JAMA Pediatrics | Original Investigation

Association of Sexual Health Interventions With Sexual Health Outcomes in Black Adolescents
A Systematic Review and Meta-analysis

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IMPORTANCE Black adolescents are at increased risk of contracting HIV and other sexually transmitted infections (STIs) and experiencing unplanned pregnancy. Although sexual health interventions aimed at decreasing these risks exist, evidence of the association between sexual health interventions and the sexual behavior of black adolescents has not been synthesized to our knowledge.

OBJECTIVE To examine the associations between sexual health interventions and behavioral, biological, and psychological outcomes.

DATA SOURCES For this systematic review and meta-analysis, a systematic search was conducted of studies published through January 31, 2019, using the PubMed, PsycINFO, and CINAHL databases and relevant review articles. The following key words were used: *youth, adolesc* or teen**; *sexual health or safe* sex or sexually transmitted disease or sexually transmitted infection or STD or STI or HIV or AIDS or pregnancy or reproductive health or condom* or contracept* or unprotected sex or abstinence*; *intervention or program or education or prevention or promotion or trial*; *latino* or latina* or latinx* or minorit* or ethnic* or hispanic or african american* or black* or race or racial or biracial*.

STUDY SELECTION Studies were included if they included a US-based sample of black adolescents, evaluated a sexual health intervention using experimental or quasi-experimental designs, included a behavioral outcome, and were published in English.

DATA EXTRACTION AND SYNTHESIS Standardized mean differences and 95% CIs were extracted and meta-analyzed using random-effects models.

MAIN OUTCOMES AND MEASURES Behavioral outcomes were abstinence, condom use, and number of sex partners. Biological outcomes were pregnancy and STI contraction. Psychological outcomes were sexual health intentions, knowledge, and self-efficacy.

RESULTS Across 29 studies including 11 918 black adolescents (weighted mean age, 12.43 years), there was a significant weighted mean association of sexual health interventions with improvements in abstinence (Cohen *d* = 0.14; 95% CI, 0.05-0.24) and condom use (Cohen *d* = 0.25; 95% CI, 0.11-0.39). No significant mean association of these interventions with number of sex partners, pregnancy, or STI contraction was found. Sexual health interventions were significantly associated with improvements in psychological outcomes: sexual health intentions (Cohen *d* = 0.17; 95% CI, 0.05-0.30), knowledge (Cohen *d* = 0.46; 95% CI, 0.30-0.63), and self-efficacy (Cohen *d* = 0.19; 95% CI, 0.09-0.28). Intervention effect sizes were consistent across factors, such as participant sex and age and intervention dose.

CONCLUSIONS AND RELEVANCE The findings suggest that sexual health interventions are associated with improvements in sexual well-being among black adolescents. There appears to be a need for wide-scale dissemination of these programs to address racial disparities in sexual health across the US.

Supplemental content

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JAMA Pediatr. 2020;174(7):676-689. doi:10.1001/jamapediatrics.2020.0382
Published online April 20, 2020.

Black adolescents in the US are at increased risk for experiencing negative sexual health outcomes.[1,2] Compared with white adolescents, black adolescents are twice as likely to become a parent before 20 years of age[1] and more likely to contract sexually transmitted infections (STIs), including HIV infection.[2] Of importance, teen pregnancy is associated with negative life outcomes, such as high school dropout, incarceration, and unemployment,[3] and costs approximately $21 billion each year in the US.[4] In addition, long-term, untreated HIV infection and other STIs can result in infertility and death.[5] With accurate information and skills and access to STI testing and birth control, black adolescents can be better equipped to avoid these negative outcomes.[6,7]

Ecological systems theory suggests that black adolescents may experience interpersonal, community-level, and systemic barriers to practicing healthy sexual behavior.[8] Poverty,[9] stress from discrimination and racism,[10,11] and lack of access to health care differentially affect black adolescents[12-15] and may be associated with poor general and reproductive health outcomes.[15-19] Thus, it is critical to examine the effectiveness of interventions aimed at reducing sexual health disparities among this racial group.

The unique context of black adolescents' sexual decision-making and experiences has guided the development of a number of interventions that have emerged during the past few decades. Many programs primarily target individual-level factors that affect black youth's sexual health, such as knowledge, self-efficacy, and self-respect.[20] A few programs target family-level factors, such as parental communication in black families.[21-23] A community-level factor, cultural narratives on safe sex practices, was also the target for a sexual health program.[24] Most of these programs have varied associations with sexual health outcomes. Intervention differences and other sources of clinical and methodologic heterogeneity may be responsible for these mixed results.[21,25-27]

Given the heterogeneity and discrepancies in study findings, the purpose of the current study was to synthesize the association of sexual health programs with sexual health outcomes among black adolescents and examine which intervention strategies are most beneficial. For the purpose of this study, sexual health interventions were defined as primary prevention programs that included some component aimed directly at encouraging abstinence or safer sexual behavior (eg, condom use) to reduce the risk of HIV infection, other STIs, and unplanned pregnancy. Several systematic reviews of sexual health interventions for black adolescents have helped to identify available interventions and the need for culturally tailored and accessible programs.[28-31] Although there are several meta-analyses that evaluate the association of adolescent sexual health interventions with health outcomes and a few meta-analyses that evaluate this association among black individuals without a focus on adolescents,[32-34] the unique barriers experienced by black adolescents in the US warrant an analysis of how current programming functions for these adolescents in particular. To our knowledge, there is no recent meta-analysis on sexual health interventions for black adolescents. Because of the wide racial disparities in sexual well-being, we sought to understand why some interventions are beneficial whereas others are not among black adolescents.

