Table 1. Participant characteristics, appraisal, and outcomes of studies in the systematic review

|  | Author/Year | Major Variables Studied and Definitions | Sample | Age | Race/Ethnicity | Findings | Appraisal | Analysis |
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| 1 | Ali, Amialchuk, & Heiland, 2011 | The members of a social network (dependent variable) identified based on set of respondent's close friends. For each adolescent, we constructed measures of the % of his or her friends who did same activities (independent variables). | N = 3,898 participants from 132 schools | Mean age: 16.3 years | Black, White, Asian, Hispanic, and other participants | A significant positive association between individuals' and friends' behaviors in sports, exercise, and fast food consumption. | Social transmission of weight-related behaviors is viable explanation for spread of obesity in friendship networks. Social transmission of weight-related behaviors is viable explanation for spread of obesity in friendship networks. | Future studies warranted. People select friends similar to them. This could be causality for the results shown. |
| 2 | [Ayala et al. (2007)](#bib_Ayala_et_al_2007) | Family variables and diet | N = 167 youth and their mothers | 8–18 years | Mexican American participants | Increased family support for healthy eating was inversely related to snacks and fiber consumed. Children who saw food ads reported more purchases and consumption of snacks and fast foods. Incidence of overweight in the cohort was 34%. | Self-reported data. Dietary collection or recall not involved in the study. Used questionnaire instead to determine consumption of foods. | Future studies warranted on family-based interventions. |
| 3 | Balvanz et al. (2016) | Using smart phones to capture video interviews and photos HS youth. Identified variables in the community that were barriers to healthy food choices and exercise. | N = 7 female participants | HS students as co-investigators |  | Youth identified ways to address community concerns such as low-cost healthy food options, safe walking areas in community. Political action—policy changes to elected officials. | Youth empowerment to identify and reduce obesity-related health risks in their community. | Involve more youth as co-investigators to combat childhood obesity. |
| 4 | Barr-Anderson, Larson, Nelson, Neumark-Sztainer, and Story (2009) | Examined relationship between television viewing behavior and dietary intake. | N = 1920 (564 middle school and 1,356 high school) students | Mean age: time 1: 17.2 years | White (40%), Black (21%), Asian (22%), Hispanic (8%), and other (9%) participants | Higher TV viewing time correlated with higher intake of high fat, salt, and sugary beverages in later period into high school and college. | TV ads influence food choices of high fat, salt, sugary beverage, especially in high school youth. | Focuses on an adolescent cohort and transition into young adulthood. |
| 5 | Bibeau et al. (2012) | Marketing on food purchases and perception | N = 16 teens and adults | Teens: mean age = 15.3 years; adults: mean age = 43.0 years | African American girls and teens | Convenience and availability of products influenced food choice and purchase, with availability being the biggest factor. The price of food was also a major influence of food choice. Most girls had their food readily available. The presentation of food influenced food choice as well. | Sample size was not mentioned or was not clear in the study. Data based solely on interviews and photovoice of participants. | Future studies warranted on the effects advertisements have on food purchases in adolescents. |
| 6 | [Bowen and Devine (2011)](#bib_Bowen_and_Devine_2011) | Acculturation—loss of traditional cultural traits and acceptance of new cultural traits. | N = 23 (N = 11 Mainland raised (US); N = 6 recent migrants; N = 6 Puerto Rican raised) | 10–18 years | Puerto Rican girls | Evening food choices (after 3 p.m.) had greater individual variation. Puerto Rican raised and recent migrants frequently reported that everyone cooks in their household and described mothers as having traditional cultural orientation. All groups described a “tradition keeper” in their household. | Follow-up interviews only occurred in 12/17 recent migrants and US raised due to return migration to Puerto Rico. | Small sample size. Based off of self-reported data. Future studies warranted to examine the multidimensional factors influencing food choices due to acculturation. |
