


# Healthy Weight and Cardiovascular Health Promotion Interventions for Adolescent and Young Adult Males of Color: A Systematic Review

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## Abstract

Cardiovascular disease is the leading cause of mortality in the United States, accounting for one fourth of deaths. Higher rates of obesity put Hispanic and Black men at increased risk. The American Heart Association cites diet quality, physical activity, and body weight as alterations responsive to health promotion intervention. Prevention strategies need to begin in adolescence and the emerging adulthood years to impact cumulative risk factors. A scoping review identified search terms and this was followed by a systematic review of Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed databases for articles published in English from January 1, 2002, through May 11, 2017. This review explores community-based content, delivery, recruitment, or retention strategies used with young men of color aged 15 to 24 years. Of 17 articles describing 16 individual interventions and 1 describing multiple interventions (with samples ranging from 37 to 4,800), 13 reported significant results in one or more domains. No studies specifically targeted the needs of young men and only three had more than 50% male participants. There was a gap in studies that addressed young men in the ages of interest with most interventions reaching participants aged 11 to 19 years. Cultural tailoring was addressed through recruitment setting, interventionist characteristics, community involvement, and theoretical frameworks such as motivational interviewing that allow individual goal setting. Because young men seek access to preventive health services less than young women, it is suggested that interventions that are community based or use push technology (send information directly to the user) be increased.

## Keywords

systematic review, health promotion, young men, young adult, African American, Latino

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## Background

Cardiovascular disease, a range of conditions including heart disease and stroke, represents a significant health burden in the United States (Mozaffarian et al., 2016). Heart disease is the leading cause of death (Kochanek, Murphy, Xu, & Tejada-Vera, 2016), accounting for almost one fourth (23.4%) of deaths in Americans in 2014. Men have higher rates of both cardiovascular morbidity and mortality compared to women (Kochanek et al., 2016; Mozaffarian et al., 2016). Hispanic and Black men have higher rates of obesity, and are, in turn, at increased risk of cardiovascular disease compared to non-Hispanic White men (Daviglius et al., 2012; Mozaffarian et al., 2016). Racial and ethnic disparities in all-cause (i.e., death

attributed to any cause) and heart disease-specific mortality, while narrowing, continue to persist (Beydoun et al., 2016;

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Gilbert et al., 2016). These disparities reflect documented differences in access to and use of health-care services as well as structural and community-level factors, including inequalities in social and built environments (housing, poverty, discrimination, and racism; Adler & Rehkopf, 2008; Douglas, Grills, Villanueva, & Subica, 2016; Gilbert et al., 2016; Jones, Crump, & Lloyd, 2012; Martin, Harris, & Jack, 2015; Shelton et al., 2009; Vega, Rodriguez, & Gruskin, 2009; Williams & Jackson, 2005).

There is strong evidence that regular physical activity has numerous physical and mental health benefits, including reduced obesity, leading to improved cardiovascular and metabolic health (Reiner, Niemann, Jekauc, & Woll, 2013). Dietary changes, specifically decreased consumption of sugar and increased fruit and vegetable consumption, have also been shown to reduce the prevalence of obesity and, in turn, obesity-related morbidity and mortality (Hu, 2013; Wang et al., 2014). The American Heart Association identifies diet quality, physical activity, and body weight as the three alterable elements with the greatest potential for improvement, and therefore these should be the primary focus of health promotion interventions (Mozaffarian et al., 2016), with health promotion, in this inquiry, being defined as the process of enabling people to increase control over and improve their health.

Recognizing that critical factors accumulate and interact to increase the risk of obesity, health promotion interventions to prevent, rather than treat, obesity that begins in adolescence and early adulthood are key to reducing the health burden of cardiovascular disease across the life span (Johnson, Gerstein, Evans, & Woodward-Lopez, 2006). Weight gain in adolescence has been shown to be associated with elevated occurrence of heart disease (Tirosh et al., 2011). Furthermore, there are few behavioral weight loss interventions that have been shown to be effective in the long term (Curioni & Lourenco, 2005; Douketis, Macie, Thabane, & Williamson, 2005; Diabetes Prevention Program Research Group, 2009; Wing & Phelan, 2005).

To reduce disparities in cardiovascular disease, culturally competent interventions that acknowledge and address context, values, and the root causes of obesity and related health risks are needed (Jones, Crump, & Lloyd, 2012; Osei-Assibey & Boachie, 2012). Interventions must be responsive to age-, gender-, race-, and ethnicity-specific needs. Young men (including both adolescents [15–19 years] and young adults [20–24 years]) have specific health needs and goals (Bell, Breland, & Ott, 2013; Jones et al., 2012; Martin et al., 2015), yet very few behavioral weight loss interventions (5% in a recent review) are specifically designed for men (Pagoto et al., 2012). Research has identified systematic differences in physical activity and diet by gender, race, and ethnicity among both adolescents (Kim,

Grimm, Harris, Scanlon, & Demissie, 2012; Taber, Chriqui, Vuillaume, Kelder, & Chaloupka, 2015) and adults (Hiza, Casavale, Guenther, & Davis, 2013; Newton, Griffith, Kearney, & Bennett, 2014). Some studies have found that engagement and outcomes in behavioral weight interventions differ by race and gender (Jelalian et al., 2008; West, Prewitt, Bursac, & Felix, 2008; Wing & Anglin, 1996), although these findings are not consistent (Newton et al., 2014). Recent systematic reviews have examined the programmatic features and outcomes of behavioral weight loss or weight maintenance interventions for multiethnic adults in general (Osei-Assibey, Kyrou, Adi, Kumar, & Matyka, 2010; Seo & Sa, 2008; Yancey, Ory, & Davis, 2006); Black adults (Osei-Assibey & Boachie, 2012), Black men (Newton et al., 2014), and Hispanic adults (Whittemore, 2007). Each of these reviews called for tailored interventions that address the specific needs, values, cultural orientations, baseline health states, and community contexts of the participants and noted small sample sizes and heterogeneity of study populations in the studies reviewed.

The developmental stage of adolescents and young adults is particularly relevant for healthy weight and cardiovascular health promotion and interventions. Diet and physical activity behaviors established in adolescence persist into later adulthood (Sanchez et al., 2007; Zahran, Zack, Vernon-Smiley, & Hertz, 2007), and addressing these behaviors early can have beneficial effects on health status later in life (Patton et al., 2016). Recent systematic reviews of health promotion interventions for adolescents and young adults (Ashton et al., 2015; Laska, Pelletier, Larson, & Story, 2012; Stoner et al., 2016), including one specifically among young men between the ages of 18 and 25 years (Poobalan, Aucott, Precious, Crombie, & Smith, 2010), identified age- and life stage-related dramatic shifts that affect both diet and physical activity. In this life stage, sometimes referred to as emerging adulthood (Arnett, 2007), physical activity patterns change as young adults enter college or transition to the workplace, and diet changes as a result of doing one's own food shopping and cooking. Reviews of health promotion interventions for adolescents and young adults (Ashton et al., 2015; Poobalan et al., 2010) also identified postintervention increases in mental health and quality of life outcomes, such as self-esteem.

To date, however, no reviews have been identified that address the intersection of gender, age, and race and ethnicity as they relate to healthy weight and cardiovascular health promotion interventions for Black or Latino men in adolescence and young adulthood. To guide the development and implementation of such interventions for young men of color, we conducted a systematic review to examine: (a) what the content, features, and approaches of behavioral health promotion interventions to promote healthy diet and physical activity that are designed specifically to reach

male adolescents (aged 15–19 years) and young adult men (aged 20–24 years) of color are; (b) how such interventions are culturally or developmentally tailored; and (c) what outcomes are reported specifically for young men or young men of color.

