New Perspectives on Health Disparities and Obesity Interventions in Youth

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Objective This article reviews intervention studies that address health disparities and the increasing rate of obesity in minority youth. The review focuses on interventions that target obesity-related behaviors (diet, physical activity, sedentary behaviors) and adiposity outcomes (body mass index) in minority children and adolescents. **Methods** A conceptual framework is presented that integrates ecological, cultural, social, and cognitive approaches to reducing obesity in ethnically diverse youth. The review highlights effective interventions in minority youth and distinguishes between culturally targeted and culturally tailored components. **Results** A limited number of studies have been conducted that target obesity-related behaviors and adiposity outcomes in minority youth. The most successful interventions for minority youth have incorporated culturally targeted and culturally tailored intervention components using multi-systemic approaches. **Conclusions** Further research is needed that focuses on testing the efficacy of theoretically based approaches that integrate culturally appropriate program elements for improving obesity-related behaviors and adiposity outcomes in minority youth.

Key words adolescents; children; diet interventions; minorities; obesity prevention; physical activity interventions.

Introduction

Over the last 20 years, the prevalence of overweight and obesity has increased dramatically in minority youth, which contributes to poor health outcomes (Kuczmarski & Flegal, 2000; Ogden et al., 2006). In 2003–2004, an estimated 23% of African American and Hispanic youth, and 28% of Indian school children were overweight or obese as compared to 17% of Caucasian youth (Caballero et al., 2003; Ogden et al., 2006). Childhood obesity has also been associated with an increasing prevalence of precursors for cardiovascular disease, type 2 diabetes, metabolic syndrome, orthopedic complications, and certain cancers (Cook, Weitzman, Auinger, Nguyen, & Deitz, 2003; Hanevold et al., 2005; Weiss et al., 2004). Thus, given the high prevalence rates of overweight and obesity among minorities, targeting prevention and intervention efforts toward minority youth has the potential to reduce health disparities across multiple disease conditions.

Recent evidence suggests that minority children experience health disparities with respect to health care access and quality of service. National studies have demonstrated disparities among minority youth in health status, insurance coverage, parental satisfaction with care, and referrals to specialists (Flores, Olson, & Tomany-Korman, 2005). Racial differences in socioeconomic status have also been shown to contribute to health disparities among minorities (Wong, Shapiro, Boscardin, & Ettner, 2002). Furthermore, minorities experience dramatically worse health status including having significantly higher mortality rates from cardiovascular disease, cerebrovascular disease, most cancers, diabetes, HIV, unintentional injuries, pregnancy, sudden infant death syndrome, and homicide as compared to Caucasians (Otten, Teutsch, Williamson, & Marks, 1990; Sorlie, Rogot, Anderson, Johnson, & Backlund, 1992).

This article provides a review of interventions that target obesity-related behaviors (diet, physical activity,

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sedentary behavior) and that target adiposity outcomes [prevention or reducing body mass index (BMI)] that have been specifically developed for minority youth and their families. Given the high prevalence rates of overweight, obesity, and health disparities among minority youth, efforts to prevent and reduce this trend should be targeted at ethnically diverse children and adolescents. Therefore, the goal of reviewing existing interventions with minority youth is to provide direction in reducing health disparities and suggestions for implementing culturally relevant interventions for minority youth. This may be especially important for identifying how cultural values may serve to inform intervention development and to increase understanding of barriers that are specific to minority populations. This article will highlight the significance of using culturally targeted (channeled materials that are sensitive to group level cultural values) and culturally tailored interventions (integration of information based on unique cultural values for individuals or groups) approaches for weight control in minority youth (Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003; Resnicow, Baranowski, Ahluwalia, & Braithwaite 1999; Sanders-Thompson et al., 2007).

Theoretical framework for understanding interventions in minority youth

In this article, an ecological framework is used that integrates ecological, cultural, social, and intrapersonal (cognitive) approaches for improving diet, physical activity, and weight control behaviors among minority youth (Booth et al., 2001; Bronfenbrenner, 1979; Davison & Birch, 2001). This approach assumes that health is shaped by environmental subsystems including intrapersonal factors, interpersonal processes and primary groups (social networks), institutional factors, community factors, and public policy. The ecological framework suggests that health promotion efforts should be multi-faceted and should address systems that adversely or beneficially affect a child's ability to engage in healthy diet, physical activity, and weight control behaviors. For example, the family and social context are at one level of the ecological model that may influence dietary choices of youth and whether resources are available for youth to engage in regular physical activity. Strategies for enhancing cultural appropriateness of interventions can also be viewed in the context of the ecological framework.

There is a growing interest in developing effective theoretically based approaches to weight control in minority populations (Wilson & Kitzman-Ulrich, 2008). Such approaches postulate that intervention effects may be

mediated through changes in social-cognitive mediators such as self-efficacy (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003). The assumption underlying this approach is that interventions result in behavior change due to changes in mediating variables. Previous research has demonstrated that interventions are more likely to have the desired impact on an outcome if the mediating variables are strongly related to the behaviors of interest and if the effective methods used in the intervention for manipulating these variables are available (Baranowski, Anderson, & Carmack, 1998).

