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Church-based interventions to address obesity among African Americans and Latinos in the United States: a systematic review

Karen R. Flórez, Denise D. Payán, Kartika Palar, Malcolm V. Williams, Bozena Katic, and Kathryn P. Derose

Context: Multilevel church-based interventions may help address racial/ethnic disparities in obesity in the United States since churches are often trusted institutions in vulnerable communities. These types of interventions affect at least two levels of socio-ecological influence which could mean an intervention that targets individual congregants as well as the congregation as a whole. However, the extent to which such interventions are developed using a collaborative partnership approach and are effective with diverse racial/ethnic populations is unclear, and these crucial features of well-designed community-based interventions. **Objective:** The present systematic literature review of church-based interventions was conducted to assess their efficacy for addressing obesity across different racial/ethnic groups (eg, African Americans, Latinos). **Data Sources and Extraction:** In total, 43 relevant articles were identified using systematic review methods developed by the Center for Disease Control and Prevention (CDC)'s Task Force on Community Preventive Services. The extent to which each intervention was developed using community-based participatory research principles, was tailored to the particular community in question, and involved the church in the study development and implementation were also assessed. **Data Analysis:** Although 81% of the studies reported significant results for between- or within-group differences according to the study design, effect sizes were reported or could only be calculated in 56% of cases, and most were small. There was also a lack of diversity among samples (eg, few studies involved Latinos, men, young adults, or children), which limits knowledge about the ability of church-based interventions to reduce the burden of obesity more broadly among vulnerable communities of color. Further, few interventions were multilevel in nature, or incorporated strategies at the church or community level. **Conclusions:** Church-based interventions to address obesity will have greater impact if they consider the diversity among populations burdened by this condition and develop programs that are tailored to these different populations (eg, men of color, Latinos). Programs could also benefit from employing multilevel approaches

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to move the field away from behavioral modifications at the individual level and into a more systems-based framework. However, effect sizes will likely remain small, especially since individuals only spend a limited amount of time in this particular setting.

INTRODUCTION

While more than a third (35.7%) of the adult population in the United States is obese, acute disparities persist across ethnic/racial groups and vary on the basis of age, sex, and socioeconomic status.¹ For example, the prevalence of obesity among African American women (51%) and Latina women (41%) is significantly higher than the rate among white women (31%).^{1,2} Irrespective of gender, African Americans seem to gain weight faster than whites (eg, 2.79 body mass index [BMI] units over 16 years compared to 2.0 BMI units).³ Obesity, in turn, increases the risk of numerous chronic health conditions, including cardiovascular disease, hypertension, and type 2 diabetes, which disproportionately affects African Americans and Latinos.⁴ Health inequalities also result in financial burdens, particularly for men of color. Between 2006 and 2009, African American men incurred an estimated \$341.8 billion in excess medical costs and Hispanic men incurred an additional \$115 billion due to health inequalities.⁵

Community-based intervention efforts designed to address obesity-related disparities experienced by racial and ethnic groups have increasingly focused on mediating social institutions such as churches.⁶ Indeed, church-based interventions have emerged as a viable approach to promoting health and wellness among vulnerable communities of color given their reach (eg, 85% of Latinos and 87% of African Americans report a religious affiliation),⁷⁻⁹ their sociohistorical role in vulnerable communities (eg, the Black Church in the civil Rights Movement), and their potential as critical partners in improving the ethical treatment of vulnerable groups in health research.¹⁰ They have also been cited as a culturally appropriate, cost-effective setting that could propel the field of lifestyle interventions forward.^{11,12} The faith community includes specific places of worship, such as churches, or organizations that are affiliated with a particular faith or religion.¹³ Prior reviews of evidence-based obesity interventions among racial/ethnic minorities have generally included studies conducted in churches¹⁴ or exclusively focused on faith-based settings.¹⁵⁻¹⁷ Those that exclusively focused on churches noted multiple methodological limitations such as small sample sizes in these studies, lack of

robust evaluative approaches, and short follow-up time frames.^{15,17} These reviews also noted that most faith-based studies have involved only women and African Americans, and that research with other ethnic minorities has tended to be exploratory.^{15,16}

This review builds on this prior work by examining additional characteristics of these interventions within the broader church-based literature and applying a more expansive framework to understand elements of success among church-based obesity programs. For example, there seems to be broad agreement that several factors are critical to the success of church-based health programs, such as the need for collaboration, tailoring, and the use of community-based participatory research (CBPR) principles.^{13,18,19} *Collaborations* speak of the partnerships between congregations and outside organizations and have been shown to increase the likelihood that the program in question can be successfully replicated elsewhere.¹⁹ *Tailoring* is the extent to which program elements take into account issues such as culture, age, and religious beliefs that can make the intervention's message more easily understood by congregation members.¹⁹ This is particularly important for obesity-specific interventions since it is unclear whether programs that incorporate religious beliefs into the curriculum are more successful than secular interventions delivered in faith-based settings.¹⁶ *Use of CBPR principles in church-based obesity programs* means the extent to which programs build effective and equal partnerships with churches to elicit trust and carry out the intervention, even though the partnership features of a study have not been assessed in previous reviews.

This review sought to address this gap by conducting a narrative review of congregation-based obesity interventions in order to inform the development of effective and sustainable obesity programs in church-based settings. Specifically, it sought to systematically review the church-based obesity intervention literature relating to the United States, to gain a deeper understanding of the current state of such interventions and their impacts on populations at increased risk for obesity. Further, it explores the extent to which these programs use CBPR principles such as collaboration and tailoring to offer future planners a survey of lessons learned in this field.

EVIDENCE ACQUISITION

Literature search

A 3-pronged search strategy was employed to identify journal articles on obesity interventions in church settings. First, a professional librarian searched multiple databases (PUBMED, Sociological Abstracts, PsycINFO, Cochrane databases, CINAHL, WorldCat, and Social Sciences Abstracts) using various combinations of the following search terms: obesity OR obese OR overweight OR body-mass index OR fruit* OR vegetable* OR exercise OR “physical activity” AND church* OR faith-based OR religion OR religion and psychology OR religious OR clergy. The literature was searched through August 2017. Publications were restricted to those written in English and conducted in the United States. Second, the National Cancer Institute (NCI)’s website on research-tested intervention programs was used. For the NCI database search, the topics selected were diet/nutrition, obesity, and physical activity, and the study setting selected was religious establishments (see <http://rtips.cancer.gov/rtips/index.do>). Lastly, bibliographies of the studies included in previous related literature reviews were reviewed to ensure a comprehensive approach.

