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Family-focused physical activity, diet, and obesity interventions in African American girls: a systematic review

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Abstract

Obesity interventions that involve family members may be effective with racial/ethnic minority youth. This review assessed the nature and effectiveness of family involvement in obesity interventions among African American girls aged 5–18 years, a population group with high rates of obesity. Twenty-six databases were searched between January 2011 and March 2012, yielding 27 obesity pilot or full-length prevention or treatment studies with some degree of family involvement and data specific to African American girls. Interventions varied in type and level of family involvement, cultural adaptation, delivery format, and behavior change intervention strategies; most targeted parent-child dyads. Some similarities in approach based on family involvement were identified. The use of theoretical perspectives specific to African American family dynamics was absent. Across all studies, effects on weight-related behaviors were generally promising but often non-significant. Similar conclusions were drawn for weight-related outcomes among the full-length randomized controlled trials. Many strategies appeared promising on face value, but available data do not permit inferences about whether or how best to involve family members in obesity prevention and treatment interventions with African American girls. Study designs that directly compare different types and levels of family involvement and incorporate relevant theoretical elements may be an important next step.

Keywords

physical activity; nutrition; adolescents; caregiver

INTRODUCTION

In the United States, disparities in obesity are evidenced by elevated obesity rates within racial/ethnic minorities relative to those seen in non-Hispanic whites.¹ This disparity affects African American (non-Hispanic black) girls aged 6 to 19 years, whose prevalence of obesity (95th percentile) in 2007–08 was 26%, compared to 16% in their non-Hispanic white counterparts² and remained steady in 2009–10.³ A striking disparity was also seen in an analysis of severe obesity (120% of 95th percentile): African American girls had double the prevalence compared to non-Hispanic white girls (18% vs. 9%, respectively).⁴ A need for specially designed interventions to address obesity in African American females is

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suggested by the disparity in prevalence and also by evidence of lesser effectiveness of weight loss interventions in black compared to white populations. African Americans tend to lose less weight than whites when offered the same intervention,⁵⁻⁷ and this difference is particularly pronounced in females.^{5, 7} These dissimilarities have been attributed to both cultural and contextual issues, i.e., possible variations in factors that influence the motivation or ability of participants to adhere to behavioral change advice.

Family-based, behavioral interventions are among the most successful for addressing childhood obesity,⁸ and may have particular relevance to racial/ethnic minority youth.⁹ When targeting youth using behavioral change strategies, it makes practical sense to engage the family and not just the child. The child is not in sole control of decision making related to healthy lifestyle choices. Rather family dynamics (i.e., family rules, emotional support, encouragement, positive reinforcement, and family involvement) work as a unit, with parents influencing their children and vice versa.⁸ Sociological research suggests that African American households exhibit an inherent strength in their supportive, interpersonal parent-child and extended family bonds, in response to historical discrimination.¹⁰ Thus, in addition to the general finding that a focus on family and home environments is important in child-focused obesity interventions, the inclusion of family members and using familiar surroundings such as neighborhood community centers or homes as the setting for the interventions may also be forms of cultural adaptation for African American children.¹⁰

Although several reviews have focused on effects of family involvement on outcomes,¹¹⁻¹⁴ findings of these reviews have pointed out the need for more evidence about the effectiveness of such approaches on racial/ethnic minorities,^{12, 14} and it is still unclear what level of family involvement yields the largest impact on youth behaviors and weight outcomes. Therefore, this review was undertaken to examine evidence available for intervention studies with a family component for African American girls. Based on an Institute of Medicine report that encouraged an inclusive approach to locating and assessing evidence about obesity prevention,¹⁵ all potentially relevant evidence was considered in order to obtain insights about strategies used, how comprehensive they were, and how they were conducted as well as impact on outcomes. The overall objective was to gather a comprehensive picture of the evidence available for this particular type of intervention for a vulnerable population, African American girls. Specific aims of the review were to 1) examine intervention strategies related to level of family involvement and cultural adaptation and 2) assess the effectiveness of studies with different types and levels of family involvement.

METHODS

Data Sources

In January and February 2011, relevant, peer-reviewed journal articles and abstracts from databases (AGRICOLA, AMED, Biological Abstracts, BIOSIS Previews, CDSR (Cochrane), CENTRAL/CCTR, CINAHL, Cochrane Library, DARE, ERIC, EMBASE, Health Source: Nursing/Academic Edition, PsycARTICLES, PsycINFO, PubMed or MEDLINE, Population Index, Proquest Digital Dissertation Abstracts Int'l, Proquest Digital Dissertations and Theses, Science Citation Index (Web of Science), ScienceDirect, SCOPUS, Social Science Citation Index (Web of Science), SPORTDiscus, TRIS, TRIP, and Web of Science) were retrieved during a systematic search of interventions for African American girls that included a family component and incorporated weight change, physical activity and/or nutrition components. The following strategy and search terms were applied: (adolescent OR girl OR teen OR child OR youth) AND (African-American OR black) AND (obesity OR weight OR overweight) AND intervention. Bibliographies from pertinent articles were also reviewed for additional applicable interventions. In November 2011 and

March 2012, the electronic search was updated. There was no limit on publication year, except for the restrictions of the databases. The earliest searchable year was 1887 (PsycINFO).

Study Inclusion and Exclusion Criteria

The inclusion criteria used for all articles and abstracts were (1) samples that included any African American girls aged 5–18 years; (2) some degree of family involvement; (3) intervention studies only; (4) intervention strategies targeted physical activity, eating/nutrition, or weight (5) any study design (e.g., randomized controlled trial, quasi-experimental, or other); (6) primary outcome related to physical activity, healthy eating (i.e., fruit, vegetable, water, sweetened beverage), or weight; (7) availability of description of intervention; (8) studies conducted in the US only; and (9) intervention took place in either a home or community setting (i.e., school, local theater, clinic, park or recreational center, etc.).

There were no restrictions on the length of the intervention, year in which the intervention took place, or the weight of participants at study entry. Included articles were not restricted to studies with African American-only or girl-only samples. However, results for African Americans and girls had to be reported or considered separately (i.e., stratification or assessment of interaction) from other racial groups and from boys. From the electronic searches, 8709 citations matched the initial search criteria. Each article title and abstract were reviewed independently by two researchers for duplicates and relevancy. Excluded were non-English publications, news reports, review articles, and secondary data analyses. The remaining articles (n=67) were then obtained for independent review by the same authors.

Identification of Eligible Studies

Of the 67 articles thoroughly reviewed, many were excluded because their results did not stratify for ethnicity and/or sex (n=31), precluding assessment of intervention effects for African American girls. No attempt was made to contact the authors of these studies to provide subgroup analysis for African American girls. Other reasons for exclusion were: the intervention did not include a family component (n=5); baseline data but not post-intervention data were reported (n=4); the article was a review or secondary data analysis (n=4); and the targeted child was less than five years of age (n=1), resulting in 22 articles. In November 2011, the databases were searched again and five articles were found that met the inclusion and exclusion criteria. No additional articles were identified after a further update of the search in March 2012, resulting in a final number of 27 articles included in this systematic review. Of the studies included, four were pilot studies^{16–19} for randomized control trials of 2-year interventions^{20–23} that are also represented in this review.

Data Extraction & Analysis

Variables of interest included the intervention behavioral change strategies, level of family involvement, cultural adaptations, and the effectiveness of the studies on diet, physical activity, and weight change. Data extracted from each article include data collection year, study population description, study setting, study design, theoretical framework, key intervention components, intervention duration and follow-up periods, assessment measures for treatment effects, key intervention findings related to outcome variables, strengths and limitations of the study, recommendations for future research, and criteria related to internal and external validity.