Previous investigators have distinguished five strategies for enhancing cultural appropriateness of health promotion program materials, which include peripheral, evidential, linguistic, constituent-involving, and socio-cultural strategies (Kreuter et al., 2003). Peripheral strategies are used to give program materials the appearance of cultural appropriateness by using certain images and pictures of group members. Evidential strategies are used to enhance the relevance of health issues for a given group by providing evidence such as prevalence data. Linguistic strategies are used to alter program materials to be dominant in the native language of the target group. Constituent-involving strategies draw on experience of members of the target group such as natural helpers or lay health providers. Lastly, socio-cultural strategies integrate health issues in the context of the broader social and cultural values and are referred to as 'deep structures' of cultural sensitivity (Resnicow et al., 1999). These cultural strategies may also be used for targeting or tailoring cultural aspects of health promotion programs (Kreuter et al., 2003). Interventions that have 'socio-cultural' or 'deep structures' typically integrate cultural values and norms into the intervention programming. Cultural tailoring approaches typically tailor for individual or groups based on how much they identify with a specific cultural value. For example, 'familialism' is considered a cultural characteristic of Latino's where certain Latino individuals may vary on how much they identify with this characteristic. Therefore, a culturally tailored program could deliver different types of interventions based on how much a person identifies with the cultural value of 'familialism'. Throughout the following review, studies will be highlighted that use cultural targeting and tailoring approaches as examples of strategies that have been used in minority youth weight control efforts.

Although increasing attention has been given to developing and evaluating obesity-related interventions in youth, relatively little attention has been devoted to understanding approaches that may be culturally appropriate for

impacting long-term behavior change among ethnically diverse children and adolescents. Recent reviews on childhood obesity prevention and treatment approaches have primarily focused on randomized controlled trials that, in many cases, do not specifically target minority or ethnically diverse populations (Doak, Visscher, Renders, & Seidel, 2006; Flynn et al., 2006; Stice, Shaw, & Marti, 2006; Whitlock et al., 2005). For example, of the 22 randomized controlled trials reviewed by Whitlock et al. (2005), only two focused exclusively on minority youth. However, reviews by Flynn et al. (2006) and Kumanyika et al. (2005) did focus primarily on underserved (immigrants, low-income) and minority populations and addressed a variety of factors in both youth and adult populations. Previous research has evaluated the effectiveness of obesity interventions among youth and investigators have highlighted the key components of interventions (i.e., diet, physical activity, sedentary behaviors, family, institutions, community) that were effective and the degree to which these components were implemented with fidelity (Doak et al., 2006; Flynn et al., 2006; Stice et al., 2006). In general, little research has focused on understanding obesity-related intervention approaches specific to minority youth.

This article provides an integrated review of issues related to obesity prevention and treatment from an ecological and cultural perspective and will highlight intrapersonal, family, school- and community-based approaches that are particularly relevant for understanding cultural targeting and tailoring strategies in ethnically diverse pediatric populations. Studies for this review were identified through Medline searches, Psychological Abstract searches, bibliographic searches of key articles, and the authors' knowledge of the literature. The key words that were used in this search included minorities, children, adolescents, overweight, obesity prevention, obesity interventions, weight loss interventions, dietary interventions, physical activity interventions, and relevant correlates of these key variables. Any studies that included an intervention primarily targeting minorities were included in this review. The review is divided into interventions that primarily target obesity-related behaviors (e.g., diet, physical activity, sedentary behaviors) and interventions that primarily target changing adiposity outcomes (e.g., BMI, weight, skin folds).

Interventions that target obesity-related behaviors

Table I presents a summary of interventions that target obesity-related behaviors and is organized by study population, theoretical approach, intervention method, cultural

innovation, and outcome (positive, negative or no effect). In general, findings from the studies reviewed in Table I show that programs that target obesity-related behaviors that include cultural targeting and/or cultural tailoring approaches have significantly produced increases in physical activity, fruit, and vegetable intake and decreases in dietary fat intake and sedentary behaviors in minority youth. For younger children, the largest effects on health behaviors (e.g., diet, physical activity) included a parental involvement component. In addition, younger children benefited from programs that focused on developing specific behavioral change skills. Identifying effective intervention strategies is important, given that a recent meta-analysis (Stice et al., 2006) showed that the majority of the programs, among all ethnic groups including Caucasians, did not produce statistically reliable weight gain prevention effects. Stice et al. (2006) argued that it is imperative to focus on the elements of programs that produced significant weight gain prevention effects, and additional reviews have been conducted to help identify aspects of successful childhood programs that target obesity-related behaviors such as diet, physical activity, and sedentary behaviors (e.g., Budd & Volpe, 2006; Doak et al., 2006). These reviews suggest that family-based interventions that incorporate education and behavior modification have been successful, and propose that best practice for changing obesity-related behaviors is an intervention that includes improving both physical activity and diet.