Key Points

Question Are sexual health interventions associated with improved sexual health outcomes in black adolescents?

Findings In this systematic review and meta-analysis synthesizing results of 29 studies of 11 918 black adolescents, sexual health interventions were significantly associated with improved abstinence, condom use, sexual health intentions, sexual health knowledge, and sexual health self-efficacy compared with control conditions.

Meaning The findings suggest that sexual health interventions are associated with improved sexual well-being among black adolescents.

The first goal of this study was to systematically review the literature on sexual health interventions for black adolescents and conduct a meta-analysis of their overall association with 3 behavioral outcomes related to sexual health (abstinence, condom use, and number of sexual partners) and 2 biological outcomes (pregnancy and STI contraction).[35,36] We also evaluated the association of interventions with 3 psychological outcomes related to sexual health behavior[37,38] (sexual health intentions, sexual health knowledge, and sexual health self-efficacy).

The second goal was to identify components that contribute to the success of sexual health interventions in decreasing sexual risk behavior among black adolescents. We considered potential moderating variables of associations, including demographic (eg, sex and age), intervention (eg, cultural tailoring and dose), and methodologic (eg, length of follow-up) characteristics.

In this meta-analysis, we use the term *black* to refer to individuals in the US who are descendants of black racial/ethnicity groups of Africa, including descendants of enslaved Africans (although *black* is not capitalized throughout the manuscript, we are using this term as a proper noun to refer to a specific cultural group).[39] When referring to specific empirical work, we use the terms of the original authors.

Methods

Search Strategy

In January 2019, for this systematic review and meta-analysis, we conducted a comprehensive search of the PsycINFO, CINAHL, and PubMed databases to extract relevant studies published through January 31, 2019. We used the following keywords: *youth, adolesc* or teen**; *sexual health or safe* sex or sexually transmitted disease or sexually transmitted infection or STD or STI or HIV or AIDS or pregnancy or reproductive health or condom* or contracept* or unprotected sex or abstinence*; *intervention or program or education or prevention or promotion or trial*; *latino* or latina* or latinx* or minorit* or ethnic* or hispanic or african american* or black* or race or racial or biracial*. Additional studies[28-32,40-43] were

located by examining prior reviews and meta-analyses and references of included articles. This initial search produced 3069 unique articles. This study followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) reporting guideline.

Selection Criteria

Studies were included if they met the following criteria: (1) included a US-based sample; (2) sampled black adolescents (ie, at least 95% of the sample was black; mean sample age ≤18 years and no participant >24 years); (3) evaluated the effects of a primary prevention, sexual health intervention (studies with already pregnant youths or STI-positive youths were excluded because of their focus on secondary prevention)[44,45]; (4) evaluated program effects using an experimental or quasi-experimental design; (5) included at least 1 of our behavioral or biological outcome measures; (6) were published in English; and (7) provided sufficient statistics to calculate effect sizes. When a study had a sample with multiple racial/ethnic groups but included subgroup analyses that evaluated intervention effects among only black participants, the results of the subgroup analyses were included.[20,46] For studies with multiple follow-up points, we used the longest follow-up with adequate data to calculate effect sizes as the most conservative estimate of treatment effects. When multiple studies reported findings using the same data, the study that reported results for the longest follow-up with adequate data to calculate effect sizes was included. All other studies using the same data were excluded.[47,48] For studies with more than 1 intervention group, we selected the sexual health intervention that was most comprehensive. When studies included more than 1 indicator for an outcome (eg, multiple indicators of condom use), we used a random number generator to select 1 indicator to reduce possible bias associated with outcome selection.

These selection criteria resulted in a final sample of 29 articles (eFigure 1 in the Supplement). From these articles, we calculated 22 independent effect sizes for abstinence, 26 for condom use, 10 for number of sex partners, 4 for pregnancy, 4 for STI contraction, 14 for sexual health intentions, 11 for sexual health knowledge, and 15 for sexual health self-efficacy. More information about these outcome variables, including how they were evaluated in primary studies, is given in eTable 1 in the Supplement.

Data Extraction

Two of us (R.E., H.J., and/or M.N.S.) independently coded each of the primary studies. The following data were extracted: (1) demographic and sample characteristics, (2) intervention characteristics, and (3) methodologic characteristics. The mean percentage agreement across all coding categories was 92%. Discrepancies between coders were resolved through group discussion until a consensus was reached. Risk of bias was calculated for each primary study.[49]

Calculation of Effect Sizes

As the indicator of effect size, the standardized mean difference, Cohen *d*, was used. The Cohen *d* can be interpreted as small (0.20), medium (0.50), or large (0.80).[50] When the Cohen *d* statistics and 95% CIs were not reported, other statistics that could be converted to Cohen *d* were calculated using Comprehensive Meta-Analysis, version 3[51] and the Practical Meta-Analysis Effect Size Calculator.[52] Study authors were contacted and data were requested when no statistics in the study could be converted to a Cohen *d*. Higher values indicate that the sexual health intervention group performed better than the control group for abstinence, condom use, sexual health intentions, sexual health knowledge, and sexual health self-efficacy. Lower values indicate that the sexual health intervention group performed better than the control group for number of sex partners, pregnancy, and STI contraction.

