight status	Cultural attraction, cultural eating	SR	83	Q	Girls report cultural attraction and cultural eating as contributors to higher rates of obesity among Black youth ("Because we as women know that Black men like big women with big breasts and butts" and "Because the foods we eat have a lot of fat")	Barroso et al. (2010)
<i>Neighborhood density of African Americans, perceived attractiveness, school reputation</i>						
Weight status	% of African American in neighborhood	SR	256	NS		Granberg et al. (2009)
	Interviewer assessed physical attractiveness, well-groomed, physically mature, attractive personality, candid; school reputation (chose area because of school)	IR	5,947	D	% by WS for attractiveness, well-groomed, attractive personality, candid: NW > OW > OB; % by WS for physically mature: OW > OB > NW; % by WS for school reputation: OB > NW > OW	Ali et al. (2013)

Note. Assist. = receiving financial assistance; b/c = because of; BMI = body mass index; Educ. = parent education; Inc. = parental income; NW = normal weight; OW = overweight; OB = obese; PA = physical activity; SES = socioeconomic status; TV = television; WS = weight status.

^aNumber of articles that report one or more Community and Societal Factor findings.

^bSource of factor (SR = self- or Black adolescent female-report, FR = family-report, PR = parent- or caregiver-report, IR = study interviewer-report).

^cSample size for study. Value is total participants or dyads at baseline or smallest sample size in cross-sectional trend analyses. Detailed information about samples available in Table 1.

^dAssociation with obesity, overweight, BMI, or adiposity among only Black adolescent females. Significant inferential findings presented first and descriptive findings last; odds ratios (OR) and regression coefficients reported as available; a plus sign (+) indicates a factor significantly ($p < .10$) and positively associated with obesity, overweight, increases in BMI or adiposity; a minus sign (−) indicates a factor significantly ($p < .10$) and inversely associated with obesity, overweight, increases in BMI or adiposity; NS = non-significant statistical finding using inferential statistical approaches, including but not limited to regressions, correlations, t -tests, and other non-parametric approaches; D = descriptive statistics (means, proportions, or percents) by weight status; Q = descriptive findings from qualitative investigations.

^eStronger association than White and Mexican American females and White, Black, Mexican American males.

^f% of OW among Black females by socioeconomic status in 1988–1994: high income > medium income > low income; and in 1999–2002: high income > low income > medium income.

^gRates significantly higher than or stronger association than White females.