

# Family-based interventions for preventing overweight or obesity among preschoolers from racial/ethnic minority groups: A scoping review

Xiran Wang<sup>1</sup>  | Alice Ammerman<sup>2</sup> | Colin J. Orr<sup>3</sup>

<sup>1</sup>Department of Nutrition, University of North Carolina at Chapel Hill Gillings School of Public Health, Chapel Hill, North Carolina, USA

<sup>2</sup>Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

<sup>3</sup>Department of Pediatrics, University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, North Carolina, USA

## Correspondence

Xiran Wang, 135 Dauer Drive, 245 Rosenau Hall, CB # 7461, Chapel Hill, NC 27599-7461, USA.

Email: [xiran0711@outlook.com](mailto:xiran0711@outlook.com)

## Abstract

**Objective:** This scoping review aimed to synthesize the published literature on family-based childhood obesity prevention interventions from 2015 to 2021 that focused on children 2–5 years of age from racial and/or ethnic minority households.

**Methods:** A PICOS (population, intervention, comparison, outcome, and setting) framework was used to guide the development of the research question, search strategy, and inclusion/exclusion criteria. To be included, the study must have been a randomized controlled trial or quasi-experimental trial that enrolled participants 2–5 years of age and their caregivers who identified as being from a racial and/or ethnic minority group in the United States. The study must have also examined a family-based intervention that incorporated components to prevent childhood obesity (i.e., fruits and vegetable intake, parental responsive feeding, physical activity), be conducted in a remote (i.e., online, text, mail), home, community, primary care setting, or early childhood education institution setting, and report on body mass index (BMI, kg/m<sup>2</sup>), BMI z-score, anthropometric measures (weight, waist circumference, fat mass, etc.), changes in health behaviors, or increase in nutritional knowledge.

**Results:** Fourteen individual studies were identified. Most interventions used multiple components for promoting nutritional knowledge and behavioral changes among families. Eight interventions included culturally tailored components targeting four aspects: (1) language barriers, (2) food choices, (3) relationships between family members, and (4) rapport building.

**Conclusions:** There is limited research in this field focusing on children from racial and/or ethnic minority groups. Future efforts should invest in developing culturally appropriate interventions for these groups.

## KEYWORDS

childhood obesity, family-based intervention, obesity prevention, racial/ethnic minority

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## 1 | INTRODUCTION

The prevalence of childhood obesity in the United States remains unacceptably high. According to recent data from the 2017–2018 National Health and Nutrition Examination Survey, the prevalence of obesity among preschool-age children, 2–5 years, is 13.7%.<sup>1</sup> Since the 1970's, the trend of childhood overweight and obesity has maintained an average annual rate of increase of approximately 0.5% for children 2 years old and older.<sup>2</sup> At the start of the millennium, the prevalence of overweight and obesity among US preschoolers rose from 7.2% to 10.3%.<sup>2</sup> Although a decline was seen during the first half of the 2010s, an increase has been seen since 2015. Currently, the prevalence of childhood overweight and obesity in the United States is higher than ever.<sup>3</sup>

A closer look at the data reveals important disparities in the pediatric obesity epidemic by race and/or ethnicity. Children who identify as Mexican American or non-Hispanic Black have a higher prevalence of obesity than their non-Hispanic White counterparts.<sup>2</sup> Since 2005, children who identify as Alaska Native or American Indian have seen the largest increase in the prevalence of obesity.<sup>4</sup> According to the US Census Bureau, the racial and ethnic composition of the US population is projected to be more pluralistic in the coming decades. By 2060, approximately 32% of the population is predicted to be a race other than White. The change in the racial and/or ethnic representation will be more most pronounced among children.<sup>5</sup> As the racial and/or ethnic diversity of children in the United States increases, health disparities associated with obesity will affect a larger proportion of the US population.<sup>6</sup> This trend of increasing racial and/or ethnic diversity of children in the US highlights the need for pediatric obesity research to include non-White populations.

Disparities in pediatric obesity might be explained by genetic factors, differences in dietary patterns, physical activity, child feeding practices, cultural norms, attitudes toward weight and aesthetics, availability of healthy foods, and access to social resources.<sup>4</sup> Evidence suggests that obesity risk factors (i.e., fruit and vegetable intake, physical activity, and screen use, rapid infant weight gain) are shaped by cultural practices and make important contributions to the observed racial and/or ethnic disparities of obesity among children.<sup>7</sup>

Addressing childhood obesity is important given the detrimental impact obesity has on the physical and mental health of children. Children affected by obesity are more likely to have (1) high blood pressure and plasma cholesterol levels, leading to increased risk of developing cardiovascular disease, (2) respiratory problems, such as sleep apnea and asthma, (3) musculoskeletal discomfort and joint problems, and (4) gallstones, fatty liver disease, and gastroesophageal reflux.<sup>8–14</sup> Children who suffer from obesity are also at increased risk for depression, anxiety, low self-esteem, and bullying.<sup>15–17</sup> A child's obesity status appears to be an important predictor for the risk of future obesity starting at age three.<sup>18</sup> In a prior study examining the association between BMI in childhood and later risk of overweight and obesity, Geserick et al found that 90% of the participants with obesity at 3 years continued to be affected by obesity as they became older, with the most significant weight gain occurring between 2 and