Statistical Analysis

Random-effects meta-analytic procedures were used for the primary analyses across all independent effect sizes to allow for the possibility of differing variances across studies.[53] To examine whether significant heterogeneity existed among effect sizes, we used the *Q* statistic and I^2. For hypothesized categorical moderators, effect sizes and 95% CIs were calculated and then compared using the Q_b statistic. Groups for categorical moderator variables must have included at least 2 studies to be considered in analyses. For categorical moderation analyses, mixed-effects models were used to allow for the possibility of differing variances across subgroups. Random-effects meta-regression was used to test continuous moderators. The *Q* model statistic was used to determine whether there was significant moderation for these models. A 2-sided $P < .05$ was considered to be statistically significant. Analyses were conducted using Comprehensive Meta-Analysis, version 3.[51]

Results

Study Characteristics

A summary of the studies included in this meta-analysis is presented in **Table 1**. A total of 11 918 black adolescents (weighted mean age, 12.43 years) were included across 29 studies.[20-27,46,52,54-56,58-73] Studies identified participants as African American (26 studies) and black (3). Most studies targeted mixed-sex samples; however, 10 included only girls and 3 included only boys.

Eighteen studies[20,23-27,54-57,62,63,65,67-70,73] evaluated interventions with cultural tailoring. Twelve studies[24,25,27,54-56,62,63,67-69,73] described using community-based participatory research methods to develop or adapt the programs. In addition, 9 programs included components aimed at promoting racial socialization (ie, messages about what it means to be black in today's society).[74] Only 1 program focused on abstinence only, whereas 27 programs were comprehensive. Intervention dose varied across studies, with 5 studies[24,54,61,65,69] including less than 3 hours of training and 4 studies[20,57,58,66] with more than 20 hours. Five studies[54,61,65,69,71] specified that all participants received the full dose. Interventions were primarily delivered in schools (9 studies), community centers (11), or clinics (6). Many programs included partner sexual communication skills training (18) and condom use skills training (18). Eight programs included parents in intervention activities.

Table 1. Study Characteristics

Source	Youth sample[a]	Intervention description	Description of cultural tailoring	Theory	Outcomes[b]
Clark et al,[26] 2005	Seventh graders in a suburban town near a southeastern metropolitan area (N = 221); mean age (range), 12.6 (12-14) y; 221 (100%) female; 217 (98%) African American; 74 (33%) had vaginal sex	10 In-person, school-based sessions	Exercises tailored to African American participants (eg, examples of African Americans who have left legacies); African American facilitators	PST	Abstinence; intentions
Dancy et al,[25] 2006	Low-income, African American, inner-city, female adolescents in Chicago, Illinois (N = 262); mean age (range), 12.4 (11-14) y	6 (2 h) In-person sessions taught in a community center by mothers to their daughters with homework activities and an abstinence agreement	Intervention developed in collaboration with low-income African American mothers and daughters; focus groups with this population used to understand factors that leave African American female adolescents at risk for HIV infection	SEM, BIM, COM	Abstinence; intentions; knowledge; self-efficacy
Delamater et al,[54] 2000	African American males attending a municipal STI clinic (N = 562); mean age (range), 17.8 (15-19) y	1 (14 min) In-person, clinic-based session	Program developed using formative interviews with public health workers and health care professionals at the local clinic, a discussion with black teen peer sex educators, and interviews and focus groups with black male adolescents attending the clinic; among other things, the intervention was culturally appropriate and addressed the misperception that African American youth are not at risk for STIs/AIDS; presented by a trained health educator and young African American woman	SRM, SEM	Condom; sex partners; intentions; knowledge; self-efficacy
DiClemente et al,[55] 2004	Sexually experienced African American girls from community health agencies in the southern US (N = 522); mean age (range), 16 (14-18) y; 522 (100%) had vaginal intercourse	4 (4 h) In-person, clinic-based sessions	Collaborated with African American adolescent girls in the community to develop the program; first session emphasized ethnic pride (eg, acknowledging accomplishments of African American women; discussing joys and challenges of being an African American adolescent); implemented by African American female health educator and 2 African American female peer educators	SCT, TGP	Condom; pregnancy; STI; knowledge; self-efficacy
DiClemente et al,[56] 2009	African American adolescent females in Atlanta, Georgia (N = 715); mean age (range), 17.8 (15-21) y; 715 (100%) had vaginal intercourse	2 (4 h) In-person, clinic-based sessions and 4 follow-up telephone calls; participants given vouchers for their male sexual partners to access STI testing and treatment	Program informed by qualitative research with adolescents from the study clinic; sessions fostered a sense of cultural pride and emphasized diverse factors contributing to STI/HIV risk (eg, sociocultural factors, structural factors); facilitated by trained African American women health educators	SCT, TGP	Condom; STI; knowledge; self-efficacy
DiClemente et al,[27] 2014	African American adolescent girls in juvenile detention in Atlanta, Georgia (N = 188); mean age (range), 15.3 (13-17) y; 188 (100%) had vaginal intercourse	3 (1.5 h) In-person counseling sessions in detention facility and participants' homes	Program adapted from existing curriculum that was culturally congruent; collaborated with Teen Advisory Board and Community Advisory Board to revise and pilot multiple drafts of the program; program addresses unique needs of African American detained girls; sessions foster cultural pride and emphasize diverse factors contributing to adolescents' HIV/STI risk	CBT, TGSTM	Condom; sex partners; STI; knowledge; self-efficacy
Dilorio et al,[22] 2006	Adolescents from Boys and Girls Clubs of Metro Atlanta (N = 582); mean age (range), 12.2 (11-14) y; 230 (39.5%) female; 570 (98%) African American; 524 (90%) had vaginal intercourse	7 (2 h) In-person, sessions in a community center for mothers and daughters with videos and 7 take-home activities	No tailoring reported	SCT	Abstinence; condom; intentions
Dilorio et al,[21] 2007	Adolescent boys from Boys and Girls Clubs of Metro Atlanta (N = 277); mean age (range), 12.8 (11-14) y; 262/273 (96%) African American; 66 (24%) had sexual intercourse	6 (2 h) In-person sessions in a community center for fathers and 1 (2 h) session for teens and fathers with a participant manual and 6 take-home activities	No tailoring reported	SCT	Abstinence; condom; intentions
Dixon et al,[57] 2000	African American female adolescents living in low-income neighborhoods in Durham, North Carolina (N = 65); mean age (range), 16.2 (14-19) y; 29 (45%) had sexual intercourse	13 (4 h) In-person sessions in a community center with field trips	Program was designed to prevent pregnancy using an Afrocentric approach; it incorporates an exploration of culture (eg, field trips to African Museum of Art) and emphasizes cultural pride	Not reported	Abstinence; condom; pregnancy