Study selection

Figure 1 shows the search methodology and inclusion/exclusion criteria. The search yielded 712 journal articles, of which 252 were removed for being duplicates or non-relevant material based on title review. Of the 460 articles screened, 378 were excluded owing to irrelevance, or because they were a thesis or book. From the 82 studies whose title and abstract were reviewed, the only articles included were original studies that used empirical, quantitative data to report the effects of an intervention designed for any faith-based setting (eg, church, faith-based organization) with at least 1 weight-related outcome (eg, BMI, diet, physical activity). Fifty-nine articles were selected for full review, and 16 were excluded because they only described the study design or reported process evaluation data. After applying these criteria, 43 relevant articles were finally included in this study.^{20–47}

Data extraction and quality assessment

Data were extracted using methods for conducting literature reviews developed for the Guide to Community and Preventive Services by the CDC’s Task Force on Community Preventive Services (Zaza S, Wright-de Agüero L, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the Guide to

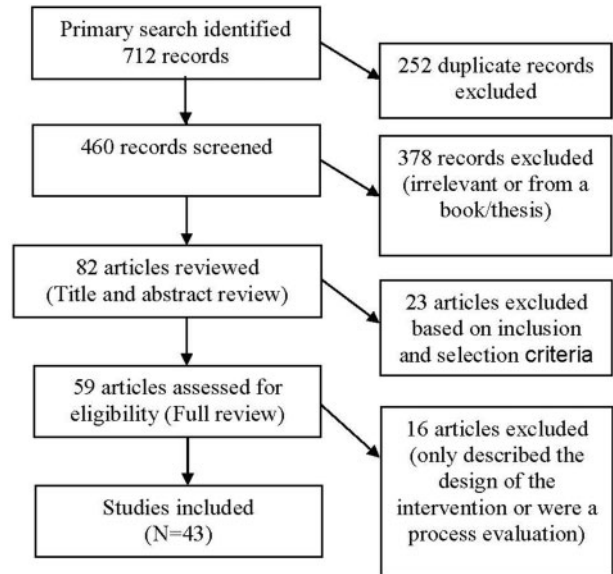


Figure 1 Flow diagram of the literature selection process.

Community Preventive Services. *Am J Prev Med* 2000;18(suppl 1):44–74). This approach was used since it facilitated systematic evaluation of each study through a standardized form that classified and described key characteristics of the intervention and evaluation (26 questions) and assessed the quality of the study’s execution (23 questions). Two independent reviewers conducted the data abstraction and verified the results of the data points: study population characteristics (ie, age, sex, race/ethnicity, socioeconomic status), study design and setting, intervention variables, theoretical model, follow-up time, and components of tailoring. These same reviewers verified the abstraction results for selected clinical and behavioral outcomes (mean weight or BMI, physical activity, and dietary intake) and calculated standardized effect sizes across studies, providing standard errors or standard deviations (SDs) according to pre-established guidelines for literature reviews.⁴⁸ For single-group pre-post effect sizes, the pre-intervention mean was subtracted from the post-intervention mean and divided by the pre-group or pooled SD. Cohen’s *d* was calculated for comparisons of intervention vs control groups when available, and reported according to Cohen’s conventions for small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$) effect sizes.^{49,50} For controlled trials, between-group effect sizes compared intervention and control group outcomes at follow-up assessment. For publications that reported data from multiple follow-up assessments, effect sizes were calculated for the assessment closest to the end of intervention for consistency across studies. Effect sizes were corrected for direction of outcome values so that positive effect sizes indicated improvement/risk reduction.

Using the same abstracted data, two independent reviewers verified the categorization of each study

according to the 4 levels established by Lasater.⁵¹ This was done to systematically assess key aspects of the church-based approach, ie, the extent to which congregational members or leaders were involved in delivering the intervention and the extent to which the intervention incorporated religious/spiritual content. Studies were classified as Level I if the church was simply a convenient location or a venue to recruit and track participants for an externally sponsored and implemented intervention, such that all or most intervention and evaluation activities occurred outside of the church. Level II signified studies in which the intervention was delivered in a church setting, but was mostly implemented by individuals from outside the church. Level III identified those studies in which trained religious organization volunteers delivered a significant portion of the intervention. Finally, Lasater Level IV signified interventions where trained religious organization volunteers delivered a significant portion of the intervention and there were substantial religious or spiritual components embedded in the intervention. In addition, studies that used CBPR methods were identified (Yes/No) since these can lead to more relevant and sustainable interventions and findings that are actionable. Studies that directly stated use of CBPR principles or mentioned collaborative partnerships for multiple phases of the study (ie, including intervention development) were classified as affirmative for the use of CBPR methods.

Lastly, studies were organized by design, from randomized (controlled) trials, to nonrandomized studies, to pre-intervention and post-intervention studies. This was done to facilitate comparison among similar studies across the identified metrics.

EVIDENCE SYNTHESIS

Study characteristics

The characteristics of the 43 studies are presented in [Table 1](#) and organized by design. Of the 43 studies, 22 were randomized by design, 6 were nonrandomized, and 15 were pre-post intervention studies. Six studies were conducted in single churches, and 14 studies were conducted in small groups of churches (ie, 2–9 churches). Four studies did not provide the number of churches, and the rest (19) were conducted in 10–49 churches and ranged in total sample size from 74 to 2519 participants. Only 2 studies focused on children, while the remaining studies focused on middle-aged or older adults. Thirty-five studies (81%) included entirely or largely (>70%) female samples. In terms of racial/ethnic composition, 32 studies focused only on African Americans, and only 5 focused exclusively on other

racess/ethnicities (ie, whites or Latinos). In terms of sociodemographic indicators such as education and income, most studies sampled individuals with a high-school education or higher, although education levels were not reported in 13 of the studies. There was more variation in terms of income among the studies that reported information on this indicator (which was only a little more than one third of the total studies). Over half of the studies were set in the southern USA, 23% were in cities in the northeast USA, and the rest of the studies reported western cities/counties, or an unspecified region (eg, the Midwest USA).