## Methods

### Overview

The current systematic review was undertaken as a first step to guide the development and refinement of a health promotion intervention for young men of color who are between the ages of 15 and 24 years. The focus of this inquiry is to identify approaches to content, delivery, recruitment, or retention that have been used by other interventions. Specifically, we examine the following key questions:

- To what extent are published health promotion interventions specifically addressing the needs or experiences of young men of color between the ages of 15 and 24 years?
- What are the key characteristics of interventions aimed at increasing physical activity and improving diet conducted with young men of color?
- How were intervention content, setting, or delivery tailored to meet the specific cultural needs (as defined by gender, race, and/or ethnicity) of their participants?
- How was intervention content, setting, or delivery tailored to meet age-related or developmental needs of their participants?
- What recruitment and retention strategies were employed at the start of the intervention, and how were these strategies adapted to address challenges that were encountered?
- Which intervention elements are most effective for subgroups identified by gender, race, and/or ethnicity in this age group?

Methods for this systematic review were guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, Altman, & Group, 2009), as outlined in Figure 1. The systematic review protocol was not registered.

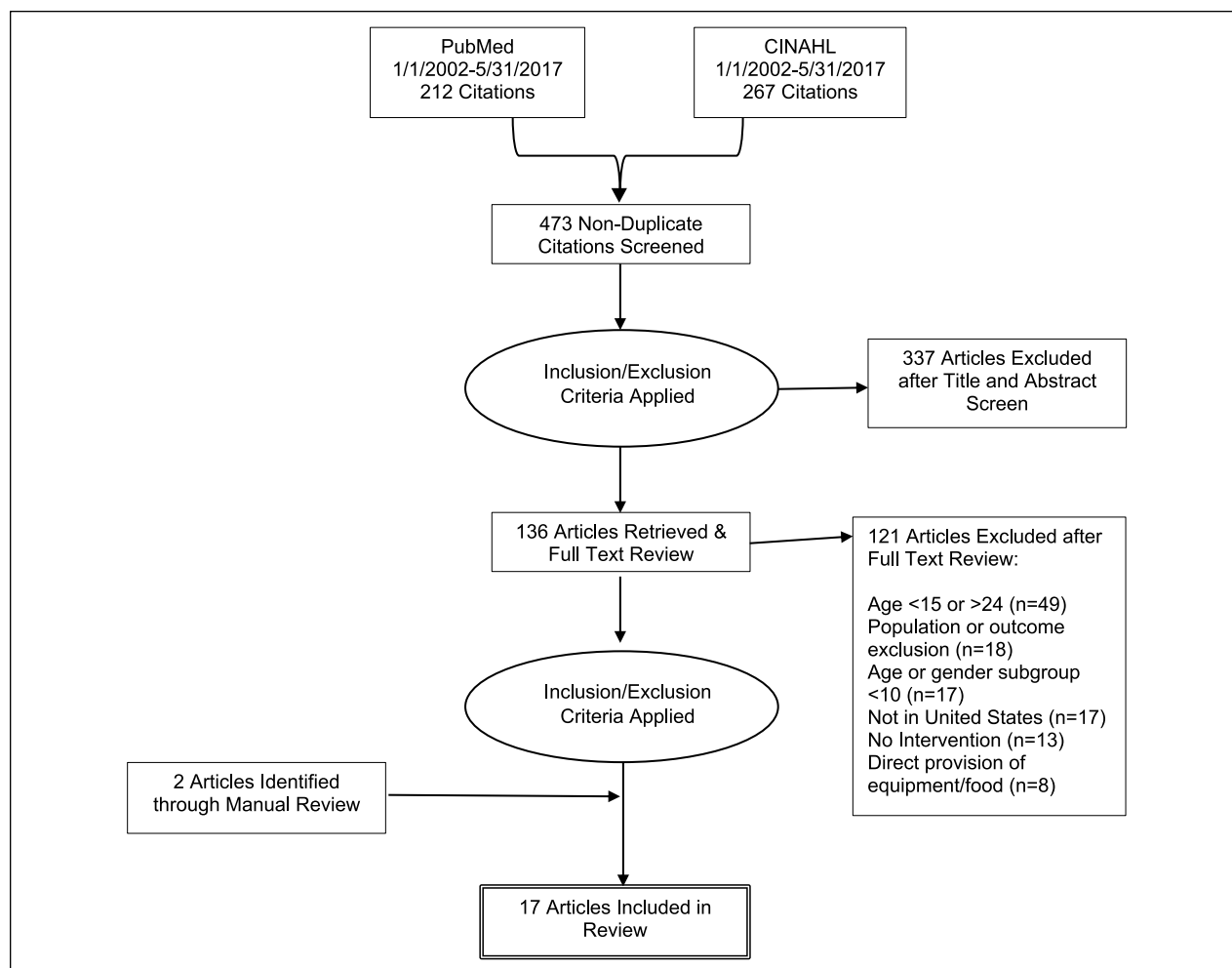
### Search Strategy

To assist in the articulation of the key questions and inform search strategies, a scoping review was first conducted to identify review articles and systematic reviews. The scoping review facilitated the articulation of the key concepts underpinning the research question, refining of

the research question to avoid overlap with existing evidence, mapping of the research question to specific search terms, and identification of the main sources and types of evidence available (Arksey & O'Malley, 2005). This approach has recently been used by others studying health promotion interventions for men (Gavarkovs, Burke, & Petrella, 2016; Seaton et al., 2017). Working from the scoping review findings, the key questions mentioned earlier were operationalized, identifying populations, interventions, comparators, and outcomes (PICO) to clearly delineate the parameters of the research question (Table 1).

Because this systematic review was intended to inform the development and implementation of interventions in primarily nursing-delivered health-care settings, the following electronic databases were identified prior to specifying the search terms: PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL). Electronic database searching methods were supplemented with identification of articles through manual review and hand-searching references within the references of reviewed papers. The electronic database search was conducted in May 2017, encompassing articles published in English from January 1, 2002, through May 11, 2017. Search terms (Table 1) were identified through an initial scoping review of previously published review articles on correlates of diet and physical activity in racially and ethnically diverse populations (Harley et al., 2014; McMurray et al., 2000) and review articles on health promotion interventions in child and adult populations (Fitzgibbon et al., 2005; Flynn et al., 2006; Kong, Tussing-Humphreys, Odoms-Young, Stolley, & Fitzgibbon, 2014).

Articles that met the criteria of describing community-based (not hospital-based or physiology laboratory-based) interventions including at least 10 male participants between the ages of 15 and 24 years and addressing physical activity, diet, weight, and/or body size were included in the review. Interventions that included only populations defined by a health condition other than obesity, diabetes, or cardiovascular disease (e.g., cerebral palsy), that compared the relative performance of two different types of exercise, or that included directly observed exercise using specific exercise equipment were excluded. No limits were placed on the duration of the intervention or follow-up period. Title and abstract review were conducted consecutively by two reviewers (KH, SG), using independent spreadsheets to track exclusion reasons. Full article review for inclusion was conducted by three reviewers (KH, SG, MF), with consensus achieved for all exclusions (see Figure 1). After review of manuscripts was initiated, and challenges were encountered in synthesizing results by race and ethnicity for non-U.S. countries (e.g., multiple country settings or with indigenous populations), non-U.S. interventions ( $n = 8$ ) were excluded.