Assessment of Intervention Components

Assessment of family participation or involvement was adapted from previous work that evaluated the nature and effectiveness of family involvement in weight control, weight maintenance, and weight loss interventions.²⁴ Family involvement was described according to: 1) family member involvement (i.e., parent-child only, multiple family members which included parent-child pair plus additional family member(s), or whole family involvement defined as entire household where child lives most of the time); 2) index member (i.e., targeted participant) of the intervention; 3) format of intervention delivery (i.e., distant, face-to-face, and/or other delivery); 4) expected joint attendance by index and family member (i.e., single/partial/all sessions attended jointly/separately); 5) goal for the family member (i.e., no specific goal, support-related goal, or change in own behavior goal); and 6) behavior targeted for change (i.e., physical activity and/or diet).

Cultural adaptation was described as 1) no cultural adaptation mentioned, 2) adaptation limited to targeted recruitment of African American participants or conduct of intervention in culturally familiar setting, or 3) specific attempts to tailor intervention components.²⁵

Assessment of Methodological Quality

Internal validity was evaluated using six criteria adapted from the Delphi List:²⁶ 1) randomization performed, 2) treatment allocation concealed for baseline data collection, 3) groups similar at baseline, 4) eligibility criteria specified, 5) point estimates presented, and 6) intention-to-treat analysis included. Criteria related to blinding were not assessed because the nature of behavioral change interventions prevents research staff and participants from being blinded to treatment assignment. External validity was assessed using seven criteria outlined by Green and Glasgow most applicable to behavior change intervention research:²⁷ staff expertise, program adaptation, long-term effects, institutionalization, attrition, consistent implementation, and quality of implementation of different program components and mechanisms. A total methodological quality score was created by summing the number of internal and external validity criteria met (see Supporting Document for Methodological Quality Assessment table).

Behavioral and Weight Change Outcomes

Studies identified included some that recruited only overweight or obese participants and were treatment-oriented as well as those that focused on or included girls in the healthy weight range and were prevention-oriented. We stratified studies into treatment and prevention subsets when considering outcomes given the differences in study participants, goals, and participant motivations related to treatment vs. prevention. In particular prevention studies tend to focus more on shaping lifelong habits than on weight loss strategies, and participant motivations for adherence may be much more heterogeneous than in treatment study populations. Both types of studies would be expected to result in similar behavior changes, but effects on weight are often smaller in prevention studies and may not be detectable in the short term. We were also cognizant of the complexities of evaluating weight change outcomes in growing children and adolescents among whom weight, height, and BMI increase with age and are evaluated on growth charts.^{28, 29} Improvements in weight of active intervention vs. control groups may be reflected in various scenarios (weight loss, no change in weight, or less weight gain; or reduced, stable, or less of an increase in age and gender specific BMI z-scores) in the active intervention relative to control group. Taken together, these issues led us to consider the direction of net weight-change outcomes only in controlled trials (RCTs) of treatment (any duration) and only in full-length RCTs of prevention. We considered the direction and significance of behavioral change outcomes for all studies.

RESULTS

Description of Studies

Table 1 provides a general description of the study population, study setting and state location, study design and theoretical framework, nature of comparison group (if applicable), and duration of intervention and post-intervention follow-up, grouped by age of participants (i.e., 12 years, 13 years, or across both age groups). Studies are grouped by participant age because studies that target different developmental stages likely require different approaches. Therefore, some of the results discussing the intervention strategies are presented according to age of the majority of participants: 12 years and younger (i.e., preadolescence), 13 years and older (i.e., mid-to-late adolescence), and 8–18 years for studies that included youth across both age groups. Fifteen of the 27 studies targeted only African American girls,^{16–18, 20–22, 30–38} six targeted African American girls and boys,^{39–44} five targeted multi-ethnic samples of girls and boys,^{19, 23, 45–47} and one study included a multi-ethnic sample of girls.⁴⁸ Sample sizes ranged from 15⁴¹ to 618.²³ The majority of studies took place in a community setting ($n=15$),^{16, 19, 21, 23, 31, 33, 34, 36, 39, 40, 42, 44–47} with the remaining taking place in either the home^{32, 38} or a combination of community and home settings.^{9, 17, 18, 20, 22, 30, 35, 37, 41, 43, 48} The interventions ranged in duration from three weeks⁴⁸ to two years,^{20, 22, 38} of which 15 were pilot studies,^{16, 18, 30, 32, 33, 35, 36, 39–44, 47, 48} one was a short-term study (12 weeks but not identified as a pilot),³⁴ and 12 were full-length, non-pilot studies.^{17, 19–23, 31, 37, 38, 45, 46} Seventeen of the studies were randomized controlled trials;^{16, 18–23, 30, 31, 33, 35, 37, 38, 42, 46, 47, 49} eight were uncontrolled (i.e., before and after) studies;^{17, 32, 36, 39–41, 43, 48} two were non-randomized controlled trials;^{44, 45} and one was a randomized trial of three active interventions.³⁷ Nine of the studies were treatment studies that targeted overweight or obese participants.^{17, 21, 37, 38, 40, 42, 44, 47, 48} The interventions were implemented in 13 different states and incorporated a variety of theoretical frameworks, of which Social Cognitive Theory was most utilized. Methodological quality of the studies ranged from 1⁴³ to 10¹⁸ with the randomized controlled trials consistently assessed as higher quality.

Intervention Approaches

Behavioral Change Techniques and Cultural Adaptation—Table 2 summarizes the specific behavioral change techniques and cultural adaptation strategies utilized. With the exception of five studies, both physical activity and diet were the main focus of the behavioral change strategies. Most studies made specific attempts to tailor their intervention components; these attempts varied, although most reported culturally tailoring the content of intervention materials and messages. Three studies did not report any level of cultural adaptation, and four additional studies limited their cultural modifications to recruiting only African American participants. Theories specific to African American families were not generally mentioned or identified for the behavioral change techniques. Although a variety of strategies were reported, no clear pattern based on age of the child or family member involvement emerged. Further descriptions of the intervention components are available in the Supporting Document.

Level and Type of Family Member Involvement—With respect to family member involvement, among the treatment studies, none included the whole family, four included multiple family members and five incorporated parent-child dyads only. All three of the whole family interventions were prevention studies. Prevention studies also included three multiple family member and 12 parent-child dyad interventions. Examining the characteristics of family member involvement (Table 3), although a clear pattern does not emerge within each cluster, some similarities in intervention approach can be reported.

The three whole family, prevention interventions targeted younger children and incorporated some form of face-to-face intervention delivery with the expectation for some of the sessions to be attended jointly by all family members. There was no clear pattern of the goals for the family members in these three studies.

Among the interventions with multiple family member involvement, the prevention studies focused most efforts on the child; family members were included only to provide support and there was a greater expectation for the child to attend the intervention sessions than the family members. Clear patterns did not emerge for the treatment studies; half engaged family members to make substantial behavioral changes and the expected attendance varied from all sessions attended jointly to all sessions attended separately.

The majority of studies engaged parent-child dyads only (n=17). The two treatment studies that targeted parental behavior change required all participants to attend all sessions separately then jointly with a face-to-face intervention delivery mode. The difference between the two studies was Janicke et al. (47) targeted younger adolescents and MacDonell et al. (42) targeted older adolescents. The other three treatment studies that included a parent-child dyad did not share any similarities.

Four of the 12 parent-child dyad prevention studies included change strategies to improve the parent's behavior, targeted younger children, and required the family member to attend all sessions while the child's attendance varied from all sessions either jointly or separately or attendance not required because of the non-face-to-face, distant delivery. Only one of the prevention studies designated no specific expectation for family member attendance, which resulted in the child attending all of the sessions alone. The remaining prevention studies engaged the family members with support-related goals to help change the child's behaviors with almost equal distribution of participants attending some of the sessions jointly or child attending all sessions alone. One parent-child dyad prevention pilot study was designed to directly assess parent only vs. child only approaches vs. a non-weight related comparison conditions,¹⁶ but the subsequent full length RCT combined the parent and child conditions.²⁰

Behavioral and Weight Outcomes

In order to examine which family components were most effective, Table 3 also includes behavioral and weight change results. As described in the Methods section, weight-related outcomes were not considered for short-term or pilot prevention studies or any before and after (uncontrolled) studies.