Interventions

Intervention details, including who delivered the interventions, are also included in [Table 1](#). Most interventions used a face-to-face delivery modality, but a wide variety of methods were utilized, including group sessions, church-level activities, self-help (eg, via printed materials, videos, messaging), and motivational interviewing (MI) counseling. Over half used a peer-educator model (n = 24), while the other studies relied on professionals/research staff or automated means (phone/web/text) to deliver the program.

Twenty-five studies also mentioned a theoretical framework derived from formative research or established theory (eg, social learning theory, social cognitive theory; see the “Theory” column, [Table 1](#)). Of note is that only 5 studies reported using an ecological model in an attempt to change individual behavior through environmental changes at the church (eg, by increasing the availability of fruit & vegetables at church functions) and only a few programs were designed to affect organizational policy-related factors (ie, Body and Soul; Eating for a Healthy Life; and the Faith, Activity, and Nutrition Program, *Fe en Acción*). Most interventions incorporated activities solely at the individual level (eg, nutrition education classes, exercise sessions, one-on-one nutritional counseling). Most studies (n = 27) incorporated intervention periods of 6 months or less.

Evaluation design and primary outcomes. Findings for the selected primary outcomes and corresponding Lasater Levels are presented in [Table 2](#). Of the 41 studies in which the Lasater Level was ascertainable, 1 (2.4%) was classified as Level I, 17 (41.5%) as Level II, 10 (24.4%) as Level III, and 13 (31.7%) as Level IV. Over half of the studies used a biomarker (eg, weight, BMI, waist circumference) as the primary outcome, whereas others focused on a behavior; such as fruit and vegetable intake or level of physical activity. For pre-post changes in weight (measured in pounds or kilograms), waist circumference, or BMI (%), 19 of the 27 identified studies

Table 1 Descriptive information of church-based obesity-related interventions by study design (n = 43)

Reference and program name (if reported)	Study Population Demographics						Intervention details	Delivered by	Theory	Duration/frequency
	Sample size	Mean age, y	Female %	Race/ethnicity %	Education and/or income, % ^c	Region				
Randomized control trials										
Arredondo et al (2017) ⁵² , Fe en Acción	N = 436 n = 16	44.4	100	100 Latino	45.4 HS+ 58.3 <\$2K (monthly)	San Diego County, CA	I: group sessions (prayer, PA classes, handouts, discussion), LHA, MI calls, mailings, simpleins/ads, LHA walkability audits and environmental projects C: cancer screening	Congregants	EM, formative research, MI	12 mo/ varied
Bopp et al (2009) ⁶⁶ , 8 Steps to Fitness	N = 146 n = 6	52	80	100 AA	91.4 HS+ 71 >\$25K	SC	Group sessions (PA, scripture reading, discussion) pedometers, assignments, handouts	Congregants, church leaders	Formative research, SCT, TTM	2 mo/ once a week
Bowen et al (2009) ²² , Eating for a Healthy Life	N = 1955 n = 40	54	85	89 W	14 ≤HS	Seattle, WA	I: volunteer advisory board, interpersonal support, mailings, motivational messages, social activities, healthy eating sessions, policy, print materials C: none	Healthy eating coordinator, congregants	MI, SLT, TTM	9 mo/ varied
Campbell et al (1999, 2000) ^{23,24} , Black Churches United for Better Health	N = 2519 n = 49	53.8	73	98 AA	67 HS 59 <\$20K	NC	I: tailored simpleins, print materials, gardens, educational sessions, cookbook/ recipe tasting, FV, LHA, community coalitions, pastor support, grocer-vendor involvement, church activities C: none	Congregants	EM, SCT, SSM, TTM	20 mo/ varied
Duru et al (2010) ²⁶ , Sisters in Motion	N = 62 n = 3	72.8	100	100 AA	23 <HS 53 <\$2K (monthly)	Los Angeles, CA	I: group sessions (scripture reading, prayer, PA goal-setting/ reinforcement, pedometer competition), PA C: group sessions (non-PA topics)	Research assistant, local fitness instructor	NR	2 mo/ once a week; 6 mo/ once a week

(continued)

Table 1 Continued

Reference and program name (if reported)	Study Population Demographics					Intervention details	Delivered by	Theory	Duration/frequency
	Sample size	Mean age, y	Female %	Race/ethnicity %	Education and/or income, % ^c				
Kennedy et al (2005) ²⁹	N = 36 n = 1	44	90.2	100 AA	NR	Baton Rouge, LA	Congregants	NR	6 mo/ varied
Krukowski et al (2010) ⁶⁷	N = 34 n = 1	48.5	71	100 W	68 college degree	South	Graduate student	NR	4 mo/ once a week
McNabb et al (1997) ⁵³ , PATHWAYS	N = 39 n = 3	56.5	100	100 AA	13 <HS	NR	Congregants	Discovery learning framework	14 wk/ once a week
Murrock et al (2010) ³³	N = 97 n = 2	NR	100	100 AA	NR	Midwest	Local dance instructor	SCT	2 mo / twice a week
Resnicow et al (2001) ³⁷ , Eat for Life	N = 861 n = 14	43.9	73.3	100 AA ^b	44 ≤HS 23 <\$20K	Atlanta, GA	Registered dietitian or dietetic intern	MI, SCT	12 mo/ varied
Resnicow et al (2004) ³⁸ , Body and Soul	N = 854 n = 15	50.6	74.4	100 AA ^b	33 ≤HS 28 <\$30K	CA; GA; NC; SC; DE; VA	Congregants	EM, MI, self-determination theory, SCT	6 mo/ NR

(continued)