6 years old.<sup>19</sup> Additionally, the study showed that having a normal weight during childhood predicted a continued normal weight later in life, indicating that early childhood might be a relatively narrow but critical period for implementing programs preventing excessive weight gain and reducing the risk of obesity.<sup>19</sup>

Family-based interventions are recognized as an effective strategy to prevent and treat childhood obesity.<sup>20</sup> Family-based interventions engage the family to encourage the adoption of healthy behaviors among all family members. Frequently, the interventions include components focusing on behavior change by teaching caregivers to set goals, solve problems, monitor their child's behaviors, and become a positive model for their child.<sup>21</sup> Sessions are typically held with caregivers and children, but individual sessions for children or caregivers have also been used.<sup>22</sup> Many studies have demonstrated that family-based behavioral programs can successfully prevent or manage childhood obesity.<sup>23–28</sup> However, according to a systematic review conducted by Ash et al on family-based childhood obesity prevention interventions prior to 2016, there were few studies focusing on the effectiveness of family-based interventions among racial and/or ethnic minority communities, and few interventions (16%) targeted obesity risk related behavioral domains other than diet and exercise (i.e., sleep and screen time).<sup>29</sup> These results were similar to the findings of a study conducted by Carr et al that also found a lack of obesity prevention interventions addressing health-promoting behaviors other than diet and exercise.<sup>30</sup>

A current gap in the literature is a summary of the recent evidence for specific component and cultural adaptations of family-based interventions in the prevention of obesity among children 2–5 years of age who belong to racial and/or ethnic minority groups. Therefore, the aim of our scoping review was to build upon the review by Ash et al and summarize the recently published literature on family-based childhood obesity prevention interventions with a focus on US preschoolers 2–5 years old who were identified by their caregivers as being from a racial and/or ethnic minority group.

## 2 | METHOD

### 2.1 | Inclusion and exclusion criteria

A PICOS (population, intervention, comparison, outcome, and setting) framework was used to guide the development of the research question, search strategy, and inclusion/exclusion criteria. The inclusion criteria addressed four aspects: participant characteristics, intervention characteristics, setting, and study design. To be included, the study must have been a randomized controlled trial or quasi-experimental trial that enrolled participants 2–5 years of age and their caregivers who identified as being from a racial and/or ethnic minority groups in the United States.<sup>31</sup> For the purposes of our study families who identified as: Blacks/African-Americans, Hispanic/Latinx, Asians and Pacific Islanders, and American Indians and Alaska Natives were included in the study.<sup>31</sup> At least half of the children enrolled needed to be at normal weight at baseline for the study to

be included in our review. The study must have also examined a family-based intervention that incorporated components to prevent childhood obesity (i.e., fruits and vegetable intake, parental responsive feeding, physical activity), be conducted in a remote (i.e., online, text, mail), home, community, primary care setting, or early childhood education institution setting, and report on body mass index (BMI,  $\text{Kg/m}^2$ ), BMI z-score, anthropometric measures (weight, waist circumference, fat mass, etc.), changes in health behaviors, or increase in nutritional knowledge. At least 50% of the participants enrolled needed to identify as belonging to a racial and/or ethnic minority group for the study to be included in this review. The current scoping review was limited to studies published since 2015 and sought to serve as an update on the systematic review published by Ash et al on prior family-based childhood obesity prevention interventions.<sup>29</sup>

## 2.2 | Search strategy

The search was limited to studies written in English, published from 1/1/2015 to 3/21/2021, and found in one of the following databases: PubMed, Scopus, PsycINFO, and CINAHL. The development of search strings was based on the five major concepts examined by the scoping review: (1) family, (2) nutrition, (3) preschool-age children, (4) overweight/obesity and weight status, and (5) racial and/or ethnic minority. With the support from a librarian, tailored search strategies were created for each database.

## 2.3 | Source of evidence screening and selection

After completing the literature search in all four databases, results were exported to a citation manager (Mendeley) and de-duplicated. The de-duplicated citations were then exported from Mendeley to Covidence for screening and review.

Two reviewers (XW and CO) independently reviewed the titles, abstracts, and full text of the articles in Covidence and decided whether an article met the inclusion criteria described above. Conflicts were resolved by discussion between the two reviewers.

## 2.4 | Eligible articles

Using the search strategy described above, one reviewer (XW) identified 4800 studies from the four databases. After removing duplicates, 3669 studies were screened based on title and abstract. At this stage, studies were excluded mainly because (1) study was not conducted in the United States, (2) study did not describe an intervention, and (3) study included an intervention that was out of the scope of the review (i.e., a training program targeting educators instead of children and their caregivers). Forty-four studies were included for full-text screening. Among these studies, 11, 13, and 5 studies were excluded because of irrelevant or unavailable

population, outcome, and intervention data/information, respectively. On manual review a duplicated article we identified and removed, leaving 14 studies meeting all the inclusion criteria for the final synthesis. Figure 1 depicts the study screening process using the PRISMA flowchart.