Intrapersonal approaches

Several studies have demonstrated that intrapersonal interventions that target obesity-related behaviors have been successfully implemented in minority adolescents. In general, self-efficacy, self-concept, and motivational beliefs have all been shown to be important constructs in understanding diet and physical activity intervention effects among ethnically diverse youth. For example, several studies have specifically evaluated diet and physical activity interventions in African American adolescents that targeted increasing intrapersonal factors such as motivation and self-efficacy. In one study by Wilson et al. (2002), healthy African American adolescents and their families were randomized to a Social Cognitive Theory (SCT) behavioral skills plus motivational, or behavioral skills only, or education-only intervention for increasing daily fruit and vegetable intake and physical activity. Adolescents in the motivational intervention participated in a strategic self-presentation videotape session that involved increasing motivation by creating cognitive dissonance and inducing shifts in positive self-concept by generating positive strategies for engaging friends and family members in making

Table 1. Interventions that Primarily Target Obesity-Related Behaviors in Minority Youth

Author(s)	Theoretical constructs	Study population	Intervention methods	Cultural innovation	Overall findings (positive/negative/no effect)
Wilson et al. (2002)	<i>Theories:</i> motivational theory (cognitive dissonance) plus social cognitive theory. <i>Intrapersonal constructs:</i> motivation, self-concept, self-efficacy for diet and PA.	53 African American adolescents and their families.	RCT: (1) 12-week behavioral skills plus motivational group targeting increasing F&V intake and PA or (2) behavioral skills only or (3) general health education.	<i>Cultural constructs:</i> program used a culturally tailored approach by allowing youth to develop positive skills and choice for changing diet and PA behaviors.	<i>Effects:</i> positive for increasing F&V intake; positive effects on self-concept and self-efficacy constructs related to F&V; no effect for PA. Adolescents in the behavioral skills plus motivation or behavioral skills showed a significantly greater increase in F&V intake as compared to the education only group.
Wilson et al. (2005)	<i>Theories:</i> integration of self-determination theory plus social cognitive theory. <i>Intrapersonal constructs:</i> motivation, self-concept, self-efficacy for PA.	48 adolescents, sixth graders (83% African American; 83% on free or reduced lunch program).	Quasi-experimental design (matched schools): (1) 4-week behavioral skills plus motivational group or (2) general health education.	<i>Cultural constructs:</i> Program used a culturally tailored approach by allowing youth choice and input on how to make PA changes.	<i>Effects:</i> positive for PA; positive effect for motivation and self-concept for PA Behavioral skills plus motivational intervention resulted in significantly greater PA than the general health program.
Beech et al. (2003)	<i>Theories:</i> social cognitive theory. <i>Interpersonal and Family Constructs:</i> role modeling, parent involvement.	60 African American pre-adolescents.	RCT: (1) child-only (12 weekly sessions on PA, nutrition, and a take-it home components), (2) parent-only group (12 weekly sessions on PA, nutrition, and interactive activities); or (3) self-esteem focused comparison group.	<i>Cultural constructs:</i> program uses culturally targeted family-based interactive modules for diet and PA.	<i>Effects:</i> positive effects on increasing PA, positive effect on reducing calories from fat and sweetened beverages 11.7% increase in minutes of PA, 34.1% decrease in servings of sweetened beverages (combined intervention groups). Parent-only group had trend towards increase in PA and fewer calories from fat.
Stolley and Fitzgibbon (1997)	<i>Theories:</i> family systems theory and social cognitive theory. <i>Interpersonal and family constructs:</i> role modeling, social support, positive family communication.	65 African American mother-daughter dyads; preadolescent females.	RCT: (1) treatment group (12 culturally tailored sessions on PA and diet) or (2) control. Sessions held at local tutoring center.	<i>Cultural constructs:</i> program used a culturally tailored approach by implementing sessions tailored to dietary needs of African American traditions	<i>Effects:</i> positive dietary effects for mothers and daughters related to fat intake; positive effects on psychosocial related constructs for diet Mothers in treatment group had significant positive changes in saturated fat, percent calories from fat, parental support, and role modeling when compared to controls. Daughters had a significant decrease in percent of calories from fat when compared to controls.