Table 1 Continued

Reference and program name (if reported)	Sample size	Study Population Demographics				Intervention details	Delivered by	Theory	Duration/frequency	
		N = people n = church	Mean age, y	Female %	Race/ethnicity %					Education and/or income, % ^c
Resnicow et al (2005) ⁴⁰ ; Go Girls!	N = 123 n = 10	13.6	100	100 AA ^b	NR	Atlanta, GA	I: group sessions (nutrition/PA education, PA), 1-d retreat, pag-ers (tailored nutrition/PA messages), 4– 6 MI calls C: group sessions (nutrition/PA education) II: culturally targeted materials (faith-based healthy eating video, PA video, cookbook, PA guide, gospel music) I2: I1, 4 MI calls C: standard materials (nutrition/PA education)	Graduate-level counselor, dietitian, exercise physiologist, research staff	Formative re-search, MI, SCT	6 mo/ once a week or once a month
Resnicow et al (2005) ³⁹ ; Healthy Body Healthy Spirit	N = 906 n = 16	46.3	76.2	100 AA ^b	28.9 ≤HS 11.6 <\$20K	Atlanta, GA	I: individual counseling (diet, barriers to be-havioral change, psy-chosocial issues), group sessions (prayer, PA, PA edu-cation, recipe tasting) support calls, healthy eating/PA mailings C: standard educational pamphlets	Graduate-level psychologist	SCT, MI	12 mo/ varied
Samuel-Hodge et al (2009) ⁴¹ ; A New Dawn	N = 201 n = 24	59	64	98.5 AA	12.4 y (mean) 45 <\$30K	NC	I: group sessions (spiritual messages, weight loss and be-havioral modification strategies) C: health education program	Registered dieti-tian, local health profes-sional, congregants	Adult learning theory, SCT, TTM	12 mo/ varied
Sattin et al (2016) ⁵⁴ ; Fit Body and Soul	N = 604 n = 20	46	83.4	100 AA	50.8 college+	August a, GA	I: group sessions (faith-based PA curriculum), family devotional activities C: group sessions (non-PA-focused faith-based curriculum), family devotional activities	Congregants	MI, SCT	12 wk/ once a week; 6 mo/ once a month
Trost et al (2009) ⁴² ; Shining Like Stars	N = 105 n = 4	8	51.4	23.9 AA 57.8 W	NR	KS		Congregants	NR	1 mo/ once a week

(continued)

Table 1 Continued

Reference and program name (if reported)	Sample size N = people n = church	Study Population Demographics				Intervention details	Delivered by	Theory	Duration/ frequency	
		Mean age, y	Female %	Race/ ethnicity %	Education and/or income, % ^c					Region
Webb et al (2017) ⁶⁸ , Walking in Faith	N = 44 n = 43	48.3	41	97.7 W	81 graduate+	PA	I: faith-based online PA curriculum C: none; waitlist	Web-based	SCT	12 wk/ once a week
Wilcox et al (2007, ^{43,44} , 2007) ^{43,44} , Health-e-AME	N = 571 n = 20	NR	68	100 AA ^b	52 ≤HS 36 <\$25K	SC	I: praise aerobics, chair exercises, walking, group sessions (behavior change skills, scripture, PA, handouts), PA-related sermons, print materials, PA/healthy food at church events C: none; waitlist	Pastor, congregants	EM, TIM	24–36 mo/ varied
Wilcox et al (2013) ⁶⁹ , Faith, Activity, and Nutrition (FAN)	N = 1257 n = 74	54.1	75.7	99.4 AA	10.3 <HS 42.7 <30K	SC	I: church leader trainings, cooks' trainings, monthly mailings (health behavior change), incentives, handouts (simple inserts, recipes), pastor mailings, messages from the pulpit, policies/ practices, stipend C: none; waitlist	Pastor, congregants	EM, SCT	15 mo/ varied
Winnett et al (2007) ⁴⁵ , Guide to Health	N = 1071 n = 14	53 (median)	67	23 AA	NR	South	I1: online curriculum (goals, nutrition/PA education, behavior change strategies) I2: I1, church simpleins, print materials, reminders from the pulpit C: none	Web-based	SCT	3 mo/ once a week

(continued)

Table 1 Continued

Reference and program name (if reported)	Sample size	Study Population Demographics					Intervention details	Delivered by	Theory	Duration/frequency
		N = people n = church	Mean age, y	Female %	Race/ethnicity %	Education and/or income, % ^c				
Yanek et al (2001) ⁴⁶ ; Project Joy	N = 529 n = 16	53	100	100 AA	92 HS	Baltimore, MD	I1: group sessions of nutrition education, taste test or cooking demo, PA, discussion, retreat I2: faith-based I1, reminder calls, print materials (simpleins, tip sheets), church event C: nutrition/PA educational materials, screening results, retreat	Research staff, congregants	Formative research, community action and social marketing model, SLT	12 mo/ varied
Young and Stewart (2006) ⁴⁷ ; Stretch-N' Health	N = 196 n = 11	48.3	100	100 AA	NR	Baltimore, MD	I: group sessions (gospel music, prayer, PA, discussion, print materials, buddy supports), handouts, individual PA plans C: individual PA plans, handouts, PA, health lectures	Certified aerobics instructor, local health educator	Formative research, SCT	6 mo/ once a week
Nonrandomized Trials										
Boltri et al (2011) ²¹ ; Diabetes Prevention Program	N = 37 n = 5	57.2	70.3	100 AA	NR	GA	I: 16-group sessions (prayer, diabetes prevention education, behavior change)	Congregants	SAT	6–16 wk/ once a week
Faridi et al (2010) ²⁷ ; Partners reducing effects of diabetes (PREDICT)	N = 161 n = 19	NR	81.2	100 AA	37 ≤HS 37 <\$30K	New Haven and Bridgeport, CT	C: 6-group sessions I: group sessions (diabetes prevention), individual meetings, advocacy activities C: none; waitlist	Congregants	NR	12 mo/ varied
Harmon et al (2014) ⁷⁰ ; Dash of Faith	N = 23 n = 2	61	69.6	100 AA	87 HS+	SC	I: group sessions (cooking, potlucks, discussion, nutrition education, guest speakers) C: general cancer information; waitlist	Consultant, guest speaker	Formative research, SCT	3 mo/ once a week; 8 mo/ bimonthly

(continued)