## 2.5 | Data extraction

A data extraction spreadsheet including study information (title, year, author, study design, location), participant characteristics (child age, sample size, race and/or ethnicity, socioeconomic status), intervention characteristics (name, theory, behavioral domain component, target population, setting, delivery mode, component, length, frequency), and intervention outcomes (outcome measure, result) were developed. One reviewer (XW) was responsible for data extraction and information categorization, while the completed spreadsheet was examined by the other reviewer (CO). Given our study is a scoping review, we did not evaluate the methodological quality of the studies.<sup>32,33</sup>

## 3 | RESULT

### 3.1 | Study design, outcome measures, & sample

A total of 14 studies were included in the final analysis (Table 1). Eleven of the studies employed a randomized controlled trial design,<sup>34,36,43,46,47</sup> and three used a quasi-experimental design.<sup>35,44,45</sup> Three studies were pilot evaluations.<sup>41,42,45</sup> Half of the studies used child body mass index (BMI), BMI z-score, or BMI trajectory as the primary outcome. Others focused on child health-related behaviors, dietary patterns, parent-feeding practices, or other anthropometric measures. There was heterogeneity in the study sample size and demographics. The sample sizes ranged from 17 to 610. A majority of the studies recruited participants who identified as Hispanic/Latinx, followed by Black/African American and American Indian. A majority of the participants were from low-income families. The studies were conducted in geographically diverse locations.

### 3.2 | Intervention characteristics

Most of the interventions built on previously studied behavioral change theories and models. The most frequently referenced theories were (1) social cognitive theory,<sup>48</sup> and (2) self-determination theory.<sup>49</sup>

Among the 14 interventions, four interventions included components only for parents, while others included components for parents and children.<sup>35,36,40,41</sup> Interventions targeting parents addressed authoritative parenting skills, parental mindfulness and behavioral strategies, parental strategies to improve child portion control and family environment, and information on child nutrition and health-related behaviors.<sup>35,36,40,41</sup>

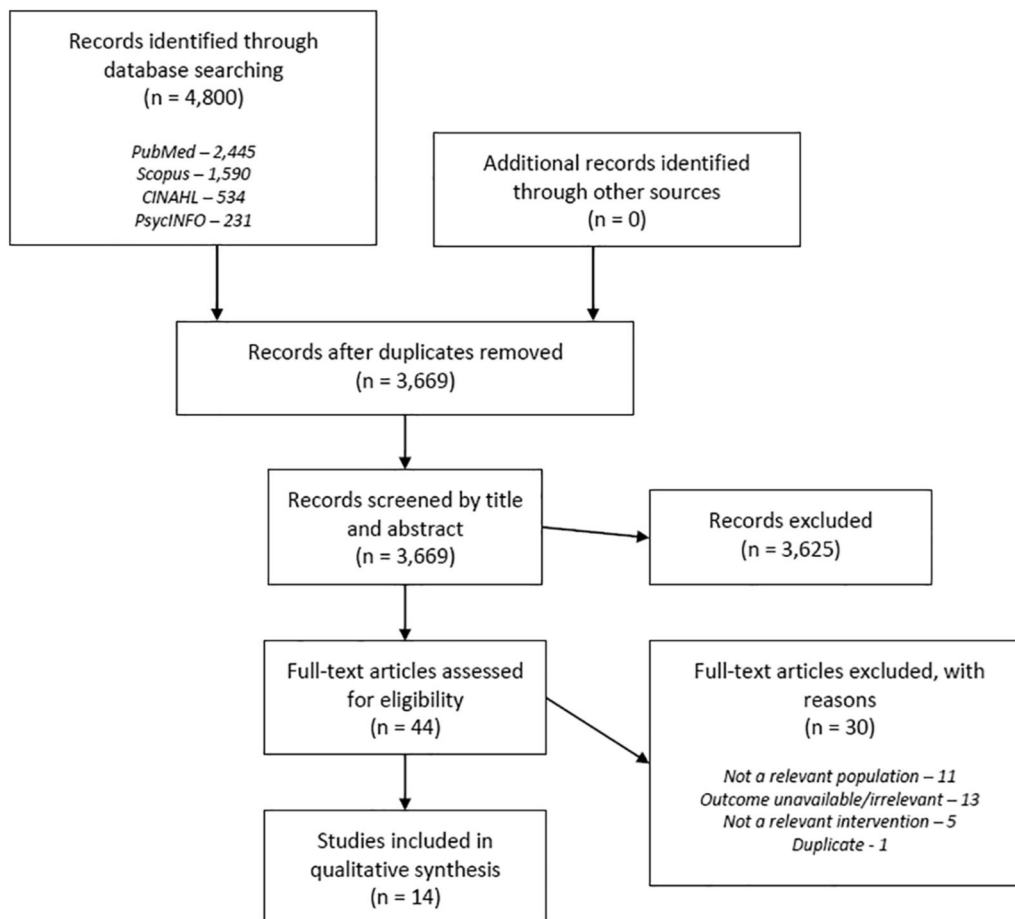


FIGURE 1 PRISMA flow diagram

Five and three interventions, respectively, enrolled primarily Hispanic/Latinx and American Indian families, and included culturally tailored curriculum or materials.<sup>35,39,40,42,44–47</sup> The remaining studies targeted diverse racial and/or ethnic minority communities. None of the studies enrolling Black/African American participants created culturally tailored components for this community. Components tailored for Hispanic/Latinx participants included recruiting local educators who shared the same cultural background with and were trusted by participants,<sup>45</sup> providing educational materials written in Spanish and delivered by bilingual/Spanish-speaking educators,<sup>39,40,42,44</sup> selecting intervention locations that participants were familiar with,<sup>42</sup> using food examples that were culturally congruent,<sup>40,42</sup> building rapport between educators and participants,<sup>42</sup> tailoring content to participants' needs in navigating individual, family, and community level barriers.<sup>39</sup> Components tailored for American Indian participants included recruiting educators from the area (tribe), promoting culturally appropriate food and activities, adopting a traditional model of younger generations inheriting life-skills from the elders, and incorporating the functions of family structure and interactions into the interventions.<sup>35,46,47</sup>