**Figure 1.** Summary of literature search.

### Data Synthesis

To synthesize findings, each article was reviewed to summarize the extent to which gender, age, or race or ethnicity (or the intersection across several of these factors) was planned for, addressed, or encountered by interventions in terms of recruitment or retention strategies; theoretical framework or approach; intervention content; delivery setting, mechanism, or format; subgroup outcome differences; and/or recruitment or retention challenges.

### Results

A total of 17 articles describing 16 individual interventions and 1 article describing the effects of multiple ongoing interventions in Charlotte, North Carolina, were included for review. A variety of outcomes were measured and categorized as being related to diet, physical activity, anthropomorphic measurements, biological measurements, and knowledge and attitudes about diet and physical activity.

### Participants

Participant characteristics are described in Table 2 (Part A). Sample sizes per intervention ranged from 37 (Carcone et al., 2013) to 1,600 (Bleich, Herring, Flagg, & Gary-Webb, 2012). The analysis of multiple interventions involved in the Charlotte REACH Projects used a population-based sample of 4,800 survey respondents (Plescia et al., 2008). While the inclusion criterion was that interventions must have included at least 10 male participants between the ages of 15 and 24 years, the ages of participants in included studies ranged from 2 to 35 years, with the majority of interventions (71%, 12/17) having participants exclusively in the age range of 11 to 19 years. Nine interventions (53%) included parents or other adult family members in the intervention along with their children or adolescents (Bean et al., 2015; Dolinsky, Armstrong, Walter, & Kemper, 2012; Jones et al., 2008; Mackey et al., 2015; Patrick et al., 2013; Rieder et al., 2013; Wieland et al., 2016). The percentage of male participants ranged

**Table 1.** Eligibility Characteristics of Studies Included in Review (PICO).

Element	Inclusion	Exclusion	Inclusion terms
Population	Adolescent (15–19 years) or young adult (20–24 years) Male Racial or ethnic minority, particularly African American/Black or Latino/Hispanic General population	Females only Exclusively males <15 or >24 years Any study that has fewer than 10 males between the ages of 15 and 24 years Disease-specific populations (cerebral palsy, Down syndrome, cancer patients) Athletic-/sport-specific populations (elite, professional) <i>Does not exclude interventions or studies that do not include Black or Hispanic males.</i> <i>Does not exclude interventions or studies that do not report race- or ethnicity-specific outcomes</i>	<b>Keywords:</b> African Americans Hispanics School age Adolescence Adolescents Youth Young adult Young men Males Men <b>MeSH:</b> African Americans Adolescents Hispanics Hispanic Americans Minority groups Young adults Males
Intervention/exposure	Behavioral health addressing physical activity, diet, weight, or body size Technology/online intervention/mobile application intervention Counseling Coaching	Surgery and any other medical treatment (including prescription drug treatments) Pharmacotherapy Interventions that directly provide or administer specific dietary components to participants (does not exclude interventions that assign diet or dietary regimen to participants) Interventions that do not address physical activity, diet, weight, or body size Directly observed exercise using specific exercise equipment	<b>Keywords:</b> Intervention studies Physical fitness Physical education and training Exercise Dietary intake Body mass index Web-based Mobile phone Preventive medicine <b>MeSH terms:</b> Health promotion Physical fitness Physical education and training Exercise Body mass index Weight reduction programs Program evaluation Internet Cell phones Mobile applications

(continued)

**Table 1. (continued)**

Element	Inclusion	Exclusion	Inclusion terms
Comparator	Other diet and physical fitness interventions for adolescent and young adult men School-based interventions targeting adolescents and young adult men Nontechnological interventions that focus on adolescent and young adult men No treatment Community based Clinic based Online/mobile application based Published in English Randomized controlled trials with a comparator Cohort studies	Surgical or any hospital procedure Comparing one specific exercise to another specific exercise Diet and physical fitness interventions for those other than adolescent and young adult males	
Setting		Hospital based/inpatient Army/armed forces setting Occupational setting	
Study design		Cross-sectional studies comparing one subgroup to another	<b>MeSH:</b> Follow-up studies Cohort studies Randomized controlled trial as topic Clinical trial as topic

Note. MeSH = Medical Subject Headings; PICO = populations, interventions, comparators, and outcomes.

**Table 2. Part A: Population and Sample Characteristics.**

Author	Year	Study name	Designed for young men?	Designed for population of color?	Participants exclusively overweight or obese?	n	% Male	% Black	% Latino/a	Age range in years	% 15–24 years	Adult family members included
Bean, M. K. et al.	2015	MI Values, Substudy Within Teaching Encouragement Exercise Nutrition Support (T.E.E.N.S)	No	Yes	Yes	99	26%	72%	Not reported (NR)	11–19, mean age 13.8	NR	Yes
Bleich, S. N. et al.	2012	Reduction in Purchases of Sugar-Sweetened Beverages Among Low-Income Black Adolescents After Exposure to Caloric Information	No	Yes	No	1,600	50%	100%	0%	12–18, mean	NR	No
Carcone, A. et al.	2013	Provider Communication Behaviors That Predict Motivation to Change in Black Adolescents With Obesity	No	Yes	Yes	37	35%	100%	0%	12–17, mean age 14.7	NR	No
Covelli, M. M.	2006	Efficacy of a School-Based Cardiac Health Promotion Intervention Program for African-American adolescents	No	Yes	No	48	67%	100%	0%	14–17, mean age 15	NR	No
Dolinsky, D. H., et al.	2012	Duke University Healthy Lifestyles Program (HLP)	No	No	Yes	282	43%	60%	8%	2–19, median age 11	32% (n = 90 age 13–19)	Yes
James, A. et al.	2015	Menu Labels Displaying the Kilocalorie Content or the Exercise Equivalent: Effects on Energy Ordered and Consumed in Young Adults	No	No	No	300	44%	4%	12%	18–30, mean age 22	NR	No
Jones, M. et al.	2008	StudentBodies2-BED	No	No	Yes	105	30%	7%	21%	Grades 9–12, mean age 15 years	NR	Yes
Jones, M. et al.	2014	StayingFit	No	No	Separate intervention tracks for overweight/obese and healthy weight participants	336	39% and 43% (by track)	16.7% African American, 46.7% multiracial/other	43.50%	Ninth-grade students, mean age 14.3 years	NR	No

(continued)