| 7 | Dabbaghian, Mago, Wu, Fritz, and Alimadad (2012) | Examine social interactions in high school adolescents and how these interactions affect their eating behavior and food choice using mathematical modeling. | N/A | High school students (school-aged) | N/A | Introduction of healthy environmental influences results in increases of students making healthy food choices. | Sample size is not available. Not directed on actual people. Not a research study. Mathematical modeling. | Limited information regarding this study. Need to test these findings in schools. |
| 8 | [Evans et al. (2016)](#bib_Evans_et_al_2016) | Participants' use of menu labels when eating out. Suggestions on menu label designs to promote better use. | N = 41 adolescents | 14–19 years | Caucasian or White, African American, and Hispanic participants | Overall menu reading ignored due to small print, too much text, lack of knowledge re: significance of information. Suggest use of color coding, icons, and pictures to explain calories, fat, salt, sugar in foods. Menu labels read more among mid- income White participants for calories and fats. Familiarity with food based on taste and cost were main criteria. | Small sample size limited to communities based on ethnicity. | Very small sample size. Could not base results off of one SES. Longitudinal studies needed. |
| 9 | [Fielding-Singh (2017)](#bib_Fielding_Singh_2017) | Parental influences on adolescents' diet. | N = 109 (44 families; 53 adolescents; 42 mothers; 14 fathers) | Adolescents: 12–19 years | Caucasian or White, African American, Hispanic, and Asian participants | Majority state dads' diet less healthy than mothers'. Majority moms involved with domestic food work. Moms reported that dads were suppliers of unhealthy food to teens. Dads did not intervene in child's unhealthy eating habits; more lenient than moms with unhealthy food decisions. Stay-at-home moms could limit dads' influences on diet in the home. Dads' disinterest in food believed to be due to racial influences. | Lower or working-class families were not part of the analysis. Name of larger study not mentioned. Researcher self-selected some participants to have more diverse participants. Small sample size. Not many fathers included in the study. Include more fathers and working class. | See appraisal. |
| 10 | [Franzen and Smith (2009)](#bib_Franzen_and_Smith_2009) | Influences on BMI and acculturation status among second-generation Hmong children. | N = 300 U.S.-born and non-U.S.–born participants | 9–18 years | Hmong and Hmong American participants | U.S.-born had higher correlation between acculturation survey scores and BMI than non-U.S.–born kids. Older sample, 14–18 years were more acculturated than younger ages. | Face and construct validity and reliability of instruments pilot tested but data not given, stated unconfirmed. Fair sample size. Nonrandom sample. | Positive correlation between BMI and acculturation. Used family and community leaders in health education for Hmong youth. Future studies focused on factors causing obesity, diet, and activity warranted. |
| 11 | [Gonzales et al. (2017)](#bib_Gonzales_et_al_2017) | UAP, PP, and NP. | N = 83 undergraduate students | Mean ages by plan: UAP = 18.7 years; PP = 19.2 years; NP = 20.1 years | White (84%), Asian (6.5%), Mixed (6.5%), and other (2%) participants | Appetitive responsiveness was positively associated with fat, excluding sugars, across all groups. Unlimited access food plan had higher fat consumption compared with NP students and higher fruit and vegetable and dairy intake compared with PP students. Approximately half of the PP students reported consumption of more fried foods, specifically potatoes. All groups did not meet USDA daily recommendations for proper nutrition. | Small sample size. Questionnaires do not include information about trans fats or saturated fats. Physical activity was not accounted for in this study. | Future studies warranted to determine the effects of meal plans on food choice and eating behavior in a larger cohort. |
| 12 | Granner and Evans (2012) | Fruit and vegetable intake. | N = 843 participants | 11–15 years | African American (40.9%), Caucasian (51.2%), and other (7.9%) participants | Self-efficacy, parent and peer modeling, family and normative beliefs were all associated with fruit and vegetable intake. Fruit and vegetable intake was not correlated with food choice in regard to social influence, weight gain avoidance, and accessibility. | Parent and peer modeling was significant, but social influences were not. | Constructs were modified from the original scale to fit this study. |