Among the nine treatment studies, three of the seven studies that assessed physical activity positively impacted this behavior. However, no clear pattern related to family member involvement, goal of the family member, format of the intervention delivery, and age of child emerged. Treatment studies that reported an increase in physical activity expected for all face-to-face sessions to be attended, but who attended (child vs. family member vs. both) or how the sessions were attended (separately vs. jointly) did not seem to influence physical activity changes. Three of the four studies that assessed dietary intake reported null or opposite to expected results. Similarly, null or opposite to expected findings were reported for the three full-length treatment RCTs. The Wadden et al. study³⁷ of obesity treatment in black adolescent girls is the only full-length study identified that designed to isolate effects of different types of parent-child involvement (child or parent alone or together). No statistically significant differences were found between either group that involved parents compared to the child alone. However, weight losses were least in the child alone group (1.6, 3.7, and 3.1 kg for child alone, mother-child together, or mother-child separately, respectively).

In general, both physical activity and dietary intake were positively affected in the prevention studies, regardless of study design. All fourteen of the 18 prevention studies that assessed some form of physical activity behavior and all 15 of the prevention studies that assessed some form of dietary intake were able to positively influence the behaviors. Most of the studies assessed physical activity and dietary intake using several measures; four and eight of the prevention studies also reported null or opposite to expected results for physical activity and dietary intake, respectively. Seven full-length RCTs were prevention studies. Of those, six assessed a weight-related outcome with four reporting positive effects on weight. The two RCTs reporting negative or null effects on weight had the highest methodological quality ranking of the prevention studies.

The five studies that mentioned limited or no intervention cultural adaptation, reported generally favorable outcomes, although they also ranked low on methodological quality (scores=1, 2, 5, 5, 6). All but Janicke et al.,⁴⁷ who did not assess physical activity or dietary behavior, reported a statistically significant increase in physical activity. Newton et al. (43), Barbeau et al. (31) and MacDonnell et al. (42), who recruited African American only samples, also reported statistically significant, positive influences on some of the other outcomes they assessed: dietary, weight-related, and dietary, respectively. Greening et al.,⁴⁶ who did not culturally adapt any of their intervention, reported positive results for all outcomes. No studies were designed to isolate effects of culturally vs. not culturally adapted interventions.

DISCUSSION/CONCLUSION

The purpose of this review was to examine intervention strategies and assess intervention effectiveness in African American girls based on level of family involvement and cultural adaptation. This systematic literature search identified 27 family-based interventions that included physical activity, eating/nutrition, or weight change components, of which many were pilot studies not linked to subsequent full length trials. Assessments of patterns related to intervention approaches and effectiveness were limited to qualitative assessments of similarities or patterns based on various groupings of studies. Studies reported diverse patterns of family involvement and cultural adaptation with no use of theoretical perspectives specific to African American family dynamics incorporated. Only one pilot and one full-length study permitted a direct comparison of more than one type of family involvement and no studies permitted direct comparison of culturally-adapted vs. non-adapted approaches. Effects on behavioral outcomes and, in some cases, on weight outcomes were in the expected direction, but statistically significant results were limited. The studies included in this review differed widely by intervention components, study design, and implementation and also in quality. Null results were observed in two of the highest quality studies, of which both were culturally adapted. Overall, we were unable to draw clear inferences with respect to the most promising or effective ways of involving family members in weight interventions with African American girls.

It has been well-established throughout the adolescent obesity literature that intervening on family systems presents a dynamic and multi-dimensional approach to influencing and engaging health behavior change for both child and adult.⁸ In the studies examined in this review, the extent to which family members were required to be involved and the type of strategies directed towards them varied with respect to their role as behavior change agents in the context of the child. A majority of the interventions included in this review incorporated parent-child involvement, though some studies reported multiple family members or whole family participation. Session attendance ranged from child only to all or some of the sessions attended by both family member(s) and child. Most family members served to support the behavior change goals of the child. However, several studies

encouraged family members, as mostly secondary audiences, to make individual behavioral changes that would perhaps influence the child's behavior.

Some patterns that surfaced are worthy of further comment. Of the nine treatment studies targeting overweight participants, five of them engaged the family members to change their own behavior and not just support the targeted child. Wrotniak et. al.⁵⁰ found that a change in parental behavior resulting in weight loss was predictive of their overweight child's weight loss in three family-based RCT studies. Although some of the findings for the five studies were non-significant (possibly due to the pilot nature of most of the studies), the outcomes tended to be more positive for weight-related behaviors and outcomes than the treatment studies that did not try to change the family member's behavior. This suggests that encouraging participating family members to change their own behavior and lose weight may be an effective strategy for overweight children to either successfully lose excess weight or prevent additional weight gain.

All but two of the ten studies included in this review that engaged family members to change their own behavior expected the child and participating family member(s) to attend at least some, if not all, of the sessions together. The outcomes of the studies do not definitively ascertain that this is an effective strategy to change African American girls' behavior, but there is promise in exploring the effect of face-to-face interaction with children and their familial support network. This face-to-face contact may provide opportunity to discuss and complete activities, share knowledge, or set supportive goals that may be key for successful change. Conducting rigorous interventions to test the effect of family member attendance is a logical next step in this area of research.

Three of the studies required only the child to attend the intervention sessions. As with examining the effectiveness of other levels of family involvement, the findings are weak in supporting the effectiveness of this strategy, suggesting that more research needs to be conducted regarding this aspect of family interventions. However, it inherently seems that not engaging the family member(s) in some form of face-to-face contact, which has proven to be an effective strategy, for a family-based study, is an underutilization of family involvement. The Wadden et al.³⁷ study finding that children engaged in a family-based intervention who attended intervention sessions alone did not lose as much weight as participants whose family members were involved in some type of face-to-face contact (with or without their children) lends possible support to this conclusion.

Similar to family-focused interventions, behavioral programs that are culturally relevant are considered important when working with ethnic minority populations, and appear to be well received.^{51–54} The studies reviewed here reflect the variety of approaches that can be used for cultural adaptation, including recruitment of only African American samples and instructors, emphasizing cultural norms and traditions, preparing foods and planning activities with which African Americans may be familiar, placing African American images on materials, incorporating focus group feedback of African Americans, and utilizing locations for intervention activities in primarily African American communities. Most of the studies included in this review addressed African American culture through direct targeting, cultural tailoring or a combination of these approaches. The cultural tailoring may confer familiarity and greater acceptance of the intervention but may not directly impact effectiveness. For this reason, studies that compare culturally tailored with non-tailored interventions may be difficult to implement.

While the overall quality of the available evidence was low from a study design perspective, several studies included in this review developed and implemented innovative intervention strategies (i.e., computer technology,^{32, 38} internet delivery,^{30, 45} theater-based education

program,⁴¹ and active video games).³⁹ The use of computer technology and internet intervention delivery attempts to lessen the burden for families to meet outside the home. Utilizing digital media to increase physical activity capitalizes on the higher than average digital media use in African American youth.⁵⁵ Theater-based education programs have been used in overweight and obesity prevention in many studies,⁵⁶ but this review highlights their use with African American children and families.