**Table 2. (continued)**

Author	Year	Study name	Designed for young men?	Designed for population of color?	Participants exclusively overweight or obese?	n	% Male	% Black	% Latino/a	Age range in years	% 15–24 years	Adult family members included
Kilnowski, J. F. and Lin, L.	2014	Migrant Middle School Media Nutrition Project	No	Yes	No	64	33%	NR	96%	11–17, mean age 13	NR	No
Kong, A. S. et al.	2013	Adolescents Committed to Improvement of Nutrition and Physical Activity (ACTION)	No	Yes	Yes	60	41%	0%	75% Hispanic and/or Native American	High school, mean age 15 years	NR	No
Macdonell, K. et al.	2012	Adaptation of Healthy Choices	No	Yes	Yes	44	20%	100%	0%	13–17, mean age 15	NR	Yes
Mackey, E. et al.	2015	The Feasibility of an E-Mail-Delivered Intervention to Improve Nutrition and Physical Activity Behaviors in African-American College Students	No	Yes	No	47	24%	100%	0%	18–20	100%	Yes
Patrick, K. et al.	2013	Face-Internet for Diabetes Prevention Intervention (PACEI-DP)	No	No	Yes	101	37%	16%	74%	12–16, mean age 14	NR	Yes
Plescia, M. et al.	2008	Charlotte REACH	No	Yes	No	4,800	37%	95%	NR	≤18	20% (n = 674) aged 18–34	Yes
Rieder, J. et al.	2013	BN Fit	No	Yes	Yes	349	46%	52%	44%	Mean age 15	NR	Yes
Schnall, R. et al.	2013	Using Text Messaging to Assess Adolescents' Health Information Needs: An Ecological Momentary Assessment	No	No	No	60	62%	27%	71%	13–18	NR	No
Wieland, M. L. et al.	2016	Healthy Immigrant Families: Participatory Development and Baseline Characteristics of a Community-Based Physical Activity and Nutrition Intervention	No	Yes	No	151 (81 adolescents, 70 adults; 44 families)	29% of adults	All U.S. refugee immigrants of Sudanese, Somali, and/or Hispanic origin	61% adults Hispanic	Adolescents 10–18, mean adolescent age 13.4	NR	Yes



**Table 2. Part B: Intervention Description.**

Author	Year	Study name	Intervention setting*	Theoretical framework	Intervention content	Delivery setting	Delivery mechanism or format
Bean, M. K. et al.	2015	MI Values, Substudy Within T.E.E.N.S.	Virginia Suburban	Motivational interviewing (MI)	Physical activity, dietary intervention and behavioral support. Parents attend biweekly groups. T.E.E.N.S. groups meet on alternate weeks with dietitian and behavioral specialist for 6 months. Perform supervised physical activity at least three times/week. Some also received MI in two individual 30-min sessions	Not reported (NR)	Individual meetings
Bleich, S. N. et al.	2012	Reduction in Purchases of Sugar-Sweetened Beverages Among Low-Income Black Adolescents After Exposure to Caloric Information	Baltimore, Maryland Urban	None reported	Provide caloric information on sugar-sweetened beverages (SSBs) in four stores. Provide three types of caloric information: absolute caloric count, percentage of total recommended dietary intake, physical activity equivalent (# of minutes jogging)	Corner stores	Signs in beverage case
Carcione, A. I. et al.	2013	Provider Communication Behaviors That Predict Motivation to Change in Black Adolescents With Obesity	Detroit, Michigan Urban	MI	Counselors met with participants to discuss weight status, provide feedback, and help create change plan. Also met with caregivers to discuss their weight goal and to help support their child. Included sessions for both adolescents and parent/caregivers	NR	Motivational interview session, video-recorded
Covelli, M. M.	2006	Efficacy of a School-Based Cardiac Health Promotion Intervention Program for African-American Adolescents	Florida Urban	None reported	Each week received lecture/discussion and exercise. Lecture focused on knowledge of cardiovascular function, risk factors and disease, health promotion, decision-making skills, and implementation strategies	School	Classes during regular class time
Dolinsky, D. H. et al.	2012	Duke University Healthy Lifestyles Program	United States Urban	MI	Provider met with family to discuss meaning of participants' body mass index (BMI) and risk for disease. Provides medical management of obesity-associated comorbidities. Then uses MI to facilitate family-centered goal for lifestyle change. Subsequent visits include provider and registered dietitian (RD) for nutrition therapy	University clinic	Clinic visits
James, A. et al.	2015	Menu Labels Displaying the Kilocalorie Content or the Exercise Equivalent: Effects on Energy Ordered and Consumed in Young Adults	Texas Suburban	None reported	Three lunch menu types: one with no calorie labels, one with calorie labels, and one with exercise labels (minutes of walking required to burn food energy)	University dining area	Menu labels
Jones, M. et al.	2008	StudentBodies2-BED	California and Idaho Small cities	None reported	Combines psychoeducation and behavioral interventions, introduces emotion regulation skills. Interactive components (journals and discussion groups), given packet of monitoring forms, handbook for parents.	Online	Internet program, letters, meetings with facilitator

(continued)

**Table 2. (continued)**

Author	Year	Study name	Intervention setting <sup>a</sup>	Theoretical framework	Intervention content	Delivery setting	Delivery mechanism or format
Jones, M. et al.	2014	StayingFit	San Francisco Bay Area Public School	Principles of behavioral science	Healthy weight regulation and improved weight/shape concerns. Eating disorder prevention program. Healthy Habits track for students <85% BMI and Weight Management track for those >85%. Both nutrition and physical activity information	High school	Web-based exercises and discussion board
Kilianowski, J. F. and Lin, L.	2014	Migrant Middle School Media Nutrition Project	Midwest—however, majority of families identified permanent residence as Florida or Texas	Transcultural nursing, child development, and education.	Nine tenets: food pyramid/My Plate, eat more fruits/veggies, eat healthy breakfast, more family meals, less television/electronics, physically active, limit SSB, portion sizes, and food labels. Media aspect engaged participants in hands-on experience to teach others healthy choices	School	Media curriculum integrated into normal class schedule
Kong, A. S. et al.	2013	Adolescents Committed to Improvement of Nutrition and Physical Activity (ACTION)	New Mexico	Transtheoretical Model, MI	Clinic appointments (8/academic year), MI, and obesity risk reduction strategies from a toolkit. Standard care: one appointment at beginning and end, received <i>Balance for a Healthy Life</i> booklet. Caregivers involved and encouraged to adopt risk reduction strategies	School-based health clinics and home	DVD, DVD player, clinic visits, telephone updates
Macdonell, K. et al.	2012	Adaptation of Healthy Choices	Detroit, Michigan	MI	Dietitian devised change plan for weight loss with adolescent participants and caregivers. Asked adolescents to choose changes in nutrition or activity in Week 1, and second behavior discussed in Week 2	Clinic	In-person sessions
Mackey, E. et al.	2015	The Feasibility of an E-Mail-Delivered Intervention to Improve Nutrition and Physical Activity Behaviors in African-American College Students	United States	None reported	24-week program of goal setting and self-regulation, addressing barriers, providing suggestions, repetition of core messages, emphasis on small cumulative goals, and integrating social networks. Each participant chose a goal and got reminders each week and prompt new goals	Online among students from historically Black colleges	Website and e-mail messages

(continued)

Table 2. (continued)