Seven interventions were delivered in-person in group settings, two were delivered by home mentors, one used phone-based using text messages, one used mail-based, and the rest incorporated

multifaceted components delivered via home-based, group-based, and/or phone/mail-based sessions.

Behavioral, cognitive, and psychomotor domains targeted by interventions varied. Five interventions featured a combination of education on healthy lifestyles (i.e., information on child nutrition, physical activity, sleep, screen use) and behavior change components (i.e., goal setting and skill building).<sup>34,36,39,45,46</sup> Two promoted parenting and feeding skills and self-efficacy building.<sup>36,38</sup> Two provided education/information on healthy lifestyles without further supplemental components.<sup>35,47</sup> Others covered parent mindfulness-based stress reduction, child eating self-regulation, and healthy meals preparation skills.<sup>40,41,43</sup> Of note, the studies conducted by Haines et al and Tomayko et al in 2019 targeted all four aspects of the behavioral domain (diet, physical activity, sleep, and screen use).<sup>38,47</sup>

There were also differences among the length and frequency of the interventions. The length of the interventions ranged from 5 weeks to 36 months, with a majority ( $n = 8$ ) of interventions engaging participants for 12 weeks or less. For interventions delivered in-person, the majority of studies consisted of weekly sessions lasting 1–2 h, with the exception of two interventions that delivered biweekly 5–10 min sessions,<sup>44</sup> and weekly 45-min sessions.<sup>43</sup> We were unable to quantify frequency of contact for studies using remote deliveries (text, phone call, etc). A full description of intervention characteristics can be found in Table 2.

TABLE 1 Study and participants characteristics

Author, year	Study design	Total participants	Geographic region	Race/ethnicity
Barkin et al, 2018 <sup>34</sup>	RCT	610 parent/child dyads	Nashville, Tennessee	Hispanic (91.4%), non-Hispanic Black (5.9%), non-Hispanic White/Other (2.6%)
Brown et al, 2019 <sup>35</sup>	Quasi-experimental	17 parents	An American Indian reservation	American Indian (47%) <sup>a</sup>
Fisher et al, 2019 <sup>36</sup>	RCT	119 mothers	Philadelphia, Pennsylvania	Black/African American (90.8%), Other (9.2%)
French et al, 2018 <sup>37</sup>	RCT	534 parent-child dyads	Minneapolis, Minnesota	Hispanic (58.4%), non-Hispanic Black (18.4%), non-Hispanic White (12.6%), multiracial (8.4%), other (2.3%)
Haines et al, 2016 <sup>38</sup>	RCT	112 families	Boston, Massachusetts	Hispanic (59%), Black/African American (22%), White/Other (18.7%)
Heerman et al, 2018 <sup>39</sup>	RCT	117 parent-child dyads	Nashville, Tennessee	Hispanic (100%)
Hughes et al, 2020 <sup>40</sup>	RCT	255 families	Houston, Texas; Pasco, Washington	Hispanic (100%)
Jastreboff et al, 2018 <sup>41</sup>	Pilot, RCT	42 parent/child dyads	New Haven, Connecticut	62% non-White <sup>a</sup>
Linville et al, 2020 <sup>42</sup>	Pilot, RCT	27 families	Oregon	Hispanic (89%)
Nix et al, 2021 <sup>43</sup>	RCT	73 parent-child dyads	Pennsylvania	Non-Hispanic white (48%), Black/African American (29%), Hispanic (23%)
Sosa et al, 2016 <sup>44</sup>	Quasi-experimental	423 children	San Antonio, Texas	Hispanic (90%) <sup>a</sup>
Taverno Ross et al, 2018 <sup>45</sup>	Pilot, quasi-experimental	49 parent-child dyads	Allegheny, Pennsylvania	Hispanic (100%)
Tomayko et al, 2016 <sup>46</sup>	RCT	150 parent-child dyads	Wisconsin	American Indian (91%), White (7%), unknown (1%)
Tomayko et al, 2019 <sup>47</sup>	RCT	450 parent-child dyads	Wisconsin; Minnesota; Montana; New Mexico; New York	American Indian (78.7%), White (18.7%), other (2.6%)

<sup>a</sup>Further break-downs unavailable.