continued

Table I. Continued

Author(s)	Theoretical constructs	Study population	Intervention methods	Cultural innovation	Overall findings (positive/negative/no effect)
Robinson et al. (2003)	<i>Theories:</i> social cognitive theory. <i>Interpersonal and family constructs:</i> parent role modeling and involvement, environmental changes in home.	61 African American females (age 8–10) and their parents or guardians.	RCT: (1) Treatment (hip hop dance classes 5 days per week at community centers, five in-home lessons on reducing television delivered to participants and a family member, and five newsletters mailed to parents/guardians) or (2) control (health education curriculum)	<i>Cultural constructs:</i> program used culturally targeted approach that included hip hop dance classes and family involvement in home environment.	<i>Effects:</i> positive effects on reducing television viewing Treatment group reported 23% less media use, significant reduction in overall household television viewing compared to controls, and 40% decrease in dinners eaten while watching television.
Frenn et al. (2005)	<i>Theories:</i> health promotion model, trans-theoretical model. <i>School-based constructs:</i> decision balance, self-efficacy for fat intake and PA, access to low fat foods and PA programs/facilities.	103 multiethnic sample of adolescents (primarily African American and Hispanic).	Not RCT: eight sessions of internet and video-based activities to increase PA and reducing fat intake.	<i>Cultural constructs:</i> program culturally targeted intervention components that focused on safety and access of PA and low fat foods; and a culturally tailored approach by implementing individually tailored internet messages.	<i>Effects:</i> positive effect on increasing PA, positive impact on decreasing dietary fat High attenders (>50%) significantly increased MVPA by 22 min versus 46 min decrease in controls and decreased percent of dietary fat from 30.7 to 29.9.
Trevino et al. (2005)	<i>Theories:</i> social cognitive theory. <i>School-based constructs:</i> health knowledge and beliefs, parent involvement, access to low-fat, high fiber foods and PA programs in home and school environment.	561 fourth-grade Mexican American students enrolled in nine elementary schools from low-income neighborhoods in the San Antonio Independent School District.	RCT: (1) five schools received the Bienestar Program of classroom activities for decreasing fat and increasing fiber and PA; parent activities to reinforce diet and PA goals; a health club; and changes in the school food services and (2) four schools served as controls.	<i>Cultural constructs:</i> PA programs were culturally tailored and included salsa dancing. Health class curriculum included multicultural learning.	<i>Effects:</i> positive effect on increasing physical fitness scores in the intervention as compared to control schools after 8 months ($p < 0.003$).

RCT: randomized controlled trial; PA: physical activity; F&V: fruit and vegetable intake.

healthy dietary and physical activity changes. Strategic self-presentation is a culturally tailored approach in that adolescents develop their own strategies for making behavior changes and have a choice on what dietary and physical activity changes they intend to make. The results demonstrated that both intervention groups showed greater increases in fruit and vegetable intake from pre- to post-treatment as compared to the education-only group. However, correlation analyses revealed that only the behavioral skills plus motivational group showed that increases in positive self-concept and self-efficacy for behavioral skills were significantly correlated with post-treatment fruit and vegetable intake and change in fruit and vegetable intake.

In a study by Wilson et al. (2005), an intervention based on SCT and Self-Determination Theory (SDT) (Ryan & Deci, 2000) was evaluated for increasing physical activity in minority adolescents. SDT proposes that behavior changes are motivated by intrinsic factors such as novel, enjoyable, self-driven, and satisfying experiences, which will sustain behavior more so than those behavior changes produced by extrinsic factors (external rewards). Students in the intervention school were matched (on race, percentage on free or reduced lunch program, sex, and age) with students from another school who served as the comparison group. The intervention emphasized increasing intrinsic motivation and behavioral skills for physical activity. A culturally tailored approach to the intervention allowed adolescents to take ownership in selecting a variety of physical activities to participate in during the after-school program. The adolescents also generated positive strategies for increasing physical activity with peers and family members in their home environment (see also Wilson et al., 2008; Wilson et al., 2006). Intervention participants showed greater increases in moderate-to-vigorous physical activity from baseline to post-treatment than the comparison group. In addition, intervention participants showed significantly greater increases in physical activity motivation and positive self-concept for physical activity than adolescents in the comparison group.

In summary, the results from these studies suggest that improvements in positive self-concept, motivation, and self-efficacy were key constructs in understanding dietary and physical activity improvements in African American adolescents who were exposed to the motivational and behavioral skills-based interventions. The culturally tailored approach that allowed adolescents to have input and choice was also an effective methodology for changing obesity-related behaviors such as increasing physical activity and fruit and vegetable intake. Further research

is needed to replicate these findings among other ethnic minority youth groups.

Interpersonal and family-based approaches

Previous research has demonstrated that family involvement in interventions is an effective approach for changing obesity-related behaviors in youth (Beech et al., 2003; Stolley & Fitzgibbon, 1997). For example, Stolley and Fitzgibbon (1997) studied mother-daughter dyads as part of a program to improve diet and physical activity behaviors in inner-city, low-income African American pre-adolescent girls. Mother-daughter dyads were randomized to receive a culturally tailored program (or control program), adapted from the Know Your Body Program, for improving healthy eating and physical activity based on African American traditions. Parent participation was included to provide support to mothers who had limited access to dietary and physical activity resources. Mothers and daughters in the treatment group showed significant decreases in percent calories from fat and significant increases in parental support and role modeling for healthy eating when compared to the control group. This culturally tailored program was effective for improving eating behaviors related to obesity and showed that key constructs such as parental role modeling and support were important theoretical factors in understanding treatment effects.

Beech et al. (2003) evaluated the impact of a culturally targeted intervention designed to increase physical activity and reduce caloric intake among African American pre-adolescents. Participants were randomized to one of three groups: child-only, parent-only, or self-esteem focused comparison group. The intervention incorporated interactive modules that were culturally based for African American parents and youth. Results showed an increase in minutes of moderate-to-vigorous physical activity, and a decrease in servings of sweetened beverages when combining the two intervention groups. Both intervention groups showed favorable results when compared to the comparison group.