Author	Year	Study name	Intervention setting*	Theoretical framework	Intervention content	Delivery setting	Delivery mechanism or format
Patrick, K. et al.	2013	Pace-Internet for Diabetes Prevention Intervention (PACEI-DP)	San Diego, California Rural and urban	Behavioral determinants model and transtheoretical model	Spotlight approach, educational topics and challenges based on weekly nutrition or physical activity goals, skill-building exercises, a reward system to encourage success, evaluation for assessment of progress, weekly weigh-in, and feedback on progress. Phase 1—education; phase 2—interactive; phase 3—interactive and multiple behaviors. Parents complete adult version	Home	Website, follow-up calls arm including online monthly group sessions, reminder text messages arm (patients given cell phones). Given pedometer and scale
Plescia, M. et al.	2008	Charlotte REACH	Charlotte, North Carolina Urban	Socioecological model	Lay health advisors (LIAs) used as change agents, trained in risk factors for disease and change theories. Aim was to improve community environment and affect public policy.	Community	In-person sessions
Rieder, J. et al.	2013	B'N Fit	The Bronx, New York Urban	Transtheoretical (stages of change) model, MI	Nutrition and behavioral goals follow expert committee recommendations, individualized recommendations provided based on participants' diets and activity level. Included patient and/or family readiness to change based on family support, stressors, and household structure	Hospital and community center	In-person sessions
Schnall, R. et al.	2013	Using Text Messaging to Assess Adolescents' Health Information Needs: An Ecological Momentary Assessment	The Bronx, New York Urban	None reported	Applications related to asthma, HIV, obesity, diet, and exercise, follow-up questions: (a) What questions did you have about your health today? (b) Where did you look for an answer? (c) Was your question answered and how? (d) Anything else?	Home and university	Provided smartphones with apps, text messages, focus group
Wieland, M. L. et al.	2016	Healthy Immigrant Families: Participatory Development and Baseline Characteristics of a Community-Based Physical Activity and Nutrition Intervention	U.S. Midwest Immigrant communities in medium city	Social cognitive (learning) theory	12 content modules, 4 for physical activity, 6 for nutrition, and 2 for synthesizing and reinforcing information. Manual included scripts, lists of recommended activities, focal asset map of resources. Optional component of physical activity opportunities	Home	In-person sessions and phone calls

Note. \*Intervention setting (region, state, city/town) as specified in the manuscript.

**Table 2. Part C: Study Findings.**

Author	Year	Study name	Outcomes	Findings	Significant findings	Food	Physical activity	Anthropomorphic	Biologic	Knowledge
Bean, M. K. et al.	2015	MI Values, substudy within T.E.E.N.S.	Treatment adherence, treatment dose received	MI enhanced adherence to this obesity intervention. MI Values is the first study to examine the impact of MI on treatment adherence among obese, primarily African American adolescents	n/a	Not measured	Not measured	Not measured	Not measured	Not measured
Bleich, S. N. et al.	2012	Reduction in Purchases of Sugar-Sweetened Beverages Among Low-Income Black Adolescents After Exposure to Caloric Information	SSB purchase	Providing Black adolescents with any caloric information significantly reduced the odds of sugar-sweetened beverage (SSB) purchases relative to the baseline	Yes	Yes	Not measured	Not measured	Not measured	Not measured
Carcone, A. I. et al.	2013	Provider Communication Behaviors that Predict Motivation to Change in Black Adolescents with Obesity	Not reported (NR)	NR	n/a	Not measured	Not measured	Not measured	Not measured	Not measured
Covelli, M. M.	2006	Efficacy of a School-Based Cardiac Health Promotion Intervention Program for African-American Adolescents	Blood pressure, health knowledge, fruit and vegetable consumption, physical activity	The intervention program was efficacious in knowledge ( $p = .0001$ ), exercise ( $p = .0001$ ), as well as fruit and vegetable intake ( $p = .0001$ ). Differences in systolic ( $p = .5548$ ) and diastolic ( $p = .9719$ ) blood pressure levels were not significant	Yes	Yes	Yes	No	No	Yes
Dollinsky, D. H. et al.	2012	Duke University Healthy Lifestyles Program (HLP)	Body mass index (BMI), blood pressure, lipids, blood glucose	Small reduction in obesity severity. However, participants treated in the HLP demonstrated meaningful improvements in obesity-related comorbid health conditions, including triglycerides, total cholesterol, and blood pressure. Younger participants, Hispanic participants, and participants attending the recommended number of visits appeared to have the greatest improvements	Yes	Not measured	Not measured	Yes	Yes	Not measured
James, A. et al.	2015	Menu Labels Displaying the Kilocalorie Content or the Exercise Equivalent: Effects on Energy Ordered and Consumed in Young Adults	Calories consumed during meal	The menu with exercise labels resulted in less energy ordered and consumed, compared to the menu with no labels in young adults largely made up of normal-weight, non-Hispanic White college students	Yes	Yes	No	Not measured	Not measured	Not measured
Jones, M. et al.	2008	StudentBodies2-BED	BMI, binge eating, depression, fat intake, physical activity	Intervention group had significant reductions in BMI compared to wait-listed controls by the end of the intervention period	Yes	Yes	Yes	Yes	Not measured	Not measured

(continued)

Table 2. (continued)

Author	Year	Study name	Outcomes	Findings	Significant findings	Food	Physical activity	Anthropomorphic	Biologic	Knowledge
Jones, M. et al.	2014	StayingFit	Weight, BMI, fruit and vegetable consumption, "weight and shape concerns"	The StudentBodies2-BED group reported significantly reduced weight and shape concerns from posttreatment assessment to follow-up assessment and from baseline assessment to follow-up assessment. Participants in the StudentBodies2-BED group who engaged in objective overeating or binge eating episodes at baseline assessment experienced a significantly greater reduction in BMI at follow-up assessment, compared with the wait-list control group	Yes	Yes	Yes	Yes	Not measured	Not Measured
Kilanowski, J. F. and Lin, L.	2014	Migrant Middle School Media Nutrition Project	Knowledge, attitude, fruit and vegetable consumption, physical activity, label reading	This summer school environment was effective for delivery of health promotion lessons to a vulnerable student population, despite its short duration	Yes	Yes	Yes	Yes	Not measured	Yes
Kong, A. S. et al.	2013	Adolescents Committed to Improvement of Nutrition and Physical Activity (ACTION)	Weight, BMI, waist, daily calories, sweetened drinks, fruits and vegetables, physical activity, TV time, high-density lipoprotein (HDL), triglycerides, glucose, insulin, homeostatic modal assessment of $\beta$ -cell function and insulin resistance (HOMA-IR)	ACTION participants had improvements in BMI percentile (mean difference $-0.6$ [ $-1.2, 0.1, p = .04$ ]) and waist circumference in cm ( $-1.7, -3.6, 0.2, p = .04$ ) compared with participants receiving standard care. Findings were concurrent with significant differences in decreased television weekday viewing but not other measures of activity. No differences were found between the two groups in blood pressure, HOMA-IR, triglycerides, and HDL-C. The ACTION weight management program was feasible and demonstrated improved outcomes in BMI percentile and waist circumference	Yes	No	Yes	Yes	Yes	Not measured
Macdonell, K. et al.	2012	Adaptation of Healthy Choices	BMI, physical activity, fast food servings, fruit and vegetable consumption	The intervention group showed a decrease in fast food and soft drink consumption. Also demonstrated an increased intrinsic motivation for physical activity. No difference in BMI between groups	Yes	Yes	No	No	Not Measured	Not measured
Mackey, E. et al.	2015	The Feasibility of an E-Mail-Delivered Intervention to Improve Nutrition and Physical Activity Behaviors in African-American College Students	Feasibility, retention, goals set	Showed that an e-mail-delivered intervention to ameliorate these challenges to health is both feasible and acceptable among African American college participants, making it an important future direction for both research and intervention on college campuses	n/a	n/a	n/a	n/a	n/a	n/a

(continued)