| 13 | [Holsten et al. (2012)](#bib_Holsten_et_al_2012) | Examine food choice in different environments. | N = 47 participants | 11–14 years | Non-White (34.2%) and Hispanic (7.7%) participants | Parents influence food choice by setting rules, providing guidance and info, and modeling behaviors, which are influenced by the child's food preference. Autonomy during developmental stages is important. | Focuses more on preadolescence stage. Study contained methodological problems and contained few overweight children. | Future studies warranted for exploring various parenting styles on obesity and effectiveness of family-based interventions. |
| 14 | Hong, Valerio, and Spencer (2011) | Comparison of school activity policies among U.S. states with the highest vs. lowest child obesity rates and with CDC recommendations. | 2007 Kaiser Foundation data on obese children; selected state school policies on physical activity for youth | 10–19 years | N/A | Obesity rates vary among states. School physical activity policies vary among states—mandatory or recommended language used. Funding appropriated according to policy language. | Comprehensive data analysis of activity levels and school policies. Has implications for changes and funding for reduction of obesity and related health problems. Recommend socioecological model. | Minimal distinction in policies between states with higher and lower prevalence of obese youth was found. Financial and infrastructure support for the implementation and evaluation of physical education policies are needed, as well as innovative strategies including socioecological models to better address the obesity epidemic (hand search). |
| 15 | Kinard and Webster (2012) | Factors influencing unhealthy eating behavior in adolescents. | N = 89 adolescents | Mean age: 16.3 years | N/A | Self-efficacy was the biggest influence among the adolescent cohort. Advertising effects can be influenced by parents, peers, and individual self-efficacy. Parents and peers influence unhealthy eating behavior. | Small sample size. | Contributes to the social influences of eating behavior and food choices. |
| 16 | Larson, Laska, Story, and Neumark-Sztainer (2012) | Examine fruit and vegetable intake. | N = 1,130 participants (476 males and 654 females) | EAT I: mean age = 15.8 years; EAT II: mean age = 20.4 years; EAT III: mean age = 26.2 years | Caucasian or White (59.8%), African American (12%), Asian (16.1%), Mixed or other (12.1%) participants | Taste preference, less perceived time barriers regarding healthy eating. Increased availability of fruits and vegetables in the home and decrease in unhealthy options predict fruit and vegetable intake 5 and 10 years after EAT I. Breakfast pattern and food preparation also significant. Majority of young adults do not meet recommendations. | Decent sample size. Ethnic/racial diversity. Vegetable and fruit data self-reported. Accounts metropolitan area in Minnesota. | Transition from adolescence to adulthood. Examines changes over time. Due to location, the results may not be generalizable. |
| 17 | [Mulasi-Pokhriyal and Smith (2011)](#bib_Mulasi_Pokhriyal_and_Smith_2011) | Subjects' perception of health and diabetes between Hmong and Hmong American pre-teens and teens. | N = 335 participants | 9–18 years | Hmong American participants | Environment was the strongest social construct determining food choices (more than personal and behavioral constructs on survey). However, all 3 constructs intersect. | Well-designed study. Instrument developed based on theoretical framework, which was pilot tested and had good validity and reliability. Nonrandom sample makes it limited. The data analysis was thorough findings consistent with study design. | Sample knew that average size means healthier. Need for early linguistically and culturally sensitive nutrition education. |
| 18 | Riebl et al. (2016) | SSB consumption in adolescents by using the TPB. | N = 168 (102 adolescents and 66 of their parents) | 12–18 years | N/A | TBP explained 34% of SSB consumption in both parents and adolescents. Intention was the biggest predictor of SSB consumption in adolescents and parents. Subjective norms in adolescents predicted intention. Parental influence may affect adolescents' SSB consumption. | Sample size was OK. TBP did not explain a large amount of SSB consumption. | Contributes to the social influences on food choice and consumption. |