### 3.3 | Outcomes

Outcomes included child weight, diet, and behavioral outcomes, and parental feeding practices and styles, diet, and behavioral outcomes (Table 2). Most of the studies compared baseline data to post intervention data, while studies conducted by Haines et al, Hughes et al, and Heerman et al incorporated follow-up periods of 9, 12, and 5 months post intervention.<sup>38–40</sup>

#### 3.3.1 | Child outcomes

##### *Weight-related outcomes*

Among the seven studies including weight-related measurements as primary outcomes, three found statistically significant results.<sup>37,39,41</sup> Jastreboff et al found that the BMI percentile of participants in the intervention group remained unchanged, while the BMI percentile in the control group increased significantly.<sup>41</sup> Heerman et al found a

marginally statistically significant effect of the intervention on participants' BMI, with an annual decrease of 0.41 kg/m<sup>2</sup> (95% CI –0.82 to 0.01;  $p = 0.05$ ).<sup>39</sup> The study conducted by French et al showed a decreased BMI at study time points of 24 and 36 months among Hispanic/Latinx children who participated in the intervention.<sup>37</sup>

##### *Diet-related outcomes*

Eight studies described child diet-related outcomes.<sup>34,36,37,40,43,45–47</sup> Two studies found that children in the intervention groups had statistically significant lower mean energy intake at 36 months, compared with children in the control groups.<sup>34,37</sup> Three studies described a statistically significant improvement in children's fruits and vegetable intake.<sup>40,45,46</sup> The study conducted by Nix et al demonstrated healthier meals and snacks consumption which included fruit and/or vegetables and protein without sweets or junk food.<sup>43</sup> The study conducted by Fisher et al focused on children's daily energy intake from solid fats and added sugar in foods (SoFAS) and found a significantly reduced energy intake from SoFAS of

TABLE 2 Intervention characteristics

Name	Setting	Theory	Participant	Component & dose	Cultural adaptation	Weight-unrelated outcome assessment tool	Significant outcome <sup>a</sup>
Parenting Mindfully for Health <sup>41</sup>	Research center	Mindfulness-Based Stress Reduction <sup>50</sup>	Parent	2 h per week (mindfulness-based parent stress group session + nutrition & physical activity counseling) × 8 weeks	N/A	Mindfulness skills—Mindfulness Attention Awareness Scale <sup>51</sup> ; nutrition data—Nutrition Questionnaire, <sup>52</sup> Dutch Eating Behavior Questionnaire <sup>53</sup> ; parenting behaviors—Toy Wait Task <sup>54,55</sup> ; physical activity—pedometer, accelerometer	Parental involvement, parental emotional eating rate, increase in BMI
Parents and Tots Together <sup>38</sup>	Community health center	Social contextual framework <sup>56</sup>	Parent & child	2 h per week (parenting & weight-related behaviors discussion session + children's healthy weight session + homework assignments) × 9 weeks	N/A	Changes in child weight-related behaviors—Children's Harvard Service Food Frequency Questionnaire, <sup>57</sup> National Longitudinal Survey of Children and Youth, <sup>58</sup> Child Feeding Questionnaire <sup>59</sup> , parenting strategies—Parenting Questionnaire, <sup>60</sup> Toddler Care Questionnaire <sup>61</sup>	Restrictive feeding practices
GROW Healthier <sup>34</sup>	Community center	Social cognitive theory <sup>48</sup> ; socioecological model <sup>62</sup>	Parent & child	Once per week (parent & child skills-building session) × 12 weeks + once per month (coaching telephone call) × 9 months + 24-month sustainability phase	N/A	Physical activity—accelerometer; dietary intake—24 h diet recall; food insecurity—US Household Food Security Survey Module <sup>63</sup> ; Parent-reported community center use—parental survey	Child mean caloric intake, use of community centers
Food, Fun, and Families <sup>36</sup>	University clinic	Authoritative food parenting <sup>64,65</sup>	Parent	1 h per week (behavioral change group session) × 12 weeks	N/A	Child daily energy from SoFAS—24 h dietary recall; authoritative food parenting practices—meal observation in a lab setting	Child daily energy intake from SoFAS, authoritative parenting practices

TABLE 2 (Continued)

Name	Setting	Theory	Participant	Component & dose	Cultural adaptation	Weight-unrelated outcome assessment tool	Significant outcome <sup>a</sup>
ANDALE Pittsburgh <sup>45</sup>	Home	Social cognitive theory <sup>48</sup> ; socioecological framework <sup>66</sup>	Parent & child	Culturally tailored for Hispanic; 1.5 h per week (home-based nutrition education + behavioral change session) × 10 weeks	Recruiting local educators (promotoras) who shared the same cultural background with and were trusted by participants	Physical activity—accelerometer, self-report survey <sup>67</sup> ; dietary intake—Block Food Screener for Kids 2007 <sup>68</sup> ; home environment—a survey adapted from several sources <sup>69–74</sup>	BMI percentile of child with obesity, child saturated fat and added-sugar intake, parent moderate-to-vigorous physical activity and self-efficacy, child and parent screen time, child and parent daily fruit and vegetable intake
SEEDS <sup>40</sup>	Early learning institution	Self-determination theory <sup>49</sup>	Parent	Culturally tailored for Hispanic; once per week (video viewing + experimental learning activities) × 7 weeks	Providing education materials written in Spanish and delivered by bilingual/Spanish-speaking educators; using food examples that were culturally congruent	Parental feeding practices, styles, and knowledge—Food Parenting Inventory & Children's Eating Behavior Questionnaire, <sup>75</sup> Child Feeding Questionnaire, <sup>59</sup> Family Rituals Questionnaire, <sup>76</sup> Caregiver's Feeding Styles Questionnaire, <sup>77</sup> Feeding Knowledge Questionnaire; child self-regulation, willingness to try new foods, and fruit and vegetable preferences—observed trial and eating self-regulation score (COMPX), <sup>78</sup> food tasting protocol, <sup>79</sup> food preference questionnaire, <sup>80</sup> Eating in Absence of Hunger Task <sup>81</sup>	Feeding practices, styles, and knowledge, child different vegetables tried
Healthy Balance <sup>42</sup>	Family resource center	Cognitive dissonance theory <sup>82</sup> ; family systems theory <sup>83</sup>	Parent & child	Culturally tailored for Hispanic; 2 h per session (parents' behavioral change session + children's healthy eating education) × six	Providing education materials written in Spanish and delivered by bilingual/Spanish-speaking educators;	Healthy habits and attitudes —self-report survey, EDDS, <sup>84</sup> Block Food Frequency Questionnaire, <sup>85</sup> Active	Parents' BMI, neck circumference, and diastolic blood pressure