Another study targeting reductions in sedentary behaviors and increases in physical activity among African American girls incorporated targeted culturally based elements of dance and focused on reducing television viewing in a randomized controlled trial of daughters and their parents/guardians (Robinson et al., 2003). Participants were randomized to either a treatment intervention or active control group. The treatment intervention consisted of hip hop dance classes, in-home lessons on reducing television delivered to participants and a family member, and culturally relevant newsletters mailed to parents/guardians. The control group was a health

education program delivered through community health lectures and through mailing newsletters. The treatment group demonstrated a significant reduction in overall household television viewing when compared to active controls.

Overall, the studies above provide examples of how specific culturally targeted and tailored family-based approaches for improving diet and physical activity behaviors are important in understanding family factors that may mediate behavior change in minority youth. In particular, targeting family support and parent involvement are key conceptual factors that should be considered in designing obesity-related interventions for ethnically diverse youth.

School-based approaches

School-based interventions have also been implemented for improving diet and physical activity behaviors among minority youth. In the Pathways initiative (a multi-site, 3-year study), investigators evaluated a culturally relevant school-based intervention designed to lower percent body fat in American Indian children (Steckler et al., 2003; Trevino, Hernandez, Yin, Garcia, & Hernandez, 2005). Pathways applied a multilevel strategy involving individual behavior change and environmental modifications to support changes in individual behavior. Both culturally targeted and tailored elements were integrated into the program. Components of the intervention included: a culturally tailored classroom curriculum designed to promote healthful eating behaviors and increased physical activity that focused on individual level behaviors; a physical activity component aimed at maximizing energy expenditure during physical education classes; a food service intervention that enhanced food staff skills in planning, purchasing, preparing, and serving lower-fat meals; and a culturally targeted family program involving taking home 'family action packs' that were linked to classroom curriculum to promote reduced fat meals and increases in physical activity. Results indicated that students in intervention schools consumed fewer calories from fat and saturated fat in school meals and in their overall diet as compared to those in the control schools.

Frenn et al. (2005) evaluated the effectiveness of a culturally tailored internet intervention on increasing physical activity and reducing fat intake in primarily African American and Hispanic seventh-grade students. The intervention included culturally tailored internet and video-based activities. Children who attended at least half of the sessions as part of their science class increased moderate-to-vigorous physical activity compared with a decrease in those attending less than half of the sessions.

Intervention children who attended at least half of sessions also showed a significant decreased in dietary fat intake as compared to those who attended less than half of the sessions.

In summary, a variety of approaches in the school setting have been implemented that have focused primarily on ethnic minorities. These programs provide support for incorporating multi-components that are culturally targeted at the school and home levels and culturally tailored for youth, parents, and families. These studies demonstrate that it is feasible to make interventions culturally appropriate by involving school staff, parents, and interactive modalities such as using the internet for improving obesity-related health behaviors.

Interventions that target adiposity-related outcomes

Table II presents a summary of interventions that target adiposity-related outcomes and is organized by study population, theoretical approach, intervention method, cultural innovation, and outcome (positive, negative or no effect). In general, only approximately half of the studies in Table II were successful at decreasing BMI or body fat measures. Many of these investigators used culturally targeted approaches that integrated cultural traditions into a multi-component program. Only several investigators used a culturally tailored approach that also targeted individual behaviors. In one review, Jelalian, Wember, Bungeroth, & Birmaher (2006) argued that comprehensive behavioral interventions that include dietary prescription, physical activity and/or decreased sedentary behavior, and behavior modification targeted at both children and parents were most effective treatments for pediatric obesity. A limitation of the previous interventions is the lack of focus on maintenance of behavior change for children who have successfully reached their goals. For treatment of adolescent obesity, there is insufficient evidence to conclude that any one treatment approach or combination of approaches is superior (Tsiros, Sinn, Coates, Howe, & Buckley, 2008). Studies in this area have provided conflicting results, suggesting that adolescents may be more responsive with parents (e.g., Brownell, Kelman, & Stunkard, 1983), whereas other studies have concluded that the level of parental involvement had no effect on treatment outcomes (Wadden et al., 1990). In general, few intervention studies that focus on adiposity outcomes have been conducted in minority youth.