Strengths

This is not the first review to examine obesity-related interventions that included a family component, however, our review is unique and contributes significantly to the literature, as we focused solely on African American girls, a vulnerable population with obesity rates that are among the highest observed among youth. Additionally, the other reviews,^{11–14} which made important contributions to the literature, had exclusions that our study did not. Golley et al.¹¹ included studies that only targeted parents with children optionally involved while our study included interventions that targeted and involved parents, children, or both. Kitzman-Ulrich et al.¹² only included interventions that targeted family system components such as parenting styles, parenting skills, or family functioning and excluded studies that minimally involved the family through take-home materials or contact at study-related events. Because it is unknown what degree of familial involvement affects behavioral change, we included all studies with any degree of family involvement. Knowlden and Sharma¹³ included studies that only targeted young children ages 2–7 while our review included a wide range of children and adolescents ages 5–18 years. Lastly, Swanson et al.¹⁴ reviewed literature published only from 1998–2008, while we wanted to access all literature that met our study criteria and did not restrict the time period of when the study was conducted or published.

Limitations

This review encountered several limitations in its synthesis of findings. Across the studies, comparing results was complicated by various methodological differences, such as intervention design, measures, and reported outcomes. Many studies relied heavily on the use of subjective, self-reported measures, which are inherently biased. A majority (n=15) of the studies were pilots with small numbers of participants and short duration; few were associated with full, longer term studies. Also, our review focused on children age five years and older. A review of studies in younger children would also be of interest given that birth to preschool age is a critical period for obesity risk development, as well as a period highly influenced by parents.

Future Research

Although the studies identified in this review included a variety of approaches to family involvement, the optimal approach or approaches with African American girls are still unclear. Whether these approaches differ for prevention and treatment or by age is a topic for further study. Also, the basis for choosing type and level of family involvement seems unclear or unsystematic, making it difficult to make definitive conclusions. This is an area that needs more attention in research design. Future studies should be designed to test directly what factors related to family involvement (i.e., family member designation, level of interaction between child and family member, and attendance of child and family member) are most effective in positively influencing physical activity and dietary behaviors. Without a clear, generalizable understanding or theoretical framework of the function of family involvement on obesity-related behavior change among African American children, researchers will continue to struggle with developing best practices for this area of public health. Technological approaches, including the use of social networking and mobile devices are also worthy of further study. Finally, although this review was undertaken at a time

when obesity rates were substantially higher in African American girls than boys, rates in African American boys have increased to levels similar to those in girls. Thus, future research should examine obesity interventions in both sexes.

Implications for Practice

To our knowledge, this review is the first to focus on empirical evidence of obesity interventions with a family component that involved African American girls. The review brings to light the need for rigorously tested obesity interventions for African American girls that allow direct inferences about whether and how to involve family members and that, if possible, clarify the benefits of various approaches to cultural adaptation. Recognizing the urgency in addressing disparities in obesity prevalence, this review has sought to present more detailed explanation of the *what* and *how* of intervention research, rather than focus on only comparing outcomes of a body of inconclusive and often methodologically flawed evidence from the perspective of assessing effectiveness. Although no definitive conclusions can be made about the most promising strategies, the findings provide substantial guidance for and will motivate the design and implementation of future studies on this important topic. The health implications of obesity begin in childhood and are even more prevalent in adults. The prevalence of obesity among African American women is now 59% percent, compared to 33% in non-Hispanic white women. Progress in the prevention and treatment of obesity in African American girls will also help to prevent them from being obese as adults.

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FIGURE I. Flowchart of Systematic Search Findings

*Search engines: AGRICOLA, AMED, Biological Abstracts, BIOSIS Previews, CDSR (Cochrane), CENTRAL/CCTR, CINAHL, Cochrane Library, DARE, ERIC, EMBASE, Health Source: Nursing/Academic Edition, PsycARTICLES, PsychINFO, PubMed or MEDLINE, Population Index, Proquest Digital Dissertation Abstracts Int'l, Proquest Digital Dissertations and Theses, Science Citation Index (Web of Science), ScienceDirect, SCOPUS, Social Science Citation Index (Web of Science), SPORTDiscus, TRIS, TRIP, and Web of Science

Table 1

Description of Pilot, Short-term and Full-length Interventions with a Family Component that Involved African American Adolescent Girls*

Author Publication Year [Year Study Started]	Study Population ¹	Study Setting ² and State Location	Study Design and Theoretical Framework	Nature of Comparison Group	Duration of Intervention and Follow-up (where applicable)
Age 12 years					
Fitzgibbon 2005 [1999] (NOTE: Supplemental articles: Fitzgibbon 2002 ⁵⁷ and Stolley 2003 ⁴⁹)	409 pre-school age children (50.5% female, 49.7% treatment, majority AA ⁴ (99% in treatment and 80.7% in control) Year 1 FU: 289 children Year 2 FU: 300 children	Community-based (Head Start pre-schools) Illinois	Two group parallel RCT ⁵ Social Cognitive Theory, Self-Determination Theory, and Translational Model	Child: Weekly, school-based, general health intervention, covering topics such as dental health, immunization, seat belt safety, and 911 procedures; no diet or physical activity information shared Parent ³ : weekly newsletter covering similar information presented to child	14 weeks 1 year and 2 year post-intervention follow-ups
Fitzgibbon 2011 [Not specified]	618 3–5 year old, multiethnic girls and boys and their parents ³ (53% girls, 94% AA ⁵)	Community-based (Head Start pre-schools) Illinois	Two group parallel RCT ⁵ Social Cognitive Theory and Self-Determination Theory	Child: Weekly, school-based, general health intervention, covering topics such as dental health, immunization, seat belt safety, and 911 procedures; no diet or physical activity information shared Parent ³ : weekly newsletter covering similar information presented to child	14 weeks 1 year and 2 year post-intervention follow-ups proposed but data not yet available
Greening 2011 [Not specified]	450 6–10 year old, multi-ethnic girls and boys (~60% AA ⁴ , ~50% girls) Treatment group (n=204) Control group (n=246)	Community-based (schools) Mississippi	Two group parallel RCT ⁵ Social Learning Theory and interdisciplinary, community-based approach	State's standard health curriculum which included didactic nutrition education, health information incorporated into academic lessons, and weekly physical education classes	8 months
Janicke 2011 [Not specified]	40 6–12 year old, multiethnic, overweight (85 th percentile for age & sex) girls & boys and their parents ² (47.5% girls, 40% AA ⁴)	Community-based (specific location not specified) Florida	Pilot, two group parallel RCT ⁵ Framework not specified	Three, 60-minute individual standard of care sessions presenting abbreviated lectures covered in treatment group	12 weeks 6 month post- intervention follow-up
Stolley 1997 [Not specified] (NOTE: Supplemental article: Willet 1995 ⁵⁸)	65 7–12 year old girls and their mothers	Community-based (low-income, tutoring center) Illinois	Short-term; two parallel RCT ⁵ Framework not specified	General health program with content including communicable disease control, effective communication skills,	12 weeks 1 year post- intervention follow-up

Author Publication Year [Year Study Started]	Study Population ¹	Study Setting ² and State Location	Study Design and Theoretical Framework	Nature of Comparison Group	Duration of Intervention and Follow-up (where applicable)
				relaxation techniques and stress reduction	
Baranowski 2003 [2001]	35 8 year old girls (> 50 th BMI percentile for age & sex) and their parents ³ Treatment group (n=19) Control group (n=16)	Community-based (summer day camp) and home-based Texas	Pilot; two group parallel RCT ⁵ Social Cognitive Theory	4-week summer day camp followed by a monthly home internet interventions involving websites with general health information and homework assistance	12 weeks
Beech 2003 [2001]	60 8–10 year old girls (> 25 th BMI percentile for age & sex) and their parents ³	Community-based (community centers) Tennessee	Pilot; three group parallel RCT ⁵ Combination of Social Cognitive and Family Systems Theories	3 monthly, 90 minute sessions to enhance and prevent decline in self-esteem and remain neutral to dietary practices and physical activity; personalized greeting cards and general health information via mailings	12 weeks
Klesges 2010 [Not specified]	303 8–10 year old girls with BMI > 25 th BMI percentile for age & sex and one parent ³ with BMI > 25	Community-based (YWCA) and home-based Tennessee	Two group parallel RCT ⁵ Framework not specified	Girls only: Social awareness and community responsibility program to improve self- esteem and self-efficacy; no focus on diet, physical activity, or weight behavioral change	2 years
Robinson 2003 [2001]	61 8–10 year old girls and their parents ³	Community-based (low-income, community centers) and home-based California	Pilot; two group parallel RCT ⁵ Social Cognitive Theory	Age-appropriate, culturally targeted newsletters including content such as health risk/ disease reduction; health education lectures to promote healthful diet and activity patterns	12 weeks
Robinson 2010 [2002]	261 8–10 year old girls and their parents ³	Community-based (low-income community centers) and home-based California	Two group parallel RCT ⁵ Social Cognitive Theory	Monthly newsletters and quarterly community center health lectures consisting of culturally tailored, authoritative, information- based health education on nutrition, physical activity, and reducing cardiovascular disease and cancer risk	2 years
Story 2003 [2001]	54 8–10 year old girls and their parents ³	Community-based (neighborhood locations and after-school program) and home-based Minnesota	Pilot; two group parallel RCT ⁵ Social Cognitive Theory	Non-nutrition/physical activity program focused on promoting positive self- esteem and cultural enrichment; 3 monthly Saturday morning meetings including arts and crafts, self-	12 weeks