**Table 2. (continued)**

Author	Year	Study name	Outcomes	Findings	Significant findings	Food	Physical activity	Anthropomorphic	Biologic	Knowledge
Patrick, K. et al.	2013	Pace-Internet for Diabetes Prevention Intervention (PACEI-DP)	Weight, BMI, adiposity, stationary time, fruit and vegetable consumption, physical activity, self-esteem, body image	Treatment effects from baseline to 12 months on BMI z-score, BMI percentile, and percentage of body fat were not observed. Treatment effects were observed for sedentary behavior, with the website only (W) arm having a greater decrease in sedentary behavior (4.9 to 2.8 h/day) than the usual care (UC) arm ( $p = .006$ )	Yes	No	Yes	no	Not measured	Not measured
Plescia, M. et al.	2008	Charlotte REACH	Physical activity, fruit and vegetable consumption, smoking	All three health behaviors improved in the study population; however, degree and significance varied by age and gender	Yes- subgroup	Yes	Yes	Not measured	No	No
Rieder, J. et al.	2013	BN Fit	BMI, fruit, vegetables, SSB	There were significant decreases in rates of gain in BMI (0.13 vs. 0.04, $p < .01$ ), BMI percentile (0.0002 vs. -0.0001, $p < .01$ ), percent overweight (0.001 vs. -0.001, $p < .01$ ), and BMI z-score (0.003 vs. -0.003, $p < .01$ ). Significant increases in vegetable and fruit consumption and in vigorous physical activity participation were observed. From T9 to T18, except for a significant increase in BMI (38.3-7.4 vs. 39.0-7.5, $p < .01$ ) in completers, all other anthropometric measures remained unchanged in completers and noncompleters	Yes	Yes	Yes	Yes	Not measured	Not measured
Schmall, R. et al.	2013	Using Text Messaging to Assess Adolescents' Health Information Needs: An Ecological Momentary Assessment	n/a	Findings indicated the usefulness of text messaging technology as a tool for assessing participants' health behavior in the context of their daily lives. The study demonstrated that adolescents are willing to use text messaging to report their health information	n/a	Not measured	Not measured	Not measured	Not measured	Not measured
Wieland, M. L. et al.	2016	Healthy Immigrant Families: Participatory Development and Baseline Characteristics of a Community-Based Physical Activity and Nutrition Intervention	Physical activity, diet, BMI, weight, waist	Not yet reported	n/a	Not reported	Not yet reported	Not yet reported	Not yet reported	Not yet reported

**Table 2. Part D: Cultural Considerations.**

Author	Year	Study name	Cultural tailoring in setting, recruitment, formative research, or approach	Subgroup outcome differences	Recruitment or retention challenges
Bean, M. K. et al.	2015	MI Values, substudy within T.E.E.N.S.	Used motivational interviewing (MI) in treatment group to set goals and values related to target behavior	No outcomes reported by subgroup; however, majority of sample was female	Families with incomes <\$40,000 were more likely to drop out prior to program initiation than families with incomes ≥\$40,000. Among MI participants, lower family income was associated with better total adherence. Among controls (no MI), higher family income was associated with better total adherence and retention
Bleich, S. N. et al.	2012	Reduction in Purchases of Sugar-Sweetened Beverages Among Low-Income Black Adolescents After Exposure to Caloric Information	Recruited managers of stores frequented by minority youth	No	n/a
Carcione, A. I. et al.	2013	Provider Communication Behaviors that Predict Motivation to Change in Black Adolescents with Obesity	Recruited participants from health-care facilities, used MI to support adolescent autonomy and goal setting	No	Not reported (NR)
Covelli, M. M.	2006	Efficacy of a School-Based Cardiac Health Promotion Intervention Program for African-American Adolescents	Recruited participants from high school with 98% African American population	The greatest change was reported in female participants' reported exercise	Concern of social desirability bias among female participants
Dolinsky, D. H. et al.	2012	Duke University Healthy Lifestyles Program	Retroactive study—recruited participants through primary care providers in areas with high proportion of minority patients, used MI for family-centered goal setting	Greatest change in younger participants, Hispanic participants, and participants attending the recommended number of visits	At the time of follow-up assessment, only 13% of the 282 participants had completed the primary phase of the program (at least 6 visits), but 80% had completed at least four visits
James, A. et al.	2015	Menu Labels Displaying the Kilocalorie Content or the Exercise Equivalent: Effects on Energy Ordered and Consumed in Young Adults	Recruitment on college campuses	NR	n/a
Jones, M. et al.	2008	StudentBodies2-BED	Recruitment in high schools	No	Dropouts were more likely to be White, to report depressed mood, and to have greater weight and shape concerns compared with completers
Jones, M. et al.	2014	StayingFit	School-based recruitment, used goal setting and self-monitoring to affect behavior change	Some slight differences in activity level between intervention tracks but not divided by age, race, or gender	n/a

(continued)

**Table 2. (continued)**

Author	Year	Study name	Cultural tailoring in setting, recruitment, formative research, or approach	Subgroup outcome differences	Recruitment or retention challenges
Kilanowski, J. F. and Lin, L.	2014	Migrant Middle School Media Nutrition Project	Part of summer school program for migrant students. Adaptations to curriculum for Latino community (food and physical activity choices), translated materials, used polytheoretical model including transcultural nursing adapted to ethnicity, family values, and foods, and migrant lifestyle	Boys obtained higher level of nutrition knowledge and stronger intentions of being physically active, eating more fruit, and fewer sweet snacks. Girls achieved higher level of food knowledge and healthier food attitudes in reducing fat and in self-efficiency	n/a
Kong, A. S. et al.	2013	Adolescents Committed to Improvement of Nutrition and Physical Activity (ACTION)	Classroom recruitment in schools with large minority populations (particularly Hispanic), used three components based on transtheoretical model and MI to encourage students and caregivers to adopt risk reduction strategies	NR	The clinician made phone contact with caregivers for an average of 41% of the time
Macdonell, K. et al.	2012	Adaptation of Healthy Choices	Recruited from urban clinic serving population predominantly of color, adapted MI techniques to increase motivation in African American youth	NR	The full dose of four sessions was achieved only by a small percentage of participants
Mackey, E. et al.	2015	The Feasibility of an E-Mail-Delivered Intervention to Improve Nutrition and Physical Activity Behaviors in African-American College Students	Recruitment at historically Black university, material adapted to college students	NR	Issues with acceptability of intervention
Patrick, K. et al.	2013	Pace-Internet for Diabetes Prevention Intervention (PACEI-DP)	Recruitment in pediatric health centers, content piloted and revised after input from diverse group of adolescents, intervention designed using transtheoretical model and behavioral determinants model	No significant effects among boys; several significant effects found in female population	n/a
Plescia, M. et al.	2008	Charlotte REACH	Recruitment at health center in community with large African American population, planned intervention to work across socioecological model	Declines in physical inactivity and smoking among women and in physical inactivity among middle-aged adults	NR

(continued)



**Table 2. (continued)**

Author	Year	Study name	Cultural tailoring in setting, recruitment, formative research, or approach	Subgroup outcome differences	Recruitment or retention challenges
Rieder, J. et al.	2013	B'N Fit	Multisite recruitment in neighborhood with large population of adolescents of color. B'N Fit program evaluated and adapted for adolescents, used trans-theoretical model to assess participant readiness to change and MI to support behavior change	NR	Very low rates of enrollment, hard to schedule meetings with parent involvement. Control group saw significantly higher attrition than the study arm
Schnall, R. et al.	2013	Using Text Messaging to Assess Adolescents' Health Information Needs: An Ecological Momentary Assessment	Participants were recruited in local public high school, used technology to conduct formative research to understand adolescent information needs and context	No	Adolescents not willing to use technology when language and interface not specifically tailored to age group
Wieland, M. L. et al.	2016	Healthy Immigrant Families: Participatory Development and Baseline Characteristics of a Community-Based Physical Activity and Nutrition Intervention	Recruitment from three ethnic groups, refugee and immigrant communities. Focus groups from local immigrant communities about barriers to physical activity and nutrition, used social cognitive theory as conceptual basis for intervention	Not yet reported	NR

from 20% (Macdonell, Brogan, Naar-King, Ellis, & Marshall, 2012) to 67% (Covelli, 2008). The synthesis revealed few interventions that included predominantly young men of color. Three had samples comprised of predominantly (>50%) male and exclusively Black and Latino adolescents (Bleich et al., 2012; Covelli, 2008; Schnall et al., 2013), but none of these interventions included young adult men over age 19 years. Conversely, one intervention (James, Adams-Huet, & Shah, 2015) included young adults, with an average age of approximately 22 years, but the sample was predominantly female (56%) and non-Latino White (only 4% Black and 12% Latino).