Interpersonal and family-based approaches

Only limited research has specifically evaluated the efficacy of family-based weight loss interventions in ethnically

Table II. Interventions that Primarily Target Adiposity-Related Outcomes in Minority Youth

Author(s)	Theoretical constructs	Study population	Intervention methods	Cultural innovation	Overall findings (positive/negative/no effect)
Wadden et al. (1990)	<i>Theories:</i> social cognitive theory. <i>Interpersonal and family constructs:</i> role modeling, parent involvement.	36 African American adolescents and parents.	<i>RCT:</i> (1) child alone, (2) mother-child together, or (3) mother-child separately. Participants attended 1-h weekly classes for 16 weeks.	<i>Cultural constructs:</i> program used culturally targeted approach that focused on nutrition, PA, and behavioral skills for African American families.	<i>Effects:</i> no positive effects of individual interventions on reducing BMI Mean BMI declined from 35.2–33.9 (groups combined). No significant differences between groups.
White et al. (2004)	<i>Theories:</i> social cognitive theory <i>Interpersonal and family constructs:</i> role modeling, parent involvement.	57 adolescent African American females and their families.	<i>RCT:</i> (1) internet behavioral group or (2) control.	<i>Cultural constructs:</i> program used cultural targeting and tailoring of information including an interactive, behavioral skills based program for African American female youth.	<i>Effects:</i> positive effects on reducing body fat in intervention youth. Adolescents in internet group lost significantly more fat than those in the control group. For parents, BMI was significantly different between the two groups.
Chehab et al. (2007)	<i>Theories:</i> social cognitive theory and relapse prevention. <i>School-based constructs:</i> behavioral skills for diet and PA, self-esteem.	452 inner-city female students predominantly Latina (12–18 years).	<i>Not RCT:</i> program elements included a celebrity lifestyle and fitness coach of a similar background as a leader in the program. The components of the program focused on behavioral skills associated with addictive food avoidance, increasing PA and self-esteem.	<i>Cultural constructs:</i> program used a targeted cultural approach that included a program leader from a similar background as an agent of change.	<i>Effects:</i> positive effect on weight loss after 9 months for obese girls; however, there was no control group to rule out bias of self-selecting into the program.
Engels et al. (2005)	<i>Theories:</i> social cognitive theory. <i>School-based constructs:</i> role modeling, parent involvement.	56 African American preadolescents and 25 parent/guardians.	<i>Not RCT:</i> 12-week after-school program (dance, sport games, fitness activities, nutrition activities, step-counters, and display board within the school).	<i>Cultural constructs:</i> program used culturally targeting approach by including relevant dance, sports, and activities for African American youth and parents.	<i>Effects:</i> no positive effects of reducing BMI in children, positive effects for BMI reduction in parents Parents had reductions in BMI, body fat, and improved fitness. Children showed higher intakes of F&V.
Fitzgibbon et al. (2005)	<i>Theories:</i> social cognitive theory, self-determination (motivational) theory, trans-theoretical model. <i>School-based constructs:</i> secondary outcomes: TV viewing, dietary intake, PA, knowledge, social support.	12 preschools (~300 African American preschool children and parents).	<i>RCT:</i> (1) weight control intervention (WCI) 14-week program focused on healthy eating (low saturated fat) and exercise (hip hop dance) and parent newsletter or (2) general health intervention (GHI).	<i>Cultural constructs:</i> program implemented culturally targeted materials and linguistically adapted materials for African Americans.	<i>Effects:</i> positive effect on preventing increases in BMI, positive effect on decreasing saturated fat intake (1-year follow-up data), no psychosocial outcomes reported. Mean increase in BMI was significantly lower in WCI group versus GHI at year 1 (0.06 vs. 0.59 kg/m ²) and year 2 (0.54 vs. 1.08 kg/m ²).

continued

Table II. Continued

Author(s)	Theoretical constructs	Study population	Intervention methods	Cultural innovation	Overall findings (positive/negative/no effect)
Johnston et al. (2007)	<i>Theories:</i> based on social cognitive theory and relapse prevention models. <i>School-based constructs:</i> behavioral skills; secondary outcomes include reductions in total cholesterol and LDL cholesterol.	60 Mexican American youth (33 boys; 55%; ages 10–14 years).	RCT: (1) weight management program that focused on behavioral skills such as controlling portion sizes, nutrition information awareness, heart rate monitoring, and the development of a token economy system or (2) self-help control group.	<i>Cultural constructs:</i> program used culturally tailored program that individualized program to food and PA preferences. Integrated culturally targeted materials that were offered in English or Spanish.	<i>Effects:</i> children in the intervention group showed a positive effect on reducing standardized BMI as compared to the self-help group. Follow-up data showed a sustained intervention effect for 3- and 6-month follow-ups as compared to youth in the self-help program.
Streckler et al. (2003)	<i>Theories:</i> social cognitive theory. <i>School-based constructs:</i> targeted diet and PA behaviors.	41 elementary schools with primarily American Indian students.	RCT: (1) randomized to school based intervention to decrease dietary fat, increase fruit and vegetable intake and PA to reduce adiposity and (2) control.	<i>Cultural constructs:</i> cultural targeted changes in foods offered such that lower fat options were provided through improved cooking methods and more fruits and vegetables were offered.	<i>Effects:</i> no positive effects for percent body fat; however, intervention school youth showed a greater decrease in calories consumed from fat than did comparison schools.
Resnicow et al. (2005)	<i>Theories:</i> social cognitive theory, self-determination theory. <i>Community/church-based constructs:</i> role modeling, parent involvement; intrinsic motivation.	147 African American adolescent females in 10 churches.	RCT: (1) high intensity (weekly behavioral sessions, 30 min of PA, food prep, retreat) or (2) moderate intensity (six sessions on barriers and benefits of PA). Parents invited to attend every other session.	<i>Cultural constructs:</i> program used cultural targeting and tailoring of nutrition, PA, and behaviors based on cultural beliefs that were tied to spirituality.	<i>Effects:</i> no positive effect overall on reducing BMI, positive effects in subgroup who attended more sessions No significant differences between groups. High attenders (>75%) in High Intensity group had significant reductions in BMI when compared to low attenders (<75%).