Author Publication Year [Year Study Started]	Study Population ¹	Study Setting ² and State Location	Study Design and Theoretical Framework	Nature of Comparison Group	Duration of Intervention and Follow-up (where applicable)
				esteem activities, creating memory books, and a workshop on African percussion instruments	
Barbeau 2007 [Not specified]	278 8–12 year old girls (3 rd –5 th grade) Treatment group (n=118) Control group (n=83)	Community-based (7 elementary schools) Georgia	Two group parallel RCT ³ Framework not specified	No intervention for comparison group	10 months
Fitzgibbon 1995 [Not specified]	24 women and their 8–12 year old daughters	Community-based (tutoring program adjacent to housing project complex) Illinois	Pilot; two group parallel RCT ³ Social Learning Theory	No intervention for comparison group	6 weeks
Raman 2010 [2005]	165 9–11 year old girls and boys (85 th BMI percentile for age & sex)	Community-based (summer camp located at YMCA) California	Pilot; two group, non- randomized, quasi- experimental Social Cognitive Theory	Child: 2-week conventional YMCA summer camp Parent ³ : nutrition and physical activity information via mail All participants: Invited to attend YMCA 3 times during the year to participate in healthy snack preparation (child only) and nutrition education (parent only)	12 months
Burnet 2011 [Not specified] (NOTE: Supplemental article: Burnet 2002 ⁵⁹)	62 participants (29 families) including 30 9–12 year old, overweight (85 th BMI percentile for age & sex) girls and boys and 32 parents ³	Community-based (specific location not specified) Illinois	Pilot; one treatment group, quasi-experimental Health Belief Model, Social Learning Theory, Theory of Planned Behavior, and Ecological Model	N/A	14 weeks (intensive) followed by monthly booster sessions up to one year 1 year
Cullen 2008 [Not specified]	67 mothers and their 9–12 year old daughters	Home-based Texas	Pilot; three different waves; one treatment group, quasi-experimental Social Cognitive Theory	N/A	8 weeks
Newton 2010 [Not specified]	77 2 nd –6 th grade students (mean age of 9.26 years; 50% girls)	Community-based (school) and home-based Louisiana	Pilot; one treatment group, quasi-experimental Social Learning Theory	N/A	18 months
Olvera 2010 [2006] (NOTE: Supplemental article: Olvera 2008 ⁶⁰)	37 girls (85 th –94 th BMI percentile for age & sex) and their parents ³ (n=27 Latina girls: n=10 AA ⁴ girls); mean age: 10.8±1.2	Community-based (University campus setting) and home-based Texas	Pilot; one treatment group, quasi-experimental Social Cognitive Theory	N/A	3 weeks

Author Publication Year [Year Study Started]	Study Population ¹	Study Setting ² and State Location	Study Design and Theoretical Framework	Nature of Comparison Group	Duration of Intervention and Follow-up (where applicable)
Jackson 2010 [2006]	15 low-income 11–13 year old girls and boys (n=12 girls)	Community-based (low-income, urban after school setting) and home-based Georgia	Pilot; one treatment group, quasi-experimental with CBPR ⁶ approach Framework not specified	N/A	6 weeks
Age 13 years					
Williamson 2006 [Not specified]	57 11–15 year old overweight girls and one overweight parent ³	Home-based Louisiana	Two group parallel RCT ⁵ Framework not specified	Health education delivered via face-to-face sessions and links to a variety of web sites promoting a healthy lifestyle	2 years
Frenn 2003 [2000]	130 12–15 year old, multi-ethnic girls and boys (n=58 AA ⁴ ; n=68 girls) Treatment group (n=67) Control group (n=63)	Community-based (school computer lab) Wisconsin	Two group, non-randomized, quasi-experimental Combination of Translational and Health Promotion Models	Comparison group not described	Academic school year ~9 months
Resnicow 2005 [Not specified]	123 12–16 year old girls (>90 th BMI percentile for age & sex)	Community-based (churches) Georgia	Two group parallel RCT ⁵ Framework not specified	Moderate intensity comparison group Child: 6 monthly sessions selecting lessons from high-intensity group; topics covered included fat facts, barriers and benefits to physical activity, fad diets, neophobia Parents: invited to attend every other session	6 months 6 months post-intervention follow-up
Wadden 1990 [Not specified]	36 12–16 year old girls and their mothers	Community-based (clinic setting) and home-based Pennsylvania	Randomized with three treatment groups Framework not specified	N/A	16 weeks 6 month post-intervention follow-up
Thompson 2010 [Not specified]	39 12–18 year old girls	Community-based (churches) North Carolina	Pilot; one treatment group, quasi-experimental Theory of Reasoned Action	N/A	12 weeks
MacDonell 2011 [Not specified]	44 13–17 year old, overweight (< 85 th BMI percentile for age & sex) girls & boys and their parents ⁵ (79.5% girls)	Community-based (adolescent medicine clinics) Michigan	Pilot; two group parallel RCT ⁵ Framework not specified	Four, 60-minute sessions of nutritional counseling	10 weeks
Across both age groups (i.e., 8–18 years)					
Cotton 2006 [Not specified]	36 8–18 year old girl and boy patients (n=27 girls)	Community-based (urban primary care setting) Georgia	Pilot; one treatment group, quasi-experimental Framework not specified	N/A	12 weeks

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Author Publication Year [Year Study Started]	Study Population ¹	Study Setting ² and State Location	Study Design and Theoretical Framework	Nature of Comparison Group	Duration of Intervention and Follow-up (where applicable)
Resnicow 2000 [Not specified]	57 11–17 year old girls (35% body fat or 85 th BMI percentile for age & sex)	Community-based (4 public housing developments) and home-based Georgia	One treatment group, quasi-experimental Social Cognitive Theory	N/A	6 months

N/A=Not applicable

* The studies are presented according to age of participants (12 years, 13 years, and across several age groups). Studies were stratified into categories based of the age of the majority of the participants.

¹ Race of participants is African American, unless denoted.

² Study settings were community-based, home-based, or both community- and home-based.

³ Parents refer to parents, caregivers, or guardians.