Table 1 Continued

Reference and program name (if reported)	Sample size	Study Population Demographics				Intervention details	Delivered by	Theory	Duration/frequency	
		Mean age, y	Female %	Race/ethnicity %	Education and/or income, % ^c					Region
Kim et al (2008) ³⁰ ; Wholeness, Oneness, Righteousness, Deliverance (WORD)	N = 73 n = 4	54.1	71	100 AA	46 ≤ HS 26 < \$20K	NR	I: group sessions (nutrition/PA education, PA, health-focused bible study, prayer) C: none	Congregants	SCT, SSM, TTM	2 mo/ once a week
Parker et al (2010) ³⁵ ; Love, Inspiration, Family, Education (LIFE)	N = 28 n = 2	50.7	100	100 AA	11 < HS < \$10K	Rural SC	I: group sessions (spiritual messages, nutrition education, daily PA, provider discussions) C: nonspiritual group sessions	County extension educator	Formative research	10 wk/ once a week
Tucker et al (2017) ³⁵ ; Health-Smart Church Program	N = 70 n = 2	NR	81.4	100 AA	40 ≤ HS < \$20K	Bronx, NYC, NY	I: individual coaching (goal-setting), group sessions (health-smart video, resource guide, discussion, health panel), PA classes C: none; waitlist	Pastor, church leaders, community member, health professional	HSET	6 wk/ varied
Pre-post test studies										
Barnhart et al (1998) ²⁰	N = 16 NR	60.5	100	100 AA	NR	Bronx, New York City (NYC), NY	Group sessions (nutrition education, goal setting, FV barriers, food advertising/labels, recipes)	Research staff	Formative research	6 wk/ biweekly
Davis Smith et al (2007) ⁷¹ ; Lifestyle Balance Church Diabetes Prevention Program	N = 10 n = 1	NR	70	100 AA	NR	Rural GA	Group sessions (nutrition education, PA, behavior change)	Research staff	NR	6 wk/ once a week
Dodani and Fields (2010) ²⁵ ; Fit Body and Soul	N = 40 NR	46	85.3	100 AA	95 HS+	Evans County, GA	Pastor-led sermons/messages, group sessions, individual coaching/assessments, print materials	Pastor, congregants	Formative research	3 mo/ once a week

(continued)

Table 1 Continued

Reference and program name (if reported)	Study Population Demographics				Intervention details	Delivered by	Theory	Duration/frequency		
	Sample size N = people n = church	Mean age, y	Female %	Race/ethnicity %					Education and/or income, % ^c	Region
Goldfinger et al (2008) ²⁸ , Project Healthy Eating, Active Lifestyles (HEAL)	N = 26 n = 1	68.3	81	100 AA	69 ≤HS 23 <\$15K	Harlem, New York City, NY	Group sessions (portion control, nutrition, budget-friendly healthy eating, PA strategies)	Congregants	Formative research	10 wk/ 8 sessions total
Gutierrez et al (2014) ⁷² ; Fine, Fit, and Fabulous (FFF)	N = 183 n = 15	NR	88.3	58.5 AA, 41.5 Latinos	73.2 HS+	Bronx, NYC, NY	Group sessions (nutrition education, healthy eating techniques, spiritual messages, PA)	Consultant, trainer	Formative research	3 mo/ once a week
Ivester et al (2010) ⁷³	N = 41 n = 1	53	65.9	98 W	NR	NC	Group sessions (prayer, nutrition education, PA), print materials, heart rate monitors, individual PA	NR	NR	2 mo/ twice a week
Kumanyika and Charleston (1992) ³¹ ; Lose Weight and Win	N = 74 n = 22	51	100	98 AA	NR	Baltimore, MD	Group sessions (nutrition education, PA), nutrition and behavioral counseling, competitions	Registered dietitian, LHA, exercise instructor	NR	2 mo/ once a week
Martinez et al (2012) ³²	N = 144 n = 1	43	100	100 Latinos ^a	57 ≤HS 42 <\$2K (monthly)	San Diego, CA	LHA-led walking groups (spiritual educational messages, prayers), PA class, sermons, print materials, health seminars, LHA walking audits, advocacy events	LHA, pastor	NR	6 mo/ varied
McCoy et al (2017) ⁴	N = 82 NR	52	87.8	100 AA	100 HS+ 17 <\$30K	MS	I: health text messages, weight loss competition C: weight loss competition	Phone-based	Formative research, HBM, IMB	3 mo/ 3 times a week
Oexmann et al (2001) ³⁴ ; Lighten Up	N = 163 n = 24	57	82	64 AA	NR	NC; SC	Group sessions (prayer, bible study, stories, diaries, spiritual health messages), support calls, behavior change checklist	NR	NR	2 mo/ once a week

(continued)

Table 1 Continued

Reference and program name (if reported)	Sample size	Study Population Demographics				Intervention details	Delivered by	Theory	Duration/frequency	
		Mean age, y	Female %	Race/ethnicity %	Education and/or income, % ^c					Region
Peterson and Cheng (2011) ³⁶ ; Heart and Soul PA Program	N = 18 n = 1	49.6	100	100 AA	44 < HS 55 < \$40K	Urban Midwestern city	Group sessions (PA, prayer, bible messages, social support domains), booklet	Nurse practitioner	Formative research, social comparison theory	6 wk/ once a week
Whisenant et al (2013) ⁷⁵	N = 56 n = 3	NR	89.3	NR	NR	AL	I: group sessions (prayer, faith-based healthy living topics, bible study, PA) C: group sessions (faith-based health messages, nutrition/PA educational messages, prayer, bible study, PA)	Health experts; nutritionists; nurses, exercise physiologists; volunteers	NR	3–6 mo/ varied
Whitt-Glover et al (2008) ⁷⁶	N = 87 n = 4	52	89	100 AA	96% HS+	NC	Group sessions (prayer, behavioral strategies to increase PA, PA, discussion, faith-based messages, incentives)	Certified fitness instructor, community LHA	SCT	3 mo/ once a week
Williams et al (2015) ⁷⁷ ; Turn the Beat Around	N = 201 n = 9	52	73.6	100 AA	25.1 ≤ HS	AL	Group sessions (prayer, stroke prevention curriculum, nutrition/PA education, BP control, goal setting, food demo)	Congregants, county extension personnel	TTM	3 mo/ biweekly
Yeary et al (2011) ⁵⁶ ; WORD	N = 26 n = 3	50.8	84.6	100 AA	42.3 ≤ HS 69.2 < 30K	AR	I: group sessions (faith-based messages, nutrition/PA educational messages, behavioral strategies, PA), self-monitoring diaries	Congregants	Formative research, SCT, SSM	16 wk/ once a week

Note: Reported income is the annual household income unless otherwise noted; numbers were rounded to the whole percent; % unless otherwise noted.¹

^a100% were of Mexican descent.