RCT: randomized controlled trial; PA: physical activity.

diverse youth, although substantial evidence for parental involvement has been demonstrated among Caucasian youth (e.g., Epstein, Valoski, Wing, & McCurley, 1990; Golan, Weizman, Apter, & Fainaru, 1998). Several randomized trials have been conducted in African American youth that provide support for family-based intervention approaches among minority youth. For example, Wadden et al. (1990) evaluated the effect of parental participation in overweight female African American adolescents. Overweight adolescents received the same SCT-based curriculum that incorporated cultural preferences (targeted to the group level) for diet and physical activity but were randomized to either: child alone, mother-child combined, or mother-child separate groups. Participants attended 1-h weekly classes and covered material that focused on behavioral skills and parental modeling (Brownell et al., 1983). Mean BMI decreased similarly across all three conditions.

Another study evaluated a family-based weight loss intervention delivered through the internet over 6 months (White et al., 2004) in African American female adolescents and their families. Families were randomized to an internet behavioral group or an education-only comparison condition. The internet behavioral condition was culturally tailored and included self-monitoring, goal setting, problem solving, behavioral contracting, and relapse prevention. At 6 months, the results showed significantly greater reductions in body fat and weight for adolescents in the intervention as compared to education-only condition. Interestingly, in this study, parents' satisfaction with life and family functioning were significant mediators of weight loss in adolescents.

In summary, the studies reviewed above provide support for including parents and family in obesity-related interventions that involve African American youth. However, further research is needed across more diverse ethnic groups and more specific attention should be given for understanding family related constructs and specific cultural factors that may be important in mediating changes in diet and physical activity. Research should compare culturally targeted to culturally tailored approaches to determine if either one approach or the combination of approaches is more effective in promoting adiposity-related changes in minority youth.

School-based approaches

Several investigators have evaluated the impact of school-based approaches on reducing obesity in ethnically diverse youth. A culturally targeted school intervention, known as 'Energy Up' (Chehab, Pfeffer, Vargas, Chen, & Irigoyen, 2007) evaluated a weight management approach for Latino

teens living in inner-city regions of New York. The intervention was innovative and was created by integrating culturally targeted program elements such as including a celebrity lifestyle and fitness coach of a similar background as a leader in the program. The components of the program focused on addictive food avoidance, physical activity, and self-esteem building. During the intervention, obese participants lost approximately 13 pounds, however no control group was implemented in this study, which limits the conclusions that can be drawn given that participants self-selected into the program.

An ecological framework was used in a recent study that investigated the impact of an after-school program in African American children and their parents/guardians promoting healthy diet and physical activity changes (Engels, Gretebeck, Gretebeck, & Jimenez, 2005). Program components were culturally targeted and included culturally relevant dance, sport games, fitness activities, nutrition activities, handouts on nutrition and fitness, step-counters, and a display board within the school. No comparison group was included in the study design. Participants were asked to log daily fruit and vegetable intake and steps. The program incorporated a motivational guest appearance from a well-known public figure to the program. Only parents showed reductions in BMI, body fat, and improved fitness, while children showed higher intakes of fruit and vegetables at the end of the program.

In a study conducted in primarily African American and Hispanic children and their parents, 12 preschools were randomly assigned to an SCT behaviorally based weight control intervention (WCI) or a general health intervention (GHI) (Fitzgibbon et al., 2005). Children in the WCI group participated in a 14-week program that was culturally and linguistically adapted for minorities to promote healthy eating and physical activity. Children in the GHI group participated in a program focused on general health concepts. Parents in both groups received weekly culturally targeted newsletters that included a homework assignment. At 1- and 2-year follow-up, the mean increase in BMI was significantly lower in WCI group as compared to the GHI group. These results demonstrated that a behavioral school-based program with a culturally integrated correspondent parental component was effective in reducing the increase in BMI in minority preschool children.

Johnson et al. (2007) also conducted a weight loss program in Mexican American youth who were enrolled in charter schools. Students were randomized to participate in a weight management program or a self-help program. The intervention was based on SCT principles and

was culturally tailored to individual preferences for food and physical activity. The program materials were offered in both English and Spanish and were culturally targeted for Mexican American youth and their families. The results of this study were impressive and demonstrated significant reductions in BMI for intervention youth as compared to youth in the self-help programs. Follow-up data also showed sustained effects at 3 and 6 months post-intervention.