### Interventions

The interventions (described in Table 2, Part B) ranged in intensity, from posting caloric information (Bleich et al., 2012; James, Adams-Huet, & Shah, 2015) or specific messaging used in encounters (Carcone et al., 2013) to multiple sessions occurring over a 6-month period (Bean et al., 2015). The majority (11 of 17) of interventions were theory based, most commonly ( $n = 4$ ) using motivational interviewing (MI) alone (Bean et al., 2015; Carcone et al., 2013; Dolinsky et al., 2012; Macdonell et al., 2012) or using MI in combination with a transtheoretical (Stages of Change) framework (Kong et al., 2013; Rieder et al., 2013). Seven of the interventions were for the treatment of obesity, only enrolling participants who were overweight or obese (Bean et al., 2015; Carcone et al., 2013; Dolinsky et al., 2012; Kong et al., 2013; Macdonell, Brogan, Naar-King, Ellis, & Marshall, 2012; Patrick et al., 2013; Rieder, et al., 2013). Nine interventions focused on obesity prevention, although they did not state the exclusion of overweight or obese participants (Bleich et al., 2012; Covelli, 2008; James, Adams-Huet, & Shah 2015; Jones et al., 2008; Kilanowski & Lin, 2014; Mackey et al., 2015; Plescia et al., 2008; Schnall, et al., 2013; Wieland et al., 2016). One intervention (Jones et al., 2014) recruited participants who were normal weight as well as those who were overweight or obese, and delivered different tracks of a similar Internet-based intervention, aimed at either prevention or treatment of overweight/obesity. The majority of interventions ( $n = 11$ ) took place in urban areas (Bleich et al., 2012; Carcone et al., 2013; Covelli, 2008; Dolinsky et al., 2012; Jones et al., 2008; Jones et al., 2014; Kong et al., 2013; Mackey et al., 2015; Patrick et al., 2013; Plescia et al., 2008; Rieder et al., 2013; Schnall et al., 2013; Wieland et al., 2016). The delivery setting varied, with four delivered in a school setting, three at home, three exclusively in a clinic setting, two exclusively in a community setting, and one in both clinic and community settings. Fewer than half ( $n = 6$ ) used technology to deliver intervention

content, including DVDs (Kong et al., 2013), videotaping of sessions (Carcone et al., 2013), or text messaging (Patrick et al., 2013; Schnall et al., 2013). Two of the interventions were online only (not including eligibility, enrollment, or outcome measurement processes), using web-based videos and discussion boards (Jones et al., 2008) and e-mail messaging (Mackey et al., 2015).

Four articles (Carcone et al., 2013; Mackey et al., 2015; Schnall et al., 2013; Wieland et al., 2016) were feasibility or pilot studies not statistically powered to report impacts. Of the remaining 13 interventions, all reported significant results in at least one domain (Table 2, Part C). One intervention (Bean et al., 2015) tested MI as an adjunct to obesity treatment for adolescents (predominantly African American females) and only examined treatment adherence, observing significantly higher adherence to gym visits and nutritional consults compared to the arm without MI. Of those remaining, eight reported significant changes in diet (Bleich et al., 2012; Covelli, 2008; James, Adams-Huet, & Shah, 2015; Jones et al., 2008; Jones et al., 2014; Macdonell, Brogan, Naar-King, Ellis, & Marshall, 2012; Plescia et al., 2008; Rieder et al., 2013). Of these, three reported decreases in sugar-sweetened beverage (SSB) consumption (Bleich et al., 2012; Jones et al., 2014; Macdonell, Brogan, Naar-King, Ellis, & Marshall, 2012). Three interventions reported increases in fruit and vegetable consumption (Covelli et al., 2008; Jones et al., 2014; Rieder et al., 2013). Jones and colleagues (2008) reported a decrease in episodes of binge eating among participants, and James, Adams-Huet, and Shah (2015) reported decreased caloric consumption during a meal in participants in the intervention group compared to controls.

Six intervention studies reported a significant change in physical activity, with three reporting increases in physical activity, reported as general increases in "exercise per week" (Covelli et al., 2008), having reported "at least one day of 60 or more minutes of exercise in the last 7 days" (Jones et al., 2014) and increases in "vigorous physical activity" (Rieder et al., 2013). Four other interventions reported significant decreases in sedentary behavior, as measured by weekday screen time (Kilanowski & Lin, 2014), "episodes of sedentary behavior" (Jones et al., 2008), and average hours of sedentary behavior per day (Patrick et al., 2013). Plescia and colleagues (2008) reported a "decrease in physical inactivity" among female but not among male participants. Possible explanations for positive effects among female but not male participants may be attributed to higher social desirability of reporting positive change among females and/or differences by gender in the type and frequency of physical activity (Covelli et al., 2008).

Six intervention studies reported significant changes in body mass index (BMI) as an anthropomorphic

measurement (Dolinsky et al., 2012; Jones et al., 2008; Jones et al., 2014; Lin, 2014; Kong et al., 2013; Rieder et al., 2013). While Kilanowski and Lin (2013) found only changes across BMI categories, Kong and colleagues (2013) reported decreases in waist circumference in addition to absolute decreases in BMI.

In total, four studies examined biological outcomes. Of these, only one, a university clinic-based intervention for families using an MI approach (Dolinsky et al., 2012), found statistically significant impact. This intervention, the Healthy Lifestyles Program, was based in a pediatric setting in which the health-care provider provided medical management of obesity-associated comorbidities. It integrated interviews in the initial visit to facilitate family-centered goals for lifestyle change, while later visits included a provider and dietician for nutrition therapy. The results reported significant changes in biological measurements, including serum triglycerides, cholesterol, and blood pressure. Two interventions (Covelli et al., 2008; Kilanowski & Lin, 2014) reported increases in physical activity and nutrition knowledge.

Five studies reported gender-based differences in outcomes, frequently (but not consistently) with female participants showing greater change in physical activity (Covelli, 2008; Patrick et al., 2013; Plescia, Herrick, & Chavis, 2008). Only one study (Plescia et al., 2008) reported significant findings only in a gender subgroup, reporting that smoking and physical inactivity decreased among female but not male participants.