^bThese studies did not report the racial/ethnic background of the study population. We are assuming it is 100% AA given the inclusion criteria and/or study focus.

^ccontrol.

Abbreviations: AA, African American; AL, Alabama; C, control or comparison group; CA, California; DASH, dietary approaches to stop hypertension; DE, Delaware; EM, ecological model; FV, fruits and vegetables; GA, Georgia; HBM, health belief model; HS, high school degree; HSET, health self-empowerment theory; HMI, xxxx; I, intervention group; IMB, information-motivation-behavior skills model; KA, Kansas; LHA, lay health advisors(s); MD, Maryland; MJ, motivational interviewing; NC, North Carolina; NR, not reported; NYC, New York City; PA, physical activity; SAT, social action theory; SC, South Carolina; SCT, social cognitive theory; SLT, social learning theory; SSM, social support models; TTM, transtheoretical (stages of change) model; VA, Virginia; W, White.

Table 2 Community partnering levels and intervention effects among church-based interventions by study design (n = 43)

Reference	Post-treatment change*			Effect size (Cohen's d) ^c			Lasater Level	CBPR principles
	Weight/waist/BMI	Diet	PA	Weight	Diet	PA		
Randomized controlled trials								
Arredondo et al (2017) ⁵²	I-C: BMI: -0.43**		Accelerometer-based MVPA: 0.15** Self-reported MVPA: 0.39**	0.23		0.25 0.38	III	Yes
Bopp et al (2009) ⁶⁶	I: -1.9 kg/m ² ** (at 3 mo.)		NS	I: 0.012 ^b (S)		NS	IV	Yes
Bowen et al (2009) ²²		+0.29 (FV servings/d) Intervention effect: 0.13**				NC	III	Yes
Campbell et al (1999) ²³		0.66** (FI) 0.19** (VI) 0.85** (FVI)				0.31 0.17 0.29	IV	Yes
Duru et al (2010) ²⁶	NS		+7457 (steps/wk) among I compared to C**	NS		NC	II	No
Kennedy et al (2005) ²⁹	-3.1 kg (6-mo group change from baseline)			0.08			III	No
Krukowski et al (2010) ⁶⁷	-3.4 kg (6-mo individual change from baseline)			NS			II	No
McNabb et al (1997) ⁵³	NS I: -10.0 lb (experimental posttest)** I: -1.4 kg/m ² (experimental posttest)** I: -2.5 in. (waist change) (experimental posttest)**			0.36 0.26 0.41			III	No
Murrock and Gary (2010) ³³	NS		+41 units in PASE (at time 2**)	NS		0.19 ^b	II	Yes
Resnicow et al (2001) ³⁷		0.79 (based on 2-item FI measure) ** 0.56 (based on 2-item)				NC	II	Yes
Resnicow et al (2004) ³⁸		I: +0.7 FV (2 item) +1.4 (17 item)				0.39 0.18	IV	Yes
Resnicow et al (2005) ⁴⁰		I1-C: +0.20 (composite FFQ, FV servings/d)** I2-C: +0.79 (composite FFQ, FV servings/d)**	I1-C: +206.4 (min/wk exercise)** 2-C: +190.2 (min/wk exercise)**			0.06 0.32 0.23 0.21	II	Yes
Resnicow et al (2005) ³⁹	NS			NS			II	Yes
Samuel-Hodge et al (2009) ⁴¹	NS	NS	NS	NS	NS	NS	III	Yes
Sattin et al (2016) ⁵⁴	I: -2.39 lb (baseline to 12 mo)**		NS	NC		NS	IV	Yes
Trost et al (2009) ⁴²			+13 MVPA steps/min I vs C, averaged across time 1 to time 4**			NC	IV	No

(continued)

Table 2 Continued

Reference	Post-treatment change*			Effect size (Cohen's d) ^c			Lasater Level	CBPR principles
	Weight/waist/BMI	Diet	PA	Weight	Diet	PA		
Webb et al (2017) ⁶⁸			Accelerometer-based moderate PA time, I vs C: +16 min/wk**			0.15	II	No
Wilcox et al (2007) ⁴⁴		NS	NS		NS	NS	IV	Yes
Wilcox et al (2013) ⁶⁹		NS	NS		NS	NS	IV	Yes
Winett et al (2007) ⁴⁵	I1-C: -0.24 kg I2-C: -0.32 kg** I2-I1: -0.08 kg	+0.35 (FV g/1000 kcal) +0.42 (FV g/1000 kcal)** +0.07 (FV g/1000 kcal)	+743.19 (steps/d) +1059.71 (steps/d)** 316.52 (steps/d)	0.03 ^a 0.04 ^a 0.01 ^a	0.20 ^a 0.23 ^a 0.03 ^a	0.16 ^a 0.21 ^a 0.07 ^a	II	No
Yanek et al (2001) ⁴⁶	I: -1.1 lb (mean weight change)** I: -0.66 in. (mean waist change)**			0.22 0.28			IV	Yes
Young and Stewart (2006) ⁴⁷			NS			NS	II	Yes
Nonrandomized Trials								
Boltri et al (2011) ²¹	I: -3.8 kg at program completion, -1.9 kg at 12-mo follow-up; I: -0.56 kg/m ² ; -0.24 kg/m ² at 12 mo			0.03 0.04			III	Yes
Faridi et al (2010) ²⁷	NS			NS			III	Yes
Harmon et al (2014) ⁷⁰		I: +2.3 servings F/V per day at 2 mo vs baseline			I: 0.22		II	Yes
Kim et al (2008) ³⁰	I: -3.0 lb mean change between I-C groups**	NS	I: +6.2 MET mean change I-C groups for recreational PA**	0.9	NS	0.77	IV	Yes
Parker et al (2010) ³⁵	I: -1.35 lb I: -1.12 kg/m ²			0.04 0.002			II	Yes
Tucker et al (2017) ⁵⁵	I: -0.23 kg/m ² mean difference T1-T2		I: +0.56 h PA mean difference T1-T2	NC		NC	III	Yes
Pre-post test studies								
Barnhart et al (1998) ²⁰		+2.0 vegetable servings per week at 8 wk vs baseline			NC		II	Yes
Davis Smith et al (2007) ⁷¹	-9.6 lb at 12 mo follow-up -1.9 kg/m ² at 12 mo follow-up			0.19 NC			II	No
Dodani and Fields (2010) ²⁵	NS			NC			IV	Yes
Goldfinger et al (2008) ²⁸	-9.8 lb (at 1 yr)	+0.7 FV servings/d (at 1 yr)	NS	0.26	0.41	NS	III	Yes