| 19 | [Senguttuvan et al. (2014)](#bib_Senguttuvan_et_al_2014) | Relationship between sibling intimacy/conflict and attitudes about health, exercise, and weight. | N = 326 participants | 12–19 years | White (73%), African American (23%), and other (6%) participants | Sibling and father intimacy had a positive correlation with teen health attitude and exercise. Mom conflict had a negative correlation with same. Father conflict and intimacy had a positive correlation on exercise; sibling conflict had no correlation with same. Mom conflict had no relation to weight; sibling conflict had a high positive relation to weight. | Sibling relations predict health outcomes. Data analysis was non-directional; thus, health outcomes could predict sibling relations. Significance of sibling relations shown. Need more on varied income level families and longitudinal studies. | Sibling relations predict health outcomes. Data analysis was nondirectional; thus, health outcomes could predict sibling relations. Significance of sibling relations shown. Need more on varied income level families and longitudinal studies. |
| 20 | [Stang et al. (2007)](#bib_Stang_et_al_2007) | Food and weight pattern comparisons between White and Hmong teens. Food, shopping, cooking, eating behaviors of 3 meals and snacks, body satisfaction levels, and activity. | N = 2,909 participants | Middle school students | Hmong (649) and White (2,260) participants | Hmong teens were more involved in family meal buying and preparation. Hmong boys > White boys regarding weight. Hmong participants > White participants regarding body image concerns. White individuals had increased unhealthy weight loss behaviors. | Skewed sample size for group comparison. Chi-square statistical analysis may be limited but appropriate. Survey results showed self-reported, may be inaccurate. More studies on Hmong needed. | Foreign-born Hmong teens have high risk for obesity and eating disorders, especially males. Specific factors re: body image and weight unknown for this pop (hand search). |
| 21 | [Travis et al. (2010)](#bib_Travis_et_al_2010) | Family food routine for athlete teen girls and management by moms. | N = 20 moms and teen daughters of middle-income status | 14–16 years | Caucasian or White participants | Individual family values and needs were the driving force behind food management and eating routine. Variable outcomes despite similar demographics of informants. Moms and teens had different concerns. | Good study design. Limited subjects, too much homogeneity (number: 20; ethnicity, SES; rural/suburban NYS). All athletic—concern for health may be higher than general population. | Framework to understand food choices—individual family system model emerged. Need larger, more heterogenous sample size future studies. |
| 22 | [Wansink et al. (2015)](#bib_Wansink_et_al_2015) | Comparison of salad type selection and consumption (school garden or school cafeteria). | N = 370 participants | High school students | White (93.9%) and Black (2.0%) participants | More students selected garden greens when offered. Less food waste on days when garden greens present regardless of total tray waste. | Small sample size and location in NY may not be generalizable to other regions with different climates. Time period of study was 3 occasions—findings may vary over longer time period—green garden salads become routine and less novel. | Future studies warranted in longer duration and in urban areas. |
| 23 | [Winkler et al. (2017)](#bib_Winkler_et_al_2017) | Adolescents' perception of obesity and maternal influences on dietary practices. | N = 26 mothers and overweight/obese female participants | 12–17 years | Black, White, Hispanic, and Mixed-race participants | Controlling and supporting influenced healthy eating behaviors. Overlooking/tempting, acquiescing influenced unhealthy eating behavior. Providing and attending did not specifically lead to unhealthy or healthy food choices, but to adolescents eating whatever was available. Intentional and unintentional children behavior influenced mothers' food choice. | Providing and avoiding parental styles not discussed throughout all interviews. Small sample size. Great definitions of parental and children types. Future quantitative studies on the relationship between mother and daughter eating behavior warranted. | Examine reciprocal relationship between parent–child and child–parent as well as social influences on food choices. |