⁴ AA=African American

⁵ RCT=Randomized Control Trial

⁶ CBPR=Community-based Participatory Research

Table 2

Intervention strategies and cultural adaptation

Author Year	Focus of behavior change techniques	Specific behavior change techniques	Cultural adaptation/
Age 12 years			
Fitzgibbon 2005	PA and diet	<ul style="list-style-type: none"> • Healthy eating and PA sessions that utilized puppets and active games • Weekly newsletters and homework 	<ul style="list-style-type: none"> • AA only sample at certain schools • Culturally tailored content and messages
Fitzgibbon 2011	PA and diet	<ul style="list-style-type: none"> • Healthy eating and PA sessions that puppets, songs/traps and active games • Weekly homework 	<ul style="list-style-type: none"> • Culturally relevant foods and traditional recipes • Newsletters created for the family • Culturally relevant music and dances • Acknowledgement of community environmental barriers to regular PA, healthful eating, social roles, and social support
Greening 2011	PA and diet	<ul style="list-style-type: none"> • Monthly family events • Nutrition and physical activities/contests • Modifications in intervention school's food service • Nutrition and PA education sessions 	<i>No cultural adaptation mentioned</i>
Janicke 2011	PA and diet	<ul style="list-style-type: none"> • Knowledge and skill-based education sessions • Food and pedometer logs • Group support meetings (separate parent/child meetings for learning component and together for goal-setting) • Taste-testing and snack prep for children • Exercise or games for children to be active 	<i>No cultural adaptation mentioned</i>
Stolley 1997	PA and diet	<ul style="list-style-type: none"> • Nutrition education sessions • Cooking demonstration • Music and dance incorporated into nutrition and physical activities 	<ul style="list-style-type: none"> • AA only sample • Culturally tailored content and programming
Baranowski 2003	PA and diet	<ul style="list-style-type: none"> • Camp program to increase behavioral and psychosocial factors related to healthy foods (i.e., fruit & vegetable intake, water consumption) and PA • Self-monitoring using pedometers 	<ul style="list-style-type: none"> • AA only sample • Formative focus group with AA sample

Author Year	Focus of behavior change techniques	Specific behavior change techniques	Cultural adaptation ⁷
		<ul style="list-style-type: none"> Goal-setting website 	
Beech 2003	PA and diet	<ul style="list-style-type: none"> PA (hip hop aerobics) sessions Healthy eating session with taste-tests of healthy foods and food preparation/games Culturally relevant take-home materials 	<ul style="list-style-type: none"> AA only sample Cultural sensitivity programming Culturally tailored take-home materials
Klesges 2010	PA and diet	<ul style="list-style-type: none"> Nutrition and PA sessions (goal setting, provided feedback, encouragement to participants, skill building, self-monitoring, problem solving, and social support) Parents/guardians were encouraged to make changes in the home food environment Field trips 	<ul style="list-style-type: none"> AA only sample AA only interventionists Cultural sensitive programming and tailored take-home materials
Robinson 2003	PA	<ul style="list-style-type: none"> Afterschool dance classes with healthy snack, homework period and discussion of increased PA (dance) and reduced TV screen time (TV watching, videotape use, and video game use) Family intervention which included role modeling for girls by African American interventionist and behavior change discussions about reducing screen time Newsletters 	<ul style="list-style-type: none"> AA only sample AA only interventionists and data collectors Music and dance selection by AA participants Attempted to account for a number of unique elements associated with African-American culture (collectivism, importance of family, present orientation, importance of religiosity, sense of historical racism and prejudice, and use of social support as a coping strategy)
Robinson 2010	PA	<ul style="list-style-type: none"> Afterschool program with dance, healthy snack, and homework Public performances START (Sisters Taking Action to Reduce Television) home-based screen time reduction program (self monitoring, a 2-week TV-turnoff, budgeting viewing hours, "intelligent" viewing) Newsletters 	<ul style="list-style-type: none"> AA only sample AA culture infused through matched models, music, intervention activities, language, values, social, and historical influences AA only dance instructors (college students or recent graduates) Awards based on Kwanzaa principles Utilized AA screen time intervention
Story 2003	PA and diet	<ul style="list-style-type: none"> PA and healthy eating program based on youth development and resiliency approach to build on family and personal strengths Family night events with interactive games and goal setting that they would continue throughout the program Phone calls by staff to check in on goals and provide support 	<ul style="list-style-type: none"> AA only sample AA only instructors Culturally tailored activities and programming

Author Year	Focus of behavior change techniques	Specific behavior change techniques	Cultural adaptation ⁷
Barbeau 2007	PA	<ul style="list-style-type: none"> Afterschool program that included homework/healthy snack time and PA (25 min PA skill instruction, 35 min aerobic PA such as basketball, tag, softball, relay races), and 20 min strengthening/stretching) Incentives for attendance 	<ul style="list-style-type: none"> AA only sample
Fitzgibbon 1995	PA and diet	<ul style="list-style-type: none"> Nutrition education (taste-testing, menu planning, interactive lessons) Skills training (problem solving, decision making, goal setting) 	<ul style="list-style-type: none"> AA only sample 25% of interventionists were AA Utilized "Rap Against Fat" activity Tailored health info for AA women
Raman 2010	PA and diet	<ul style="list-style-type: none"> Summer day camp with community-based exercise, nutrition, and behavioral modification Monthly nutrition educational sessions "Personal best" approach to PA program to create an environment where overweight children develop positive self-esteem and respect Follow-up: Weekly intervention sessions including PA and modeling, hands-on nutrition education and skill-building, and self-esteem modeling Outside-of-program PA 	<ul style="list-style-type: none"> AA only sample Culturally tailored programming and content
Burnet 2011	PA and diet	<ul style="list-style-type: none"> PA and nutrition discussion topics Behavioral goal setting Skill building and group problem solving Engaging family activities (shopping, cooking, exercise) Self-monitoring practice Group outings 	<ul style="list-style-type: none"> AA only sample Surface and deeper cultural-tailoring All AA female lay community leaders Formative focus groups with AA families
Cullen 2008	Diet	<ul style="list-style-type: none"> Interactive, computer-based nutrition education (goal-setting, problem solving) 	<ul style="list-style-type: none"> AA only sample Culturally tailored website content and images
Newton 2010	PA and diet	<ul style="list-style-type: none"> Classroom-based PA opportunities/resources Altered classroom and cafeteria environments and provided teachers with materials and equipment Newsletters and messages via program's website 	<ul style="list-style-type: none"> AA only sample

Author Year	Focus of behavior change techniques	Specific behavior change techniques	Cultural adaptation ⁷
Olvera 2010	PA and diet	<ul style="list-style-type: none"> Exercise class PA education Nutrition education (healthy-meals modeling, hands on activities, games, handouts, home challenge, and cooking lessons) Behavior counseling (art projects, poetry, journaling, behavioral contracts, and home challenges) Parent programming (taught how to adapt family meals, completed activities to support daughter's healthy food choices and enhance their PA and self-esteem) 	<ul style="list-style-type: none"> Incorporated AA cultural values (collectivism, importance of respect and maternal roles, and use of social support) in program Culturally tailored activities (i.e., common AA foods, dance)
Jackson 2010	PA and diet	<ul style="list-style-type: none"> Exercise class Child take-home activities Recipe/healthy snack preparation Theater games/dramatic writing Nutrition education PA education Parent programming (one-hour health info and recipe making session, parent take-home activities) End of the program theater performance/dinner for family 	<ul style="list-style-type: none"> Formative focus groups with AA AA only sample AA only interventionists Culturally tailored activities (i.e., hip hop dance)
Age 13 years			
Williamson 2006	PA and diet	<ul style="list-style-type: none"> Internet-based, interactive nutrition education and counseling via intervention website/email Face-to-face counseling session Behavioral self-monitoring online log 	<ul style="list-style-type: none"> AA only sample Culturally tailored activities (i.e., common AA recipe, links to AA health websites) Counselors educated on culturally specific health info and dietary/PA-related issues
Frenn 2003	PA and diet	<ul style="list-style-type: none"> Internet and video intervention with healthy snack and gym labs (when available) PA and nutrition education sessions (topics included asking and discussing with parents healthy food options for the home; interactive, teen-specific, building awareness of fat in popular food, self-efficacy in selecting healthier options, peer model of preparing healthy snacks and exercising; learning about recommendations for PA) 	<i>No cultural adaptation mentioned</i>
Resnicow 2005	PA and diet	<ul style="list-style-type: none"> 30 minutes of PA Taste-test and preparation of healthy foods 	<ul style="list-style-type: none"> AA only sample