(continued)

Table 2 Continued

Reference	Post-treatment change*			Effect size (Cohen's d) ^c			Lasater Level	CBPR principles
	Weight/waist/BMI	Diet	PA	Weight	Diet	PA		
Gutierrez et al. (2014) ⁷²	−4.38 lb (at 12 wk)			NC			II	Yes
Ivester et al (2010) ⁷³	Waist: −11.4 cm at 8 wk (men) Waist: −10.9 cm at 8 wk (women)			0.59 0.70			N/A	No
Kumanyika and Charleston (1992) ³¹	Medication group: −6 lb No-med group: −6 lb			0.19 0.18			II	No
Martinez et al (2013) ⁷⁸			+53 (mean min LTPA/wk at 6 mo)			0.22	IV	N/A
McCoy et al (2017) ⁷⁴			<30 min PA: +8% (of IG participants)			NC	I	No
Oexmann et al (2001) ³⁴	0–5 sessions: Blacks: −2.7 lb (ST) Whites: −3.6 lb (ST) 6–8 sessions: Blacks: −3.5 lb (ST); −3.1 lb (LT) Whites: −6.3 lb (ST); −6.2 lb (LT)			0.63 0.63 0.79, ST 0.32 LT 0.8 ST 0.51 LT			N/A	Yes
Peterson and Cheng (2011) ³⁶			+140 min/wk at 6 mo post test			0.76	II	No
Whisenant et al (2014) ⁷⁵	−11.46 lb (weight) −3.05 inches (waist)		NC				IV	No
Whitt-Glover et al (2008) ⁷⁶		+1373 steps/d: 12 wk +67 min MPA: 12 wk +44 min VPA: 12 wk +5.5 METs total PA at 16 wk				0.54 0.97 0.92	II	Yes
Williams et al (2015) ⁷⁷	NS		NS				III	Yes
Yeary et al (2011) ⁵⁶	−4.0 kg at 16 wk (>50% attendance group) −1.5 kg/m ² at 16 wk (>50% attendance group)	+4.8 total PA METs +7.1 MVPA METs	0.20 0.22	0.43 0.90			IV	Yes

Abbreviations: BMI, body mass index; C, control or comparison group; cm, centimeters; CBPR, community-based participatory research; FFQ, food frequency questionnaire; FI, fruit intake; FV, fruit and vegetables; FVI, fruit and vegetable intake; I, intervention group; lb, pounds; LT, long term; LTPA, leisure time physical activity; MET, metabolic equivalent task; MPA, moderate physical activity; MVPA, moderate and/or vigorous physical activity; N/A, not available; NC, not calculated owing to insufficient information; NS, results not significant; PA, physical activity; PASE, physical activity scale for the elderly; ST, short term; VI, vegetable intake; VPA, vigorous physical activity; WC, waist circumference.

^aEffect sizes were corrected for the direction of outcome values so that positive effect sizes indicate improvement/risk reduction.

^bCohen's d calculation was based on the last study assessment.

^ccontrol.

*Only results for studies in which change (pre-change to post-change and/or intervention effect) meeting a significance level of $P < 0.05$ are noted.

**Intervention effect or comparison (ie, intervention to control group) difference meets a significance level of $P < 0.05$.

that measured these outcomes reported statistically significant changes. Only 7 studies reported a significant time-series difference between the intervention and comparison groups for measurements of weight, waist circumference, or BMI,^{29,30,45,46,52-54} and about half (n = 4) of these employed CBPR principles.^{30,46,52,54} Most of the 7 studies with significant time-series differences in weight outcomes (n = 6) were Lasater Level III or IV studies,^{29,30,46,52-54} indicating that the church had a significant role in the development and implementation of the BMI/weight intervention.^{30,46,54} Overall, of the 27 studies with biomarker outcomes, 19 (70%) demonstrated significant improvements in BMI, weight, or waist circumference. Of the 19 successful studies, the slight majority (63%; n = 12) were Lasater Level III or IV studies. It should be noted that the number of study outcomes exceeds the total number of studies (n = 43) because more than 1 outcome may have been measured per study.

Dietary outcomes. Findings for diet-related outcomes are also presented in Table 2. In terms of pre-post changes for diet, most studies (n = 13) focused on servings of fruits and/or vegetables per week/day. Nine reported significant changes and the majority were designed to detect a time-series difference between intervention and control groups.^{20,22,23,28,37-40,45} All of these studies employed CBPR principles and about half were highly engaged with participating churches given their Lasater Levels of III/IV.^{22,23,28,38} Overall, of the 11 studies with diet outcomes, 9 (82%) demonstrated significant increases in fruit or vegetable intake. However, only 44% (n = 4) of the 9 successful studies were Lasater Levels III or IV.

Physical activity outcomes. Table 2 also presents findings related to those studies that measured some aspect of physical activity (n = 21). Seven studies reported non-significant findings, and of the 14 that found significant differences (67%), 8 studies reported significant time-series differences between the intervention and comparison groups for measurements of leisure-time physical activity. Of these 14 studies, 7 (half) had employed CBPR principles and tailoring, and 6 (42%) had high (III/IV) Lasater Levels.^{30,32,42,52,55,56} Of the 21 studies with exercise outcomes, 14 (67%) demonstrated significant increases in physical activity or steps per day. However, only 43% (n = 6) of the 14 successful studies were Lasater Levels III or IV.