In summary, very limited research has specifically focused on implementing obesity interventions in school-settings targeted at specific minority populations. The key conceptual factors that seem to be important in understanding school-based effects included integrating both culturally targeted and tailored approaches that include involving parents, changing the school environment, improving behavioral skills, and addressing broader health behavior issues in the context of the intervention programs. Further research is needed specifically to address what potential mechanisms for change that may be most important especially among ethnically diverse children and adolescents.

Church-based approaches

Few community-based interventions have been conducted exclusively among minority children and adolescents. Investigators have targeted church-based settings for reducing obesity among ethnically diverse youth and their families. A study by Resnicow, Taylor, Baskin, and McCarty (2005) evaluated the effectiveness of a culturally tailored SCT plus motivational church-based intervention with African American girls. Ten churches were randomized to either a High Intensity group or a Moderate Intensity group that targeted adolescent girls. The High Intensity group received weekly behavioral sessions that included a behavioral activity, physical activity, and healthy snacks; a 1-day retreat, and messages via telephone or pager based on motivational interviewing. Participants in the Moderate Intensity group received six sessions that contained information on barriers and benefits to physical activity, fad diets, and trying new foods. Parents were invited to attend every other group meeting in both group conditions. Participants in the High Intensity group who attended more than 75% of sessions had significantly greater reductions in BMI when compared to those who attended less than 75% of sessions.

In summary, church-based interventions designed specifically for minority youth have shown somewhat limited success; however, the potential for integrating culturally tailored program components in this setting seem to offer great potential for future studies. Future research is

needed to better understand whether church-based interventions that integrate both culturally targeted and tailored components for the whole family may be effective in reducing obesity among minority youth.

Conclusions and future directions

This article has highlighted a number of key environmental, cultural, social, and intrapersonal intervention approaches that have been associated with understanding interventions that are targeted at enhancing obesity-related behaviors and at improving adiposity-related outcomes in minority youth. Investigators have targeted the home, school, and community environments as key systems for promoting healthy diet, physical activity, and weight control behaviors. Both culturally targeted and culturally tailored approaches have been implemented in previous studies. Studies that have included both these levels of cultural integration into their intervention program elements have tended to show the most impact on altering health behaviors and adiposity, although no investigator has compared these approaches in an empirical test. Research is needed to clearly test effective ways of integrating culturally appropriate interventions components at group and individual levels for reducing obesity in minority youth.

Based on this review of the empirical studies, an agenda for future research is proposed. Much of the previous research has been conducted in primarily African Americans and more research is needed to test the effectiveness of culturally targeted and tailored interventions in Hispanic, American Indian, and Asian American youth. In general, there is also a lack of evidence for demonstrating theoretical mediation of culturally integrated intervention elements among ethnically diverse youth. Research is needed that integrates more of the 'deep structured' or 'socio-cultural' tailored interventions that include activities that youth can identify with as part of their cultural values (e.g., providing salsa or hip hop dance to increase physical activity) rather than just 'surface level' tailoring of interventions with respect to adapting culturally relevant linguistics of program materials or with using role models who are from the same culture. Investigators may need to develop measures to more accurately and to assess the effectiveness of culturally tailored intervention components that could be tested as mediators in understanding effectiveness of interventions especially among minorities and low income populations.

Some investigators have also argued for more community level research to effectively develop

interventions that address the barriers and needs of a target population (Glasgow, Klesges, Dziewaltowski, Bull, & Estabrooks, 2004). Community level approaches could also expand our understanding of other cultural innovations that may not have been tested to date. Qualitative research will continue to be important in understanding what theoretical approaches may be best suited for youth from diverse ethnic backgrounds. Ecological approaches that are combined with behavioral, and motivational approaches may hold promise if molded to the cultural needs of the target community. However, focusing on individual differences in cognitive beliefs and motivational readiness in and of itself will probably not yield meaningful insights into the complex process of behavior change over time unless culturally tailored to individual needs in the context of a broader program that also integrate cultural targeting of group level traditions.

The studies reviewed in this article suggest that investigators and health care providers consider broader conceptual issues in the context of developing obesity programs while also integrating intrapersonal factors such as intentions, motivation, and self-efficacy constructs. This article sets the stage for future investigations to develop multi-level cultural approaches for improving obesity-related health behaviors and adiposity-related outcomes in minority youth. In general, the most successful interventions to date have incorporated culturally relevant intervention components related to diet, physical activity, and family involvement in minority youth that are tailored at more 'deep structures' in the ethnic minority youth. However, further research is needed to evaluate theoretical approaches and mediators that integrate cultural measures of cognitions, social engagement, and environmental approaches for promoting long-term health behavior change to reduce the risk of obesity specifically in ethnically diverse youth.

Given that minority children experience health disparities with respect to health care access and quality of service, a number of important implications can be drawn from this review. Interventions for preventing and treating obesity should target minority youth given the disparities that exist with respect to health status (Flores et al., 2005). Efforts to integrate culturally targeted and tailored program elements should be implemented as part of standard health care services. Racial differences in socioeconomic status have also been shown to contribute to the cause of health disparities among minorities and should be a consideration in developing long-term sustainable approaches for obesity prevention or treatment in minority youth and their families.

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