Author Year	Focus of behavior change techniques	Specific behavior change techniques	Cultural adaptation ¹
		<ul style="list-style-type: none"> Dependent on treatment group, motivational interviewing counseling calls Retreat at national park Two-way pagers for targeted messages 	<ul style="list-style-type: none"> Formative assessment focus groups with AA families
Wadden 1990	PA and diet	<ul style="list-style-type: none"> Incentive structure based on weight loss and attendance Take-home assignments Various levels of parental involvement based on treatment condition (parents received homework assignments, participated in program with girl, or talking with daughter or attended separate similar session) 	<ul style="list-style-type: none"> AA only sample AA-adapted curriculum content
Thompson 2010	PA	<ul style="list-style-type: none"> PA log Aerobic dance class PA education (knowledge about PA, goal setting, benefits and barriers, body image, role models, social support, hair maintenance, health statistics, solicit feedback from girls about changing environments) 	<ul style="list-style-type: none"> AA only sample Incorporated AA cultural values (spirituality, expressive communication and, interconnectedness or commonality) AA only interventionists
MacDonnell 2011 ¹⁰	PA and diet	<ul style="list-style-type: none"> Goal setting and barrier/problem solving sessions based on motivational interviewing approaches 	<ul style="list-style-type: none"> AA only sample
Across both age groups (i.e., 8–18 years)			
Cotton 2006	PA and diet	<ul style="list-style-type: none"> Nutrition sessions (topics focused on reducing sweetened beverages, drinking low-fat milk, increasing fiber intake and fruits and vegetables) PA sessions (topics included cardio, strength, and flexibility training; utilized PA gaming video software) 	<ul style="list-style-type: none"> AA only sample
Resnicow 2000	PA and diet	<ul style="list-style-type: none"> Educational/behavioral activity (30–60 minutes of PA and preparation/taste-testing of low-fat meals) Communication skills training to enhance ability to request healthy food from parent Nutrition education (topics included substitution, moderation, and abstinence with respect to eating; understanding fat and calorie content of food; distinguishing emotional side of eating, reading food labels) Field trips to farmers' markets or grocery store Incentives based on active participation and attendance 	<ul style="list-style-type: none"> AA only sample AA tailored PA programming

¹ Cultural adaptation categorized as (1) none mentioned, (2) targeted adaptation limited to recruitment of African-American participants or conduction of the intervention in a culturally familiar setting, or (3) specific attempts to tailor intervention content. Adapted from Whit-Glover and Kumanyika 2009.²⁵

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PA=physical activity
AA=African-American

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Table 3

Treatment vs. Prevention Studies: Description of Family Involvement¹ and Child-Level Outcome Results

DESCRIPTION OF FAMILY COMPONENT						OUTCOME RESULTS ²				
Author Year	Family member involvement ³	Goal of family member ⁴	Expected joint attendance ⁵	Format ⁶	Age of Child	Study Design ⁷	MQ ⁸	Physical Activity ⁹	Dietary Behavior ¹⁰	Weight-related ¹¹
TREATMENT STUDIES										
Burnet 2011	Multiple family members	Change in own behavior	All sessions jointly	Face-to-face only	12 years	Pilot UCT	5	~ Walking: + ~ Vigorous PA: –	Eating habit: –	Not applicable ¹²
Williamson 2006	Multiple family members	Change in own behavior	Some sessions jointly	Face-to-face with some type of distant format	13 years	RCT	6	Not reported	Not reported	%BF: – Weight: + BMI: +
Olvera 2010	Multiple family members	Support-related	All sessions separately	Face-to-face only	12 years	Pilot UCT	4	[^] Fitness: + [^] MVPA: +	Not reported	Not applicable ¹²
Raman 2010	Multiple family members	Support-related	Some sessions jointly	Face-to-face only	12 years	Pilot NRCT	4	Not reported	Not reported	Weight: + BMI-Z: – %BF: – Waist circ: +
Janicke 2011	Parent-child only	Change in own behavior	All sessions separately then jointly	Face-to-face only	12 years	Pilot RCT	5	Not reported	Not reported	BMI-z: +
MacDonnell 2011	Parent-child only	Change in own behavior	All sessions separately then jointly	Face-to-face only	13 years	Pilot RCT	6	~ MET: + <i>Within group differences:</i> Fast food: + Soft drink: + Fruit: – Veggies: + <i>Between group differences:</i> Fast food: + Soft drink: + Fruit: + Veggies: +		BMI: –
Resnicow 2005 ¹³	Parent-child only	Support-related	Some sessions jointly	Face-to-face with some type of distant format	13 years	RCT	8	No differences	No differences	No differences
Wadden 1990 ¹²	Parent-child only	Various (support-related or change in own behavior)	Various (none, some, or all) sessions jointly	Face-to-face only	13 years	RCT	7	Not reported	Not reported	<i>Within group differences:</i> Weight: + BMI: + <i>Between group differences:</i> Weight: + BMI: +

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DESCRIPTION OF FAMILY COMPONENT						OUTCOME RESULTS ²				
Author Year	Family member involvement ³	Goal of family member ⁴	Expected joint attendance ⁵	Format ⁶	Age of Child	Study Design ⁷	MQ ⁸	Physical Activity ⁹	Dietary Behavior ¹⁰	Weight-related ¹¹
Resnicow 2000 ¹⁵	Parent-child only	No specific goal	All sessions child only	Face-to-face only	Across both age groups (i.e., 8–18 years)	Pilot UCT	5	No differences	No differences	Not applicable ¹²
PREVENTION STUDIES										
Story 2003	Whole family	Change in own behavior	Some sessions jointly	Face-to-face with some type of distant format	12 years	Pilot RCT	7	[^] MVPA: + ~ MVPA: +	FV1: – SSB: – Water: + kcal: + %fat: +	Not applicable ¹²
Robinson 2010	Whole family	Support-related	Some sessions jointly	Face-to-face only	12 years	RCT	9	[^] MVPA: +	kcal: + %fat: +	BMI: – BMI-z: –
Robinson 2003	Whole family	Support-related	Some sessions jointly	Face-to-face with some type of distant format	12 years	Pilot RCT	10	[^] MVPA: + ~ MVPA: +	kcal: – %fat: +	Not applicable ¹²
Thompson 2010	Multiple family members	Support-related	Some sessions jointly	Face-to-face only	13 years	Pilot UCT	4	[^] Fitness: – [*] ~ METs: – [*] ~ PA psychosocial variables (attitude, self-efficacy, social support: -enjoyment, intention, family support): +	Not reported	Not applicable ¹²
Jackson 2010	Multiple family members	Support-related	Single session jointly	Face-to-face with some type of distant format	12 years	Pilot UCT	4	~ PA recom: + [*] ~ PA preference: + [*] ~ Benefits of PA: –	Dietary recom: + [*] Dietary preference: + [*] Healthy ways: 0 Reading food labels: 0	Not reported
Newton 2010	Multiple family members	Support-related	All sessions child only	Face-to-face with some type of distant format	12 years	Pilot UCT	1	6, 12, & 18 months: ~ MVPA: + [*]	6 & 18 months: kcal: + 12 months: Kcal: – 6, 12, & 18 months: %fat: + [*] %satfat: + [*] %carb: + [*] %protein: +	Not applicable ¹²
Stolley 1997	Parent-child only	Change in own behavior	All sessions jointly	Face-to-face only	12 years	RCT	7	Not reported	Satfat: + %fat: + [*] Chol: +	Not reported
Fitzgibbon 1995	Parent-child only	Change in own behavior	All sessions jointly	Face-to-face only	12 years	Pilot RCT	6	Not reported	Within group difference: Fat gram: + [*]	Not reported