| 24 | [Wong et al. (2015)](#bib_Wong_et_al_2015) | Purchase of non-SSBs. | N = 211 majority low-income adolescents | 10–14 years | African American participants | Placing non-SSBs at the front of the store significantly affected adolescents who were in the "sometimes drank SSBs category" (effective in people who are developing unhealthy habits). | Small sample size containing mostly AA adolescents. | Effects of product placement on healthy behaviors. Experiment in an actual corner store on adolescents warranted. |
| 25 | [Zeller et al. (2007)](#bib_Zeller_et_al_2007) | Stress surveys compared demographic data, weight, and BMI of parents and youths. | N = 149 participants from families of obese and lean individuals (78 obese and 71 nonoverweight) | 8–16 years | African American and non-Hispanic White | Parents of obese youth had higher BMI, meal-time stress, higher family conflict compared with nonoverweight youth families regardless of race and SES. | Includes children. Small sample size, convenience sample. | Need to replicate this study with other sample populations. No cause and effect due to research method. |
| Genetics |  |  |  |  |  |  |  |  |
| 26 | Cai, Cole, Butte, Smith, et al. (2008) | Cytokine levels. | N = 1,030 participants from 319 families ages | 4–19 years | Hispanic participants | Cytokines measured, including IL-6, TNF-alpha, and TNF-beta 1, were significantly heritable (range: 0.41, 0.94, and 0.84, respectively). BMI, FM, truncal FM, and insulin heritable and associated with CRP and leptin. Positive correlations between CRP, leptin, and MCP-1 and negative correlations between adiponectin, sICAM-1, and TGF-beta 1. | Includes children and GWAS. Adequate sample size. Includes Hispanic population. | No previous literature on GWAS linking IL-6, TNF-alpha, RANTES, exotoxin, and TGF-beta 1 with obesity. |
| 27 | [Cai, Cole, Butte, Voruganti, and Comuzzie (2007)](#bib_Cai_et_al_2007) | Glucose levels and quantitative trait loci. | N = 1,030 participants from 319 families | 4–19 years | Hispanic participants | Increases in fasting serum glucose, insulin, c-peptide, and HOMA-IR in overweight. Fasting serum triglycerides and LDL high in 25% to 20% of overweight. Systolic BP high in 26% overweight. Fasting serum glucose heritable (0.62 ± 0.08) found on chromosomes 7, 10, 13, and 19. Chromosome 13q markers D13S158–D13S173 highly significant. | Includes children. Large sample size. Fasting serum glucose is considered heritable. | Viva La Familia Study commonly analyzed. Futures studies warranted on the heritability of fasting serum glucose and its effects in youth. |
| 28 | Cai, Cole, Butte, Voruganti, and Comuzzie (2008) | Energy expenditure and substrate oxidation. | N = 1,030 participants | 4–19 years | Hispanic participants | TEE on chromosome 1 near marker D1S2841 significant. SMR, BMRQ, and PROOX associated with loci on chromosomes 18, 17, and 9, respectively. | Replications were not performed for TEE on chromosomes 11 and 20. Includes children like most genetic studies. | GWAS in regard to metabolic rate phenotypes common. Known candidate genes on chromosome 18p for energy metabolism were not found in this study. |
| 29 | [Cai, Cole, Haack, Butte, and Comuzzie (2007)](#bib_Cai_et_al_2007) | Heritability of birth weight. | N = 629 | 4–19 years | Hispanic participants | Birth weight highly inherited. Birth weight in relation to childhood body size and HDL positively correlated. Total triglycerides and glucose levels positively correlated with birth weight. Birth weight negatively correlated with total cholesterol, LDL, and free fatty acids. | This study could not detect biomarkers or linkage signals on chromosomes. Includes children. | GWAS focusing on understudied Hispanic population. Future studies warranted. |
| 30 | [Comuzzie et al. (2012)](#bib_Comuzzie_et_al_2012) | Genetic variants for obesogenic properties | N = 815 participants from 263 families | 4–19 years | Hispanic participants | Weight z-score change related to COL4A1 on chromosome 13. MTNR1B on chromosome 11 associated with fasting glucose. APOA5-ZNF249 on chromosome 11 related to triglycerides. PCSK2 on chromosome 20 related to total antioxidants. MATK on chromosome 19 associated with total energy expenditure. CHRNA3 related to sleeping energy expenditure. MATK and COL4A1 associated with obesity pathogenesis | Includes children. Shows the relationships between genes and obesogenic properties. | Adequate sample size. Includes sleep, which is a trend in obesity studies in adults. |