### *Cultural Considerations*

The extent to which the interventions were tailored to address contextual factors, health concerns, or health behaviors by gender, race, or ethnicity, or to take into account various cultural considerations in their design, recruitment, or retention is summarized in Table 2 (Part D). None of the interventions studied was specifically designed to reach men in general or more specifically men of color. The most common strategy described in the studies was targeted recruitment, with eight interventions (Covelli, 2008; James, Adams-Huet, & Shah, 2015; Jones et al., 2008; Jones et al., 2014; Kilanowski & Lin, 2013; Kong et al., 2013; Mackey et al., 2015; Schnall et al., 2013) targeting enrollment through schools to reach their targeted demographic. Another five interventions recruited from health-care settings. Of the 11 interventions that were specifically designed to reach populations of color, not all described conducting planning work or formative research or testing with members of their target communities before intervention rollout. Those that did used approaches such as conducting a feasibility study (Mackey et al., 2015; Schnall et al., 2013) or formative research and pilot testing (Patrick et al., 2013) with

diverse members of the target community to guide improvements in intervention content and messaging. Others carried out needs and asset assessment of the community (using it to design and refine the intervention; Plescia et al., 2008) or used a participatory approach (including community advisory boards) to involve the community in all aspects of the intervention, including intervention content (Kilanowski & Lin, 2013; Kong et al., 2013; Plescia et al., 2008; Wieland et al., 2016). Some had the intervention carried out by staff whose cultural background (Kilanowski & Lin, 2013) or age group (Rieder et al., 2013) mirrored that of participants.

Some studies used a theoretical framework on which the intervention was built to tailor the intervention to meet specific population needs or concerns. MI, used by six of the interventions studied, elicits from participants their personal goals and potential identified barriers to change. These MI-based interventions were therefore considered to be well suited to address person-centered outcomes with specific populations defined by age group, race, ethnicity, or culture (Bean et al., 2015). Supporting this approach, a meta-analysis of 72 MI interventions found larger effect sizes among ethnic minority populations (Hettema, Steele, & Miller, 2005). Transcultural nursing (Kilanowski & Lin, 2013) is another theoretical approach used to explicitly guide the incorporation of cultural considerations in intervention content.

### **Discussion**

This review identified several commonalities across interventions. All of the interventions that examined diet or physical activity outcomes found significant positive effects, although it should be acknowledged that effect sizes were small. Most of the interventions used schools or clinics as a way to target recruitment, and more than half included parents or caregivers in the interventions. Interventions designed to specifically reach specific communities defined by race, ethnicity, or life stage followed best practices of engaging community members in the intervention planning and conduct through participatory approaches, conducting formative work, or using a theoretical underpinning that builds in person-centered approaches. Using participatory approaches has been shown to be an effective way to address adolescents' specific barriers to behavior change (Goh et al., 2009).

Cultural sensitivity in health promotion interventions involves addressing two dimensions (Resnicow, Baranowski, Ahluwalia, & Braithwaite, 1999): surface and deep structure. The surface structure matches materials and messages to observable, "superficial" characteristics of a target population, such as by using the language, food, or locations familiar to and preferred by the target audience. However, culturally sensitive interventions

must also address the deep structure, by acknowledging and incorporating cultural, social, historical, and psychological forces that influence the target health behavior in the target audience. Attention to deep structure must also acknowledge social determinants of health (the conditions in which people are born, grow, live, work, and age), specifically racism and discrimination, which have been solidly linked to racial and ethnic health disparities overall and in cardiovascular health (Braveman & Gottlieb, 2014; Paradies et al., 2015; Williams & Jackson, 2005; Jones, Crump & Lloyd, 2012). This review suggests that deep structure can be addressed by using theory-driven communication approaches such as MI to guide interventions by encouraging participants to identify their personal goals, values, and beliefs, and set their own context-specific goals, while taking into account forces, both internal and external, that may serve as facilitators or barriers to planned behavior change.

Some limitation in this review, and in the underlying studies, must be acknowledged. The aim of this study was to synthesize information on the approach used by the intervention designers and implementers, rather than to draw conclusions on the relative effect sizes yielded by the different approaches, an examination precluded by the heterogeneity of outcomes covered by the underlying studies. Publication bias must be considered here; likely, given the inclusion of terms that map to outcomes (e.g., BMI), the approach and search terms used here may have overlooked interventions that were culturally tailored but did not yield significant changes or differences in outcomes. Finally, not all of the studies that observed significant differences in anthropometric outcomes also observed significant changes in mediating factors such as diet and physical activity, placing a limit on one's ability to draw causal claims.

Several unanswered questions remain about how health promotion interventions can effectively engage adolescent and young adult men of color to yield health behavior change that ultimately will affect chronic disease risk and address disparities. This review revisited an inquiry (Flynn et al., 2006) over a decade ago, which found that "few programmes for children and adolescents are gender-specific and . . . programmes specifically addressing boy's needs are rare (p. 36)." This review indicates that this gap still persists for adolescents and young adults: Of the 17 interventions in this review, none was specifically designed for young men, and only three of them had more than 50% male participants. Outside the context of interventions, related qualitative work suggests that young men have specific conceptualizations and definitions of health that could be utilized when developing content for interventions that seek to reduce sedentary behaviors and increase healthy eating (Wright, O'Flynn, & Macdonald, 2006). Previous research on

health disparities in men of color has called for an examination of the intersection of race and ethnicity with gender (Griffith, Metzl, & Gunter, 2011), and the need for interventions to address the ways in which these factors intersect, for example, as ideals about masculinity assigned by mainstream White society may lead to internal conflict. There do exist a number of interventions specifically for adult African American males (Treadwell et al., 2010), as covered in some key reviews (Newton et al., 2014; Osei-Assibey & Boachie, 2012).

This review sought to identify interventions that address the additional intersection of the age- and life stage-specific needs of young men as they transition from school age to adulthood, but found scant guidance on interventions that addressed all factors. This review uncovered only one study (James, Adams-Huet, & Shah, 2015) that included young adults, yet with few (16%) participants of color. Emerging adulthood, a term sometimes used to describe the transitional period between adolescence and adulthood (Arnett, 2007), is a developmental stage that presents specific needs, capabilities, and contexts that directly affect a health promotion intervention's approach and potential for positive impact. The best practices identified for conducting childhood obesity prevention interventions (Flynn et al., 2006) do not necessarily hold here. Intervention strategies for adults have been shown to be less effective for young adults (Gokee-LaRose et al., 2009), with trials showing lower rates of participation and attendance. Attrition and low dose, a barrier to many interventions that seek to reach adolescents (Crutzen et al., 2011), was addressed in more than half of the interventions studied here by including parents or other adult caregivers in the intervention, an approach that would not be appropriate for young adults. In the emerging adulthood age range of interest here (between the ages of 15 and 24 years), new independence and self-reliance for health care and well-being that previously would have been encouraged by parents, teachers, or other adult caregivers, is in the hands of young adults.

Because young men have been shown to access preventive health services less frequently than young women (Rand et al., 2007), community-based or technology-based interventions that do not require engagement with a health-care provider have the potential to reach young men in need of guidance and support around developing and maintaining healthy behaviors. Technology that enables push-out engagement that sends information directly to participants through e-mail contacts (Mackey et al., 2015; Patrick et al., 2013), text messages (Schnall et al., 2013), or push notifications in apps (messages that appear even when the participant is not using the app)—rather than a pull-in approach that requires participants to seek out a website or app—can reduce documented challenges in delivering sufficient exposure to intervention

content for young adults; Crutzen et al., 2011). In this review, however, only six of the studied interventions used technology-based interventions, and of these, only three (Jones et al., 2014; Kong et al., 2013; Patrick et al., 2013) measured changes in diet, physical activity, or anthropometry.

Future work should develop and test interventions specifically designed for young men of color. While this review suggests that theory-guided or technology-based approaches would show the most promise, additional evidence is needed.

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