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DESCRIPTION OF FAMILY COMPONENT						OUTCOME RESULTS ²				
Author Year	Family member involvement ³	Goal of family member ⁴	Expected joint attendance ⁵	Format ⁶	Age of Child	Study Design ⁷	MQ ⁸	Physical Activity ⁹	Dietary Behavior ¹⁰	Weight-related ¹¹
									<i>Between group difference:</i> % fat: + [*]	
Beech 2003	Parent-child only	Change in own behavior	All sessions separately	Face-to-face only	12 years	Pilot RCT	8	[^] MVPA: + ~ MVPA: +	Kcal: + % fat: + FJV: + SSB: + Water: +	Not applicable ¹²
Cullen 2008	Parent-child only	Change in own behavior	All sessions family member only	Distant only	12 years	Pilot UCT	3	Not reported	Food avail: – Parent modeling FV: + [*] Parent modeling low fat food: – Parent encour fruit: – Parent encour veggies: +	Not reported
Greening 2011	Parent-child only	Support-related	Some sessions jointly	Face-to-face only	12 years	RCT	5	~# of activities: + [*]	Dietary habits: + [*]	% BF: + [*]
Cotton 2006	Parent-child only	Support-related	Some sessions jointly	Face-to-face only	Across both age groups (i.e., 8–18 years)	Pilot UCT	3	Not reported	Not reported	Not applicable ¹²
Klesges 2010	Parent-child only	Support-related	Some sessions jointly	Face-to-face only	12 years	RCT	9	[^] MVPA: +	<i>Year 1:</i> Veggies: 0 Fruit: 0 <i>Year 2:</i> Veggies: + Fruit: – <i>Years 1 & 2:</i> SSB: + Water: + Fat: – Kcal: +	<i>Year 1:</i> BMI: – Waist circ: – <i>Year 2:</i> BMI: + Waist circ: + <i>Years 1 & 2:</i> % BF: + Weight: –
Baranowski 2003	Parent-child only	Support-related	Some sessions jointly	Face-to-face with some type of distant format	12 years	Pilot RCT	6	[^] MVPA: – ~ PA: +	Kcal: + % fat: + FJV: + SSB: + Water: +	Not applicable ¹²
Fitzgibbon 2005	Parent-child only	Support-related	All sessions child only	Face-to-face with some type of distant format	12 years	RCT	7	<i>Post-intervention & Year 2:</i> ~ Exercise freq: + <i>Year 2:</i> ~ Exercise freq: –	<i>Post-intervention & Year 1:</i> Fat: + Sat fat: + <i>Year 2:</i> Fat: – Sat fat: –	<i>Post-intervention:</i> BMI: + BMI-z: + <i>Year 1 & 2:</i> BMI: + [*] BMI-z: +
Fitzgibbon 2011	Parent-child only	Support-related	All sessions child only	Face-to-face with some type of distant format	12 years	RCT	8	[^] MVPA: + [*]	Total kcal:– % fat – Fruit: +	BMI: + BMI-z: +

OUTCOME RESULTS ²										
DESCRIPTION OF FAMILY COMPONENT										
Author Year	Family member involvement ³	Goal of family member ⁴	Expected joint attendance ⁵	Format ⁶	Age of Child	Study Design ⁷	MQ ⁸	Physical Activity ⁹	Dietary Behavior ¹⁰	Weight-related ¹¹
									Veggies: +	
Frenn 2003	Parent-child only	Support-related	All sessions child only	Face-to-face with some type of distant format	13 years	NRCT	2	~ MVPA: + *	% fat+	Not reported
Barbeau 2007	Parent-child only	No specific goal	All sessions child only	Face-to-face wit some type of distant format	12 years	RCT	6	~ MPA: + * ~ VPA: + ~ MVPA: + * ^ Fitness: + *	Not reported	BMI: + * Waist circ: + * %BF: + *

¹ Assessment of family involvement is adapted from McLean 2003²⁴ taxonomy for intervention characteristics. The index member (or targeted participant for behavioral change) for each study was the child.

² Interpretation of outcome results: For randomized controlled trials and non-randomized controlled trials, outcomes reported are for between group differences unless denoted; a plus sign (+) indicates a treatment minus control difference in the desired direction and a minus sign (−) indicates a difference opposite to the desired direction. For uncontrolled trials, outcomes reported are for within group differences unless denoted; a plus sign (+) indicates a post-intervention minus baseline difference in the desired direction, a minus sign (−) indicates a difference opposite to the desired direction, and a zero (0) indicates no change.

* indicates a statistically significant difference at a level of $P<0.05$.

[^] indicates an objective measure of PA (e.g., accelerometer, pedometer).

~ indicates a subjective measure of PA (e.g., self-report questionnaire).

³ Family member involvement categorized as (1) parent-child only, (2) multiple family members that included parent-child pair and additional family member(s), or (3) whole family (defined as entire household where child lives most of the time).

⁴ Goal of family member categorized as (1) no specific goal, (2) support-related goal (minimizing negative support, providing passive support, providing active support), or (3) change in own target behavior (food intake/physical activity) for weight control, weight maintenance or weight loss.

⁵ Expected joint attendance at sessions by index (targeted participant) and family member categorized as (1) single session jointly, (2) partial (some sessions) jointly, (3) full (all sessions jointly), (4) index member only (family member not expected to attend), (5) family member only (index member not expected to attend) or (6) all sessions separately.

⁶ Format of intervention delivery categorized as (1) distant (letter, pamphlet, newsletter, online, telephone) only, (2) face-to-face only, or (3) face-to-face with some type of distant format.

⁷ Abbreviations for different types of study designs: RCT=randomized controlled trial; UCT=uncontrolled trial; NRCT=non-randomized controlled trial

⁸ MQ=Methodological Quality which is based on the sum of internal and external validity criteria met; the highest possible score is 11. Internal validity was evaluated using the 6 criteria adapted from the Delphi List.²⁶ External validity for the controlled studies was assessed using the criteria outlined by Green and Glasgow.

⁹ Abbreviations for physical activity (PA) outcome results: MVPA=moderate to vigorous physical activity; MET=metabolic equivalent; PA recom=knowledge of PA recommendations; PA preference=preference for PA over sedentary behavior; MPA=moderate physical activity; VPA=vigorous physical activity

¹⁰ Abbreviations for dietary behavior outcome results: FV/=fruit/vegetables/juice; SSB: sugar-sweetened beverages; kcal=total calories; %fat: percent of calories from fat; eating habit=overall eating habit measured by composite eating score; dietary recom=knowledge of dietary daily recommendations; dietary preference=dietary preference of fruits & vegetables over sweets; healthy ways=dietary ways to eat healthy; FV=fruits & vegetables; %satfat=% of calories from saturated fats; %carb=% of calories from carbohydrates; %protein=% of calories from proteins; food avail: food availability, parent modeling: child-report on parental modeling of healthy eating, parent encour: child-report of parental encouragement to eat healthy foods; sat fat=grams of saturated fat; chol=cholesterol; fat grams=total grams of fat

11 Abbreviations for weight-related outcome results: BMI=body mass index; circ=circumference; %BF=% body fat

12 Due to the difficulty in interpreting weight-related outcomes for uncontrolled studies and short-term or pilot randomized controlled trials, weight-related outcomes are presented for full-length RCTs only. Please see text for further explanation.

13 For Resnicow 2005 study, details about differences between intervention and control groups are not provided. Results focus on within intervention group (high attenders vs. low attenders and moderate intensity vs. high intensity) differences.

14 For Wadden 1990 study, expected joint attendance, goal of family member, and target of behavior change technique were dependent on to which treatment group participants were randomized.

15 For Resnicow 2000 study, details about differences between intervention and control groups are not provided. Results focus on within intervention group (high attenders vs. low attenders) differences.