Effect sizes. While the majority of studies (81%) reported significant within- or between-group differences across outcomes, effect sizes were reported or could be calculated in only 57% of cases. Of the 24 studies

where effect sizes were either reported (n = 4) or were calculated (n = 20), most effect sizes were small to medium in magnitude.

DISCUSSION

This narrative review was unique in its utilization of CBPR principles and Lasater Levels as metrics by which to evaluate church-based obesity interventions. To the authors' knowledge, it is the only systematic review to identify and highlight these important components of obesity programming within faith-based settings. This review found that the majority of church-based interventions that targeted weight, diet, or physical activity outcomes employed CBPR principles throughout the development and implementation phase of the interventions. However, no straightforward relationship was found between successful study outcomes and higher Lasater Levels. While the slight majority of successful studies targeting BMI/weight/waist outcomes also had higher Lasater Levels (III or IV), this was not the case for studies targeting diet or physical activity outcomes (where the slight minority of successful studies had higher Lasater Levels). At best, this suggests that the use of trained religious organization volunteers, rather than external interventionists, for implementing outcomes may be associated with more positive weight outcomes.

Prior reviews of interventions targeting obesity, diabetes, and/or cardiovascular disease in faith-based organizations have either not considered both the delivery mechanism and the religious tailoring facets of interventions^{15,16} or have focused only on the collaborative research structure in studies involving predominantly African American samples.^{17,57} Two systematic reviews suggested only about half of faith-based health programs are delivered by external health professionals,^{17,58} and another review found 12 of 19 studies followed collaborative research approaches, but only 2 used a participatory approach where members of the faith community exerted greater control and provided input throughout program development and implementation.⁵⁷ If congregation involvement can help reduce obesity-related disparities, church-based interventions need to be created within broader, sustainable partnerships than is currently exhibited in this review. Such a partnership would identify and address the barriers to collaboration and build consensus across sectors on how to best engage in these activities, as well as leverage resources from these sectors to target the sources of obesity disparities, create interventions to eliminate disparities, and develop a continual feedback loop that sustains learning within the partnership. However, partnerships are often solely funded through grants, and sustainability is often hampered as a

result.⁵⁹ Further, additional research could compare the efficacy of church-based health interventions that vary the level of engagement with churches. For example, studies could examine whether a church-based intervention is more likely to be sustained when engagement is high (ie, a Lasater level III or IV) than when it is low (ie, Levels I and II).

This narrative review also found church-based obesity interventions largely focus on female, older African American populations in the South, similar to a prior review that found about half of the identified studies involved African Americans and most had predominantly female participants.¹⁵ Although the focus on African Americans is critical given obesity disparities in the United States, the emphasis on female African Americans may preclude the generalizability of these studies to other vulnerable populations. For example, only 2 studies focused solely on Latinos, despite the fact that this group is also heavily burdened by obesity and obesity-related diseases⁶⁰ and is also highly religious.⁶¹ Men of color also experience health disparities and are underrepresented in most public health research.⁶² Therefore, to fully address obesity-related disparities, it is important to include Latinos as well as men in future church-based intervention research.

Most studies intervened solely through behavioral modification at the individual person-level through educational and fitness sessions or print materials and did not address organizational or policy/environmental domains. Yet congregations provide physical infrastructure and complex social networks that can be leveraged for health promotion and services. They also provide access to informal support, food, healthcare, and educational and job opportunities through extended social networks and linkages with other community institutions.⁷ Minority congregations in particular are often viewed as trusted resources by their members and can help provide culturally sensitive programs to address obesity. Future church-based interventions should strive to employ a multilevel approach to move the field forward.

Of interest in this research is the comparatively large number of studies with significant findings in which effect sizes were not reported by authors and were instead calculated by research staff (57%). Also of note is that effect sizes could not be calculated in 31% of the studies with significant findings owing to insufficient information or incomplete reporting of pertinent information (such as standard errors or standard deviations). This suggests that better reporting is needed for faith-based interventions. Further, in the 68% of studies that included effect size estimates, the majority (75%) revealed small-to-medium effects, similar to a recent

meta-analysis of physical activity interventions across diverse settings that found a mean effect size of 0.19.⁶³ This raises implications regarding future church-based studies in terms of ensuring that they are sufficiently powered to detect small-to-medium effects. This may be particularly true for church-based interventions that follow the social-ecological model, since community-level interventions often have smaller effects as measured by conventional methods.^{64,65} There is also the inherent issue that individuals spend only so much of their time at church, which may further exacerbate this problem of smaller effect sizes.

Strengths and limitations

This is the first narrative review of church-based obesity interventions to comprehensively examine outcomes, intervention design, and program implementation for church-based interventions across different racial/ethnic groups. Other strengths include the use of methods approved by the Community Preventive Services Task Force, which is composed of public health and prevention experts appointed by the CDC Director, and these methods have been published in peer-reviewed journals. Quality control of the screening process was ensured by using reviewers trained in these methods specifically for this review.

Regarding limitations, this review focused only on interventions conducted in the United States. Though the focus on the USA is warranted given the stark disparities in obesity experienced by certain groups in this country, future reviews could benefit from including a more international perspective. Second, as mentioned above, among those 57% of studies in which effect sizes (Cohen's *d* statistics) were calculated by research staff, unbalanced study designs, participant attrition, and incomplete information hindered this review's ability to calculate reliable estimates in some cases. This helps explain why few studies reported effect sizes at the outset, and speaks to the methodological challenges inherent in using effect size estimates as a comparative metric by which to compare faith-based intervention studies. It also raises the question of whether traditional study metrics are sufficient or whether new metrics should be developed for research in church and similar community-based settings.

CONCLUSION

Public health professionals developing church-based interventions to address obesity need to consider the diversity among populations burdened by this condition and develop programs that are tailored to these different populations (eg, men of color, Latinos). Programs

could also benefit from employing multilevel approaches to move the field away from behavioral modifications at the individual level and toward a more systems-based framework. This seems imperative if church-based interventions are to address and reverse the racial and ethnic inequalities related to obesity in the United States.

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