(continued)

Table 1. Study Characteristics (continued)

Source	Youth sample[a]	Intervention description	Description of cultural tailoring	Theory	Outcomes[b]
Fang et al,[58] 1998	African American adolescents living in 3 different public housing facilities in a large Eastern city (N = 382); mean age (range), 11 (9-15) y; 141 (37%) had sexual intercourse	7 (1.5 h) In-person sessions in a community center, 1 daylong session at a rural campsite, and 6 (2.5 h) monthly booster sessions	No tailoring reported	SCT, PMT	Abstinence; condom; intentions
Haggerty et al,[59] 2007	Eighth grade students in Seattle, Washington, public schools (N = 331); 161 (49%) female; mean age, 13.7 y; 163 (49%) African American; 168 (51%) white[c]	7 (2-2.5 h) In-person, school-based sessions for parents and teens with take-home workbook activities and videotaped program for parents	No tailoring reported	SDM, SCRT, SLT, DAT	Abstinence
Howard et al,[60] 1990	Eighth graders from an Atlanta hospital's low-income patient population (N = 536); 530 (99%) black; 131 (25%) had sexual intercourse	5 In-person, school-based sessions; each session was the length of a classroom period	No tailoring reported	SIM	Abstinence; pregnancy
Howard et al,[61] 2011	School age, African American, female teenagers who visited a family planning clinic (N = 254)	1 (5 min) Clinic-based presentation on a computer	No tailoring reported	Not reported	Condom
Jemmott et al,[62] 1992	Black male teenagers in 10th-12th grades recruited from outpatients at a medical clinic in West Philadelphia, Pennsylvania (N = 157); mean age, 14.6 y	1 (5 h) In-person, school-based session, including video tapes and exercises	Program materials were pilot tested and selected to provide accurate information in ways that would be interesting to inner-city black male adolescents (eg, video narrated by black male and included multiethnic case); all materials were culturally appropriate	TRA	Abstinence; condom; sex partners; intentions; knowledge
Jemmott et al,[63] 1998	Young, inner-city African American sixth to seventh grade adolescents in Philadelphia, Pennsylvania (N = 659); mean age, 11.8 y; 349 (53%) female; 166/659 (26%) had sexual intercourse	8 (1 h) In-person, school-based sessions	Intervention activities developed using focus groups with participants who reflected the study population; the curriculum was designed to encourage participants to be proud of themselves and their community and was delivered by African American facilitators	SCT, TRA, TPB	Abstinence; condom; intentions; knowledge; self-efficacy
Jemmott et al,[64] 2010	African American middle school students from urban public schools in the Northeastern US (N = 662); mean age (range), 12 (10-15) y; 354 (53%) female; 153 (23%) had sexual intercourse	3 (4 h) In-person, school-based sessions	No tailoring reported	SCT, TRA, TPB	Abstinence; condom; sex partners
Klein et al,[65] 2011	African American teenage females in the San Francisco Bay Area (N = 178); mean age (range), 15.8 (14-18) y; 93 (52%) had sex	2 (1 h) Computer sessions plus in-person discussions at a research facility	Program was developed for African American female teenagers to enhance ethnic and gender pride and raise awareness of HIV risk factors prevalent among African American female teenagers; some activities included discussion of positive aspects of being an African American young woman and introductions to African American culture through art	SCT, TGP	Abstinence; condom; knowledge; self-efficacy
Kogan et al,[23] 2012	African American adolescents in rural counties in Georgia (N = 502); mean age (range), 16 (15-16) y; 261/502 (51%) female	5 In-person sessions for caregivers and 5 for youth, 5 family sessions, and an optional 20-min condom skills unit; all activities in a community center	Program materials were developed for African American preadolescents and addressed unique risk factors that African American adolescents encounter; sexual health curriculum and condom skills unit were based on materials adapted from a program for African American adolescent women (Sisters Informing Healing Living and Empowering); program facilitated by African American group leaders	Not reported	Condom; self-efficacy
Li et al,[66] 2002	African American youth from recreation centers serving public housing communities in Baltimore, Maryland (N = 383); mean age (range), 11.3 (9-15) y; 170 (44%) female; 136 (36%) had sexual intercourse	8 (90 min) In-person sessions in a community center followed by 6 monthly boosters	No tailoring reported	PMT, SCT	Abstinence; condom