| 31 | [Glessner et al. (2010)](#bib_Glessner_et_al_2010) | CNVs associated with obesity. | N = 6,634 participants (2,559 obese and 4,075 controls) | 2–18 years | European American and African American participants | Found CNVs not present in public domain and qPCR validations. CNVs exclusively replicated in AA: deletions—EDIL3, S1PR5, FOXP2, TBCA, ABCB5, and ZPLD1 and replications—K1F2B and ARL15. Other CNVs found in EA: deletions—DERA, PNLIPRF1, BC015432-CDS2, CENTD1 and deletions—SLCO1A2, EGFL11, GPR98, PCDH20, APOB. | Adequate sample size. Includes children and adolescents. CNVs differed by race/ethnicity. | Large sample size. Cannot generalize these data because of rarity in variants. Future studies warranted. |
| 32 | Graff et al. (2012) | Obesity-related SNPS. | N = 8,694 overweight and obese participants | 12–21 years | European American, African American, Hispanic American, and Asian American participants | In EA adolescents—rs9939609 (near FTO), rs571312 (near MC4R), rs6548238 (near TMEM18), and rs987237 (near TFAP2B) were significant after Bonferroni correction. AA, HA, and AsA showed nominally and marginally significant associations (8, 5, and 3, respectively). | Does not state which SNPs are significant in the other ethnicities. Performed a meta-analysis of the literature after finding the SNPs. Compared the adolescent cohort to adult cohort ARIC Study also in meta-analysis. | Inconsistencies in the meta-analysis. Studies SNPs near the FTO gene, which is known to be associated with obesity and obesity-related diseases. Study stresses the importance of genetic studies in adolescents. |
| 33 | Grant et al. (2008) | SNPs. | N = 4,690 obese and lean participants | 2–18 years | Caucasian (418 obese and 2,270 controls) and African American (578 obese and 1,424 controls) | Significant association between rs8050136 and rs3751812 and childhood obesity risk in Caucasians. In AA, rs8050136 show strong LD with rs9939609 and rs3751812 has weak LD. No significance with other 11 SNPs analyzed in AA. | Did not have any specific significant findings in AA cohort. Includes children. | GWAS. Future studies warranted in other ethnicities. |
| 34 | [Kaulfers et al. (2015)](#bib_Kaulfers_et_al_2015) | Correlations of INSIG2 and factors affecting overweight/obesity and LDL. | N = 1,058; 5th–12th graders who participated in the Princeton School District Study (37% overweight, 63% lean) | 10–18 years | Non-Hispanic White (53%) and African American participants | Significant findings between overweight group and rs17047757 in non-Hispanic White. Association between rs12464355 and LDL in NHW. INSIG2 is related to overweight (BMI ≥ 85%) and dyslipidemia. | Adequate sample size. Location of rs12464355 not described like others. No significant data were presented for AA in the study. | Relationship between INSIG2 and obesity needs to be further studied. Prior studies found correlation and others did not. |
| 35 | [McQueen et al. (2014)](#bib_McQueen_et_al_2014) | Heritability of BMI. | N = 1,886 participants | Grades 7–12 | African American or Black (677 participants), White (917 participants), Hispanic (209 participants), Asian (73 participants), and Native American (8) participants | FTO gene associated with 0.27 kg/m2 increase in BMI. 6 SNPs down-weighted and 30 up-weighted. Up-weighted SNPs do not have significance. | Ethnically diverse population. Did not specify age range of participants. Focused on an adolescent cohort. | Significance of FTO gene studied, which is known to be related to obesity. |
| 36 | Shank et al. (2017) | Depressive symptoms, eating behaviors, and BMI and body fat measures. | N = 194 overweight/obese participants | 8–18 years | Non-Hispanic Black and White participants | Youth with LOC eating had increased inflammation, depressive symptoms, and eating-related psychopathology. Fat mass associated with an increase of hsCRP levels. | Diverse sample. Small sample size. Includes children. LOC only measured at one-time point. Other inflammatory markers not examined. | Future studies warranted on interventions for LOC eating and other factors influencing LOC eating. Does not account diet or diet quality. Relationship between LOC and eating disorders such as binge eating. |