(Continues)

TABLE 2 (Continued)

Name	Setting	Theory	Participant	Component & dose	Cultural adaptation	Weight-unrelated outcome assessment tool	Significant outcome <sup>a</sup>
Healthy Children, Strong Families <sup>46</sup>	Home, mail	AI model of elders teaching life-skills to the next generation	Parent & child	Culturally tailored for American Indian; mentor group: 1 h per month (home-based toolkit lessons on healthy lifestyle) × 12 months + once per month (newsletter + behavioral change group session) × 12 months; non-mentor group: Once per month (mailed toolkit lessons on healthy lifestyle) × 12 months + once per month (newsletter) × 12 months	Recruiting educators from the area (tribe) and promoting culturally appropriate food and activities; a traditional model of young generations inheriting life-skills from the elders and the value toward family interaction	Nutrition and activity behaviors—24 h dietary recall, interview; physical activity—accelerometer; psychosocial factors—SF-12 <sup>87</sup>	In both groups: BMI percentile of child with obesity, child fruit/vegetable consumption, child and adult mean television watching, adult self-efficacy, adult quality of life
Healthy Children, Strong Families 2 <sup>47</sup>	Mail	AI model of elders teaching life-skills to the next generation	Parent & child	Culturally tailored for American Indian; once per month (mailed toolkit lessons on healthy lifestyle) × 12 months + social media engagement	Recruiting educators from the area (tribe) and promoting culturally appropriate food and activities; a traditional model of young generations inheriting life-skills from the elders and the value toward family interaction	Health behaviors—self-report surveys <sup>88-96</sup>	Child and adult: healthy diet patterns, adult F/V intake, moderate-to-vigorous physical activity, and self-efficacy, home nutrition environment
Short Messaging System (SmS) Parent Action Intervention <sup>35</sup>	Rural American Indian reservation/Text message	N/A	Parent	Culturally tailored for American Indian; 3 times per week (text message on child healthy lifestyle) × 5 weeks	Recruiting educators from the area (tribe) and promoting culturally appropriate food and activities	Parent knowledge and child behaviors—a 10-item survey adapted from the 2013 Maine Integrated Youth Health Survey <sup>97</sup>	Child overall health behaviors, behaviors related to PA and sleep



TABLE 2 (Continued)

Name	Setting	Theory	Participant	Component & dose	Cultural adaptation	Weight-unrelated outcome assessment tool	Significant outcome <sup>a</sup>
iMiranos! (Look at Us, We Are Healthy!) <sup>44</sup>	Early learning institution, home	Social cognitive theory <sup>48</sup>	Parent & child	Culturally tailored for Hispanic; 5–10 min per week (parent obesity education + take-home activities) × six sessions	Providing education materials written in Spanish and delivered by bilingual/Spanish-speaking educators	Parent message recall—interview; parent knowledge, family supportive behaviors, and child health behaviors—a questionnaire generating/including/asking for a knowledge score, 5-point Likert-type item, a family support behaviors score, and frequency of child specific behaviors	Adult knowledge scores and family supportive behaviors
Competency-Based Approaches to Community Health <sup>39</sup>	Community center	Self-determination theory <sup>49</sup> ; social cognitive theory <sup>48</sup>	Parent & child	Culturally tailored for Hispanic; 1.5 h per week (education on healthy lifestyle + skill building session + individualized coaching) × 15 weeks + twice per month (coaching call on behavioral change) × 3 months	Providing education materials written in Spanish and delivered by bilingual/Spanish-speaking educators; tailoring content to participants' needs in navigating individual, family, and community level barriers	Acculturation—Brief Acculturation Scale for Hispanics <sup>98</sup> ; diet—survey <sup>99</sup> ; child physical activity—parent self-report; Parent physical activity—Behavioral Risk Factor Surveillance System <sup>100</sup> ; eating behaviors—survey <sup>101</sup> ; parent self-efficacy—a 16-item scale <sup>102</sup> ; parenting practices—Preschooler Physical Activity Parenting Practices <sup>103</sup>	Child BMI growth
Now Everybody Together for Amazing and Healthful Kids (NET-Works) <sup>37</sup>	Home, community center	Social ecological model <sup>104</sup>	Parent & child	1 h per month (home-based behavioral change session) × 36 months + monthly check-in calls + once per week (community-based parenting class) × 12 weeks	N/A	Dietary intake—24-h dietary recall, Healthy Eating Index 2010; physical activity—accelerometer; screen time—parent self-report	Child energy intake and television viewing, BMI of Hispanic children and children affected by overweight/obesity

(Continues)

TABLE 2 (Continued)

Name	Setting	Theory	Participant	Component & dose	Cultural adaptation	Weight-unrelated outcome assessment tool	Significant outcome <sup>a</sup>
Recipe 4 Success <sup>43</sup>	Home	Recipe 4 conceptual model	Parent & child	45 min per week (home-based nutrition education + coaching on food preparation skills) × 10 weeks	N/A	Toddlers' healthy eating habits—24 h dietary recall, percentage of healthy meals; toddlers' self-regulation—snack delay task, <sup>105</sup> task orientation and/or regulation subscale of the Infant Behavior Record, <sup>106</sup> Infant-Toddler Social and Emotional Assessment <sup>107</sup> ; parents' responsive feeding practices—video recordings and scoring of how parents introduced toddlers to 3 novel healthy foods; parents' sensitive scaffolding—scoring of parents' tendencies to structure interaction tasks in an developmentally appropriate manner	Child healthy meals and snacks and self-regulation, adult responsive feeding practices and sensitive scaffolding

<sup>a</sup>The outcomes listed were statistically significant at a *p*-value of at least <0.05.

children in the intervention group, compared with their counterparts in the control group.<sup>36</sup> Tomayko et al found an improved dietary pattern at 12 months, measured with a scale adopted from Trude et al, among both adults and children in the intervention group.<sup>47,108</sup>

#### *Other behavioral outcomes*

Eight, five, three, and two studies measured physical activity, sedentary behaviors (i.e., screen time), sleep, and self-regulation, respectively. Five studies found improvements in child health-related behaviors. Among them, studies conducted by French et al, Tomayko et al in 2016, and Taverno et al found significantly reduced screen time for children at study timepoints 24 and 36 months, 24 months, and 10 weeks, respectively.<sup>37,45,46</sup> Nix et al found increased self-regulation of children as measured by “delay of gratification, task orientation, and emotional and/or behavioral control”.<sup>43</sup> Brown et al identified improved overall child health behaviors related to sleep, physical activity, and TV viewing.<sup>35</sup>

### 3.3.2 | Parental outcomes

#### *Feeding practices and styles*

Four studies described parental feeding practices or styles-related outcomes. The study conducted by Hughes et al found improved parental feeding practices, styles, and knowledge.<sup>40</sup> Haines et al found significantly reduced restrictive feeding practices among parents in the intervention group compared to control, Fisher et al saw increased authoritative parenting practices, and Nix et al found more responsive feeding practices.<sup>36,38,43</sup> These three outcomes have been identified by previous studies as being associated with better child weight status and feeding behaviors.<sup>109–111</sup>

#### *Diet-related outcomes*

Three studies included measurements of parental intake,<sup>45–47</sup> and two studies reported statistically significant improvements in parental dietary consumption, as measured by amount of fruits and vegetable intake of parents.<sup>45,47</sup>

#### *Behavioral outcomes*

Six studies described the effects of interventions on parental behavioral changes related to their own health.<sup>36,38,40,41,43,44</sup> A variety of parental health-related behaviors were studied. The most frequent statistically significant behavioral outcomes were increased physical activity and self-efficacy to conquer impediments to physical activity.

## 4 | DISCUSSION

Our study summarizes the recently published literature of a gap identified by the systematic review conducted by Ash et al., namely a paucity of studies evaluating family-based obesity prevention

interventions among preschool-aged children from racial and/or ethnic minority groups.<sup>29</sup> Our review differs from the systematic review by Ash et al by focusing on preschool-age children living in the United States as opposed to the global community.<sup>29</sup> Social, environmental, and cultural backgrounds vary between countries and play critical roles in the development of childhood obesity. Given this, and the changing racial and ethnic demographics of children in the United States, it is important to review the evidence of family-based interventions in the prevention of overweight/obesity in racial and ethnic communities in the United States.

Overall, there was limited research in the field from 2015 to 2021. We identified 14 individual studies, with a majority of the studies published after 2017 ( $n = 11$ ), suggesting an increased interest in studying health-promoting interventions for children 2–5 years old who identify as Hispanic/Latinx, American Indian, or Black/African American. The most frequently addressed obesity risk related behaviors were diet ( $n = 8$ ) and physical activity ( $n = 8$ ), followed by screen use ( $n = 5$ ), and sleep ( $n = 3$ ). Five (35.7%) studies reported statistically significant improvements of behavioral outcomes including screen use ( $n = 4$ ), sleep ( $n = 1$ ), and physical activity ( $n = 1$ ). The lack of interventions targeting all four behavioral domains ( $n = 2$ ) and a disproportionately focus on diet and physical activity was consistent with the findings of prior work.<sup>29</sup> Half of the 14 studies used child weight-related measurements as the primary outcome. Only 5 studies (35.7%) found statistically significant change in BMI or BMI percentile results. These results might be due to, relatively brief, non-intense interventions, or lack of interventions incorporating comprehensive behavioral change strategies. These findings regarding the effectiveness of interventions on behavioral and weight-related changes were consistent with two recent reviews looking at similar interventions among Hispanic/Latinx children and families.<sup>112,113</sup>

Looking at culturally tailored components of the reviewed interventions, we found that the most frequently addressed aspects were (1) language barriers, (2) food choices, (3) relationships among family members, and (4) rapport building. None of the 14 interventions included all four components. As obesity prevention efforts are increasingly conducted in diverse populations and communities, it is important to consider how adaptations could be made to increase the cultural relevance and effectiveness of interventions.

Language and food preferences are important factors to consider when developing obesity preventing strategies. Language can be a barrier for non-English speaking communities and food recommendations need to be consistent with cultural preferences and norms.<sup>114,115</sup> Studies included in this review tailored interventions for Spanish-speaking populations by using frequently suggested strategies, such as developing education materials in Spanish, inviting bilingual facilitators or health coaches to lead group sessions and interviews, investigating dietary cultural practices of target population, and suggesting food choices that are more familiar and culturally congruent with family preference.<sup>116,117</sup> It will be important for future curricula/programs to consider the use of different dialects

and cultures to accommodate Spanish-speakers from various regions (i.e., Mainlanders and Caribbeans) and generations (i.e., those who were born and raised in the United States and those who recently arrived).<sup>118</sup>

Family structure is another element to be considered when designing interventions targeting minority populations. The concept of “family” and roles of family members can be particularly important among racial and/or ethnic minority groups. For example, in American Indian families, elders are viewed as leaders of the family unit and family decisions are made with needs of the family/clan taking priority.<sup>119,120</sup> Among the 14 studies, Tomayko et al incorporated the American Indian model of inheriting life-skills from the elders into the delivery of their toolkit designed to be used in participant's homes.<sup>46</sup> The combination of the traditional model with a focus on the home environment achieved significant improvements in both child and adult weight-related behaviors. Included studies also employed various methods to build rapport among participants, such as recruiting “promotoras” (individuals who were trusted from the community of target population), creating educational videos featuring families from diverse cultural background, and adding time for open communication between educators and participants prior to every education session.<sup>42</sup> Leveraging the existing interactions among family members and building rapport could be specifically beneficial for racial and/or ethnic minority participants.

There were two gaps identified by this review. First, none of the interventions developed culturally tailored curriculum/program for Black/African American populations who, like Hispanic/Latinx and American Indians, experience weight-related health disparities. A previous systematic review examining the effect of culturally adapted interventions for Black/African American women found that 17 of 28 studies saw significant improvements in diet- and weight-related outcomes in treatment over control groups, demonstrating the benefit of incorporating culturally appropriate components into interventions targeting Black/African Americans.<sup>121</sup> More tailored interventions for this population may be important in reducing obesity disparities among children. Second, only 3 of 14 studies included a follow-up period after the completion of the intervention to evaluate long-term impact of the intervention on weight status. As a result, it is difficult to evaluate the effectiveness of interventions in preventing obesity at later time points in childhood and adulthood. This gap was also identified by a systematic review examining the impact of childhood obesity prevention interventions targeting children 0–5 years old from socioeconomically disadvantaged backgrounds.<sup>122</sup> Future studies should incorporate longer follow-up periods (i.e., >12 months) to allow sufficient time to observe the changes of anthropometric outcomes and maintenance of healthy weight behaviors.

A majority of the interventions lasted 12 weeks or less. Only 4 out of the 14 interventions (28.6%) were equal to or more than 12 months. This finding is consistent with prior reviews targeting the same age group.<sup>123,124</sup> Some short, but intense, interventions have demonstrated a positive impact on weight/health behaviors.<sup>125</sup> The interventions examined by this review only arranged weekly sessions

which could not be categorized as intense, which may contribute to the lack of statistically significant findings. Although longer follow-up periods translate into greater costs and have higher rates of missing data, it would be constructive in addressing the question of do childhood obesity preventing interventions impact weight status in adolescence and adulthood.

Several limitations of this study are worth noting. First, this review was not intended to be a systematic evidence review to summarize findings across similar but separate studies, limiting the interpretation of the findings; instead, the review focused primarily on a scoping review of study/intervention design and search results to identify intervention gaps, providing guidance and reference for future interventions and research. Secondly, the review targeted only interventions published in 2015 and beyond which was a rather short period of time, weakening the comprehensiveness of this review and disabling the analysis of time trends. However, this review was conducted with an intention to build on previous work looking at family-based childhood obesity prevention interventions including a review done in 2015,<sup>29,123</sup> and focused on racial and/or ethnic minority groups which had not been independently addressed by prior reviews.

## 5 | CONCLUSION

There is a limited but increasing number of studies examining family-based interventions studies to prevent obesity among minority preschool children (2–5 years of age) in the United States. Unfortunately, there is a lack of culturally tailored components for each racial and/or ethnic group, especially those targeting Black/African American families. Interventions also focused on addressing nutrition and physical activity as obesity prevention activities and did not address other drivers of obesity such as sleep. Future interventions covering these gaps should be studied to further the evidence for culturally appropriate and efficient means to prevent obesity among high risk minority children.

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## CONFLICTS OF INTEREST

Authors have no conflicts of interest.

## ORCID

Xiran Wang  <https://orcid.org/0000-0002-1011-2124>

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## SUPPORTING INFORMATION

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