(continued)

Table 1. Study Characteristics (continued)

Source	Youth sample[a]	Intervention description	Description of cultural tailoring	Theory	Outcomes[b]
Markham et al,[20] 2012	Predominantly African American and Hispanic seventh graders from urban middle schools (N = 1258); mean age, 12.6 y; 752 (60%) female; 494 (39%) African American[c]; 609 (48%) Hispanic; 153 (12%) other; 138 (12%) had any sex	24 (50 min) In-person, school-based sessions with computer activities and 6 homework assignments	Most facilitators of the intervention were African American or Hispanic; otherwise, no tailoring was reported	SCT, TPB	Abstinence; condom; sex partners; intentions; knowledge; self-efficacy
Morrison et al,[67] 2007	Youths in a multicultural city, Seattle, Washington (N = 402); mean age (range), 12.7 (12-15) y; 253 (63%) female; 149 (37%) African American[c]; 56 (14%) Asian/Pacific Islander American; 64 (16%) mixed race; 36 (9%) white; 8 (2%) Latino; 12 (3%) other races/identities; 32 (8%) African immigrants; 20 (5%) Asian immigrants; 12 (3%) Latino immigrants; 8 (2%) immigrants of mixed backgrounds or from various backgrounds; 88 (22%) had vaginal sex	8 (2 h) In-person sessions in a community center and 1 (2 h) booster session	Intervention adapted from program that was developed for African American youths; intervention was adapted using focus groups with young people from the target audience; as a result, some new topics were added and old topics dropped; the program aimed to be inclusive of diverse family types; facilitators were recruited from the community	PMT	Abstinence; condom; intentions; self-efficacy
Murry et al,[68] 2011	African American 11-y-old children residing in rural counties in Georgia (N = 332); mean age (range), 11.2 (11) y; 178 (54%) female	7 (2 h) In-person sessions in a community center—first hour of sessions just for teens and second hour for both teens and parents	Program developed for rural African American families with diverse family structures using focus groups with African American community members; program targeted enhancement of family protective processes, such as adaptive racial socialization strategies and adaptive behaviors to use when encountering racism; all facilitators were African American and videos featured a famous African American actor	SLT, PBT, CFT	Abstinence; condom
Peskin et al,[46] 2015	Eighth graders from schools in a large, urban school district in southeast Texas (N = 1374); mean age, 14.3 y; 811 (59%) female; 238 (17%) African American[c]; 1012 (74%) Hispanic; 124 (9%) other race/ethnicity; 275 (20%) had vaginal, oral, or anal sex	13 (35-45 min) School-based, computer lessons	No tailoring reported	SCT, LSP	Abstinence; condom; sex partners; intentions; knowledge; self-efficacy
Roye et al,[69] 2007	Black and Latina teenage women (N = 400); mean age (range), 18 (15-21) y; 180 (45%) black[c]; 220 (55%) Latina; 400 (100%) had vaginal sex	1 (15-20 min) In-person clinic-based session; 2 videos (21 min total)	Program informed by qualitative and quantitative studies with black and Latino teens from a similar neighborhood; 3 focus groups of minority adolescents informed final video editing so it reflected learning needs of the target population; the videos included HIV-infected Black and Latino youths	SCT, TRA, HBM	Condom
Shepherd et al,[70] 2017	African American adolescents in the southern US (N = 612); mean age (range), 12.9 (12-14) y; 309/612 (51%) female; 153 (25%) were sexually experienced	8 (90 min) In-person, school-based sessions	Program designed to reduce risky sexual behaviors and improve safe-sex skills among African American adolescents with components such as AIDS and African Americans and Wrap-up—African proverb	TPB	Abstinence; condom; self-efficacy
St Lawrence et al,[71] 1995	African American adolescents (N = 246); mean age (range), 15.3 (14-18) y; 177 (72%) female	8 (90-120 min) In-person, clinic-based sessions	No tailoring reported	IMB, SLT	Abstinence; condom; sex partners; knowledge; self-efficacy
Stanton et al,[72] 2004	African American youths from low-income, urban community sites (N = 817); median age (range), 14 (13-16) y; 472 (58%) female	8 (1.5 h) In-person sessions in a community center with homework and 4 (90 min) booster sessions for teens; 1 (20 min) video for parents	No tailoring reported	SCT, PMT	Abstinence; condom; pregnancy

(continued)

Table 1. Study Characteristics (continued)

Source	Youth sample[a]	Intervention description	Description of cultural tailoring	Theory	Outcomes[b]
Sznitman et al,[24] 2011	African American adolescents in 2 northeastern and 2 southeastern mid-sized US cities (N = 1383); mean age (range), 15.2 (14-17) y; 791 (57%) female	Media campaign (15 mo), including 3 (30 s) television advertisements and 8 (60 s) radio advertisements; a mean of 3 TV and 3 radio advertisements played per month	Formative research included semistructured interviews with low-income African American adolescents in the cities where the intervention took place to create a culturally sensitive communication program and an adult community advisory board to make suggestions about media content; advertisements placed on channels and during programming hours that were popular among African American adolescents and all radio and television advertisements featured hip hop music and African American adolescent actors	Not reported	Condom; sex partners; STI; intentions; self-efficacy
Wechsberg et al,[73] 2017	Sexually active, substance-using African American females (N = 237); mean age (range), 17.6 (16-19) y; 237 (100%) had vaginal intercourse	3 Individual sessions, 1 group session, and 1-on-1 time with interventionist after sessions; all activities in-person and in a community center	Used teen advisory board, focus group discussions, in-depth interviews, pretesting and posttesting, community advisory board, and an expert panel to modify program content, format, and delivery; intervention tailored to experiences of female African American teens; program included brief stories from young African American women	ETF, AAFT	Condom; sex partners

Abbreviations: AAFT, African American feminist theory; BIM, behavioral-intentions model; CBT, cognitive behavioral therapy; CFT, circular functioning theory; COM, community-other-mothers model; DAT, differential association theory; ETF, empowerment theoretical framework; HBM, health belief model; IMB, informational needs, motivational influences and behavior risk reduction model; LSP, life skills paradigm; PBT, problem behavior theory; PMT, protection motivation theory; PST, possible-selves theory; SCRT, social control theory; SCT, social cognitive theory; SDM, social development model; SEM, self-efficacy mechanism; SIM, social inoculation model; SLT, social learning theory; SRM, self-regulation model; STI, sexually transmitted infection; TGP, theory of gender and power; TGSTM, theory of goal setting and task motivation; TPB, theory of planned behavior; TRA, theory of reasoned action.

[a] Basic demographic information for adolescents (ie, sex, age, race, percentage sexually active, and geographic location) is reported for all studies that included this information.

[b] Outcomes are those reported by authors and synthesized in this meta-analysis: abstinence, abstinence/delayed sexual activity, condom, condom use; intentions, intentions to be abstinent/practice safer sex; knowledge, sexual health knowledge; pregnancy, incidence of pregnancy; self-efficacy, sexual health self-efficacy; sex partners, number of sexual intercourse partners; STI, and STI contraction.

[c] Outcomes for subsample that included only black participants were used in all analyses in which this study was included.

Risk of Bias

Risk of bias was calculated for each primary study (eTable 2 in the Supplement). Most studies (26 [90%]) had low risk of bias for random sequence generation, and 19 (67%) had low risk of bias for incomplete outcome data. However, risk of bias pertaining to selective reporting was unclear for many studies.[21-24,26,27,54,55,57-63,65-73]

Behavioral Outcomes

Abstinence

Individual study effect sizes (Cohen *d*) for abstinence ranged from −0.48 (95% CI, −1.77 to 0.81) to 0.71 (95% CI, −0.02 to 1.44), with an overall weighted mean effect size across studies of 0.14 (95% CI, 0.05-0.24; *P* = .004), which indicated that sexual health interventions had a statistically significant association with abstinence among black adolescents (**Figure 1** and **Table 2**). There would have to be 60 additional studies that were not statistically significant for the combined *P* value to exceed .05 (fail-safe N = 60).

There was significant heterogeneity among studies for the abstinence outcome (Q = 34.90, df = 21, P = .03, I^2 = 39.83); thus, we examined moderators of intervention success (**Table 3** and eTable 3 in the Supplement). Intervention setting and study publication year moderated the association between sexual health interventions and abstinence. School-based interventions (Cohen *d* = 0.25; 95% CI, 0.10-0.39; *P* = .001) had a stronger association with improvements in abstinence than interventions in community centers (Cohen *d* = 0.04; 95% CI, −0.07 to 0.16; *P* = .47). In addition, interventions reported in older studies had stronger associations with improvements in abstinence than interventions in studies published more recently (coefficient = −0.01; 95% CI, −0.03 to −0.001; *P* = .03).

Condom Use

Individual study effect sizes (Cohen *d*) for condom use ranged from −0.27 (95% CI, −1.04 to 0.51) to 0.82 (95% CI, 0.29-1.35), with an overall weighted mean effect size across studies of 0.25 (95% CI, 0.11-0.39; *P* < .001), which was statistically significant (**Figure 2**). On average, sexual health interventions had a statistically significant association with condom use among black adolescents (Table 2). There would have to be 292 additional studies that were not statistically significant for the combined *P* value to exceed .05 (fail-safe N = 292).

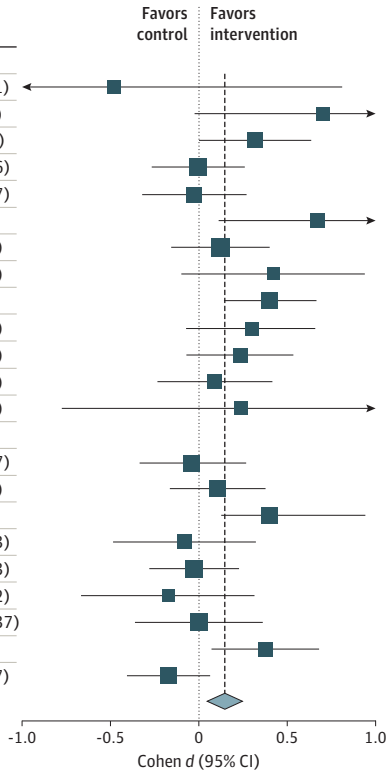
There was significant heterogeneity among studies for the condom use outcome (Q = 104.14, df = 25, P < .001, I^2 = 75.99); thus, we examined moderators of intervention success (Table 3 and eTable 3 in the Supplement). Publication year moderated the association such that interventions reported in older studies had stronger associations with improvements in condom use than those reported in studies published recently (coefficient = −0.02; 95% CI, −0.04 to −0.01; *P* = .01). No other statistically significant moderators were identified.

Number of Sex Partners

The overall weighted mean effect size (Cohen *d*) for number of sex partners across studies was −0.06 (95% CI, −0.25 to 0.13; *P* = .54), which was not statistically significant (Table 2 and eFigure 2 in the Supplement).

Figure 1. Forest Plot for Abstinence Outcome

Source	Participants, No.	Cohen *d* (95% CI)
Clark et al,[26] 2005		
Female	47	-0.48 (-1.77 to 0.81)
Male	53	0.71 (-0.02 to 1.44)
Dancy et al,[25] 2006	165	0.32 (0.004 to 0.64)
DiIorio et al,[22] 2006	355	-0.01 (-0.27 to 0.26)
DiIorio et al,[21] 2007	240	-0.03 (-0.32 to 0.27)
Dixon et al,[57] 2000	65	0.67 (0.11 to 1.24)
Fang et al,[58] 1998	263	0.12 (-0.15 to 0.40)
Haggerty et al,[59] 2007	79	0.42 (-0.10 to 0.94)
Howard et al,[60] 1990	365	0.40 (0.14 to 0.67)
Jemmott et al,[62] 1992	115	0.30 (-0.07 to 0.67)
Jemmott et al,[63] 1998	337	0.23 (-0.07 to 0.53)
Jemmott et al,[64] 2010	180	0.09 (-0.23 to 0.42)
Klein et al,[65] 2011	84	0.24 (-0.78 to 1.25)
Li et al,[66] 2002		
Female	170	-0.04 (-0.34 to 0.27)
Male	213	0.11 (-0.16 to 0.37)
Markham et al,[20] 2012	255	0.53 (0.13 to 0.94)
Morrison et al,[67] 2007	142	-0.08 (-0.49 to 0.33)
Murry et al,[68] 2011	301	-0.03 (-0.28 to 0.23)
Peskin et al,[46] 2015	154	-0.17 (-0.66 to 0.32)
Shepherd et al,[70] 2017	303	-0.001 (-0.37 to 0.37)
St. Lawrence et al,[71] 1995	225	0.38 (0.07 to 0.69)
Stanton et al,[72] 2004	340	-0.17 (-0.41 to 0.07)



Forest plot displaying effect sizes and 95% CIs for abstinence. Positive effect sizes indicate that sexual activity was reduced in intervention participants compared with control individuals. Error bars indicate 95% CIs; diamond, overall effect size.

Table 2. Weighted Mean Effect Sizes of Sexual Health Interventions for Sexual Health Outcomes in Black Adolescents[a]

Outcome	Studies, No.	Cohen *d* (95% CI)	*P* value
Behavioral outcomes			
Abstinence	22	0.14 (0.05 to 0.24)	.004
Condom use	26	0.25 (0.11 to 0.39)	<.001
Number of sex partners	10	−0.06 (−0.25 to 0.13)	.54
Biological outcomes			
Pregnancy	4	−0.16 (−0.41 to 0.09)	.20
STI contraction	4	−0.07 (−0.43 to 0.30)	.73
Psychological outcomes			
Sexual health intentions	14	0.17 (0.05 to 0.30)	.007
Sexual health knowledge	11	0.46 (0.30 to 0.63)	<.001
Sexual health self-efficacy	15	0.19 (0.09 to 0.28)	<.001

Abbreviation: STI, sexually transmitted infection.

[a] Higher values indicate the sexual health intervention group had improved outcomes compared with the control group for abstinence, condom use, sexual health intentions, sexual health knowledge, and sexual health self-efficacy. Lower values indicate that the sexual health intervention group had improved outcomes compared with the control group for number of sex partners, pregnancy, and STI contraction.

Biological Outcomes

Only 4 studies[55,57,60,72] assessed pregnancy as intervention outcomes, and only 4 studies[24,27,55,56] assessed STI contraction. The overall weighted mean effect size across studies was not statistically significant for both pregnancy (Cohen *d* = −0.16; 95% CI, −0.41 to 0.09; *P* = .20) and STI contraction (Cohen *d* = −0.07; 95% CI, −0.43 to 0.30; *P* = 73) (Table 2 and eFigure 3 and eFigure 4 in the Supplement).

Psychological Outcomes

Sexual health interventions were associated with improvement in 3 psychological outcomes: sexual health intentions (Cohen *d* = 0.17; 95% CI, 0.05-0.30; *P* = .007), sexual health knowledge (Cohen *d* = 0.46; 95% CI, 0.30-0.63; *P* < .001), and sexual health self-efficacy (Cohen *d* = 0.19; 95% CI, 0.09-0.28; *P* < .001). Effect sizes ranged from small to moderate.

Discussion

This meta-analysis synthesized almost 30 years of research on the effectiveness of sexual health interventions among black adolescents in the US. Overall, results from 29 studies of 11 918 black adolescents showed that these programs have been successful. Sexual health interventions were significantly associated with improvements in abstinence, condom use, sexual

Table 3. Weighted Mean Effect Sizes of Intervention for Abstinence and Condom Use

Variable	Abstinence					Condom use				
	Studies, No.	Cohen *d* (95% CI)	*P* value	Between groups Q_b	Between groups *P* value	Studies, No.	Cohen *d* (95% CI)	*P* value	Between groups Q_b	Between groups *P* value
Sex										
Female only	5	0.21 (−0.05 to 0.47)	.12	0.38	.83	8	0.22 (−0.03 to 0.47)	.08	2.31	.31
Male only	4	0.17 (−0.07 to 0.41)	.17			3	0.57 (0.13 to 1.00)	.01		
Mixed	13	0.12 (−0.002 to 0.25)	.05			15	0.21 (0.02 to 0.39)	.03		
Cultural tailoring[a]										
Tailored	10	0.18 (0.02 to 0.35)	.03	.34	.56	16	0.22 (0.04 to 0.39)	.01	0.36	.55
Not tailored	12	0.12 (−0.003 to 0.25)	.06			10	0.31 (0.07 to 0.54)	.01		
Racial socialization component[b]										
Included	5	0.15 (−0.07 to 0.37)	.19	.004	.95	9	0.25 (0.01 to 0.48)	.04	0.001	.97
Not included	17	0.14 (0.03 to 0.25)	.01			17	0.25 (0.08 to 0.42)	.004		
Intervention completion[c]										
Completed full intervention	2	0.29 (−0.11 to 0.69)	.16	0.44	.51	5	0.33 (0.02 to 0.65)	.04	0.34	.56
Did not complete full intervention	10	0.15 (0.02 to 0.27)	.02			13	0.23 (0.04 to 0.41)	.02		
Partner communication skills training										
Included	13	0.12 (−0.01 to 0.24)	.07	0.35	.55	16	0.20 (0.02 to 0.37)	.03	0.36	.55
Not included	8	0.18 (−0.002 to 0.37)	.05			8	0.29 (0.03 to 0.56)	.03		
Condom skills training										
Included	13	0.13 (−0.01 to 0.26)	.06	0.27	.60	17	0.18 (0.01 to 0.36)	.04	0.98	.32
Not included	8	0.19 (0.004 to 0.37)	.05			7	0.36 (0.06 to 0.66)	.02		
Parental involvement										
Parents involved	7	0.09 (−0.07 to 0.24)	.27	0.77	.38	6	0.24 (−0.07 to 0.55)	.13	0.01	.94
Parents not involved	15	0.18 (0.05 to 0.30)	.005			20	0.25 (0.10 to 0.41)	.002		
Intervention dose, h										
≤10	7	0.26 (0.06 to 0.46)	.01	3.13	.21	12	0.26 (0.06 to 0.46)	.01	0.07	.97
11-20	10	0.06 (−0.06 to 0.19)	.32			10	0.22 (−0.02 to 0.47)	.07		
>20	5	0.20 (0.01 to 0.38)	.04			4	0.27 (−0.12 to 0.65)	.17		
Setting										
School	10	0.25 (0.10 to 0.39)	.001	4.81	.03	6	0.29 (0.03 to 0.55)	.03	0.42	.81
Community center	10	0.04 (−0.07 to 0.16)	.47			10	0.24 (0.03 to 0.44)	.02		
Clinic	0	NA	NA			6	0.34 (0.11 to 0.57)	.004		

Abbreviation: NA, not applicable.

[a] Studies that included a description of substantial intervention components developed or adapted specifically for black adolescents were considered tailored for the cultural tailoring moderator.

[b] Studies that included a description of program components aimed at sending messages to black adolescents about the meaning of their race in the context of society were coded as included for the racial socialization component moderator.[74]

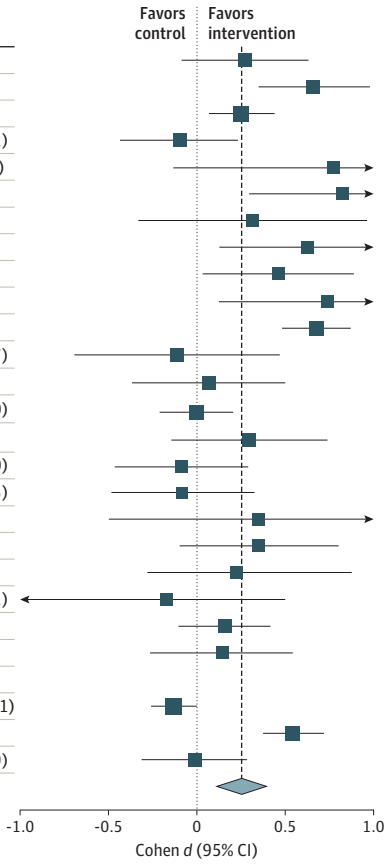
[c] Studies in which all participants completed all program components were coded as all completed for the intervention dose completion moderator.

health intentions, sexual health knowledge, and sexual