| 37 | [Su et al. (2014)](#bib_Su_et_al_2014) | DNA methylation. | N = 1,534 (1st panel: 7 obese and 7 lean; replication panel 1: 46 obese and 46 lean; 2nd panel: 48 obese and 48 lean; replication panel 2: 230 obese and 413 lean; 3rd panel: 703 participants) | 1st panel: 14–18 years; replication panel 1: 14–30 years; 2nd panel: 14–20 years; replication panel 2: 13–19 years | African American and European American participants | 117 genes identified from literature. 4 CpG sites displayed differential methylation between obese and lean in 1st panel (LEPR, SNRPN, KREMEN1 & Ly86). 2nd panel: CpG site in LY86 showed differential methylation. Obese had increased methylation levels of CpG site in LY86. | Did not account for just adolescents throughout the other stages of the study. Publishing different papers for different parts of study instead of 1 entire study. Unclear and abundance of info. | Expression of LY86 unknown. Not a large sample. |
| 38 | [Tejero et al. (2007)](#bib_Tejero_et_al_2007) | Fasting serum levels of adiponectin. | N = 1,226 (466 participants for adiponectin analysis and 760 participants for genotyping | 4–19 years | Hispanic participants | Regions on chromosomes 11, 8, and 18 linked to circulating adiponectin levels in Hispanic children, with chromosome 11 having the strongest association. | Includes children. Chromosome 11 displays the strongest associated for serum adiponectin levels. | First GWAS for adiponectin levels in children. |
| 39 | Voruganti et al. (2007) | Serum ghrelin and body composition. | N = 1,030 (boys = 510 and girls = 520) | 4–19 years | Mexican American participants | Ghrelin is negatively correlated (p < .001). Heritability for serum ghrelin was 0.61 ± 0.08. Ghrelin was inversely related to BMI, fat mass, waist circumference, insulin, HOMA, IGFBP1, and IGFBP3. The highest LOD score was between STR markers (D1S2697 and D1S199) on the short arm of chromosome 1p36.2. | Adequate sample size. GWAS. Ghrelin levels are negatively correlated to BMI. Includes children. | Viva La Familia Study commonly analyzed. Future studies comparing what was found to other ethnicities and populations. |
| 40 | [Voruganti et al. (2015)](#bib_Voruganti_et_al_2015) | Serum uric acid levels. | N = 815 participants | 4–19 years | Mexican American participants | About 25% children were hyperuricemic. Heritability of SUA was 45%. SLC2A9 SNPs significantly associated with BMI and waist circumference. Positive correlations between SUA and components of metabolic syndrome except HDL-cholesterol. Positive correlation with both systolic and diastolic BP. | Includes children. Focuses on understudied population. SUA levels are considered heritable. | Future studies warranted on other ethnicities and other Hispanic populations. |
| 41 | [Walker et al. (2013)](#bib_Walker_et_al_2013) | Liver fat content. | N = 223 overweight/obese participants | 8–17 years | Hispanic participants | ELF subject male with higher liver fat. BMI percentile higher in ELF. PNPLA3 and APOC3 associated with liver fat content (APOC3 slightly above significance). Reduction in ALT could improve prediction of ELF. | Includes children. Difficulty defining ALT. Did not use the gold standard for liver fat %. | ALT produced high false negative diagnoses of ELF. Nonalcoholic fatty liver disease common in Hispanics due to high obesity rates. |

Note: AA = African Americans; AsA = Asian Americans; BMI = body mass index; BP = blood pressure; CNV = copy number variant; CRP = C-reactive protein; ELF = elevated liver fat; FM = fat mass; GWAS = genome-wide association studies; HA = Hispanic American; HDL = high-density lipoprotein; HOMA-IR = homeostasis model assessment-estimated insulin resistance; HS = high school; IL-6 = Interleukin 6; LD = linkage disequilibrium; LDL = low-density lipoprotein; MCP-1 = Monocyte chemoattractant protein-1; NP = no plan; NYS = New York State; PP = point plan; qPCR = quantitative polymerase chain reaction; SES = socioeconomic status; slCAM-1 = Soluble intercellular adhesion molecule-1; SNP = single nucleotide polymorphisms; SSB = sugar-sweetened beverages; TEE = total energy expenditure; TGF = Transforming growth factor; TNF = tumor necrosis factor; TPB = Theory of Planned Behavior; UAP = unlimited access plan; US = United States; USDA = United States Department of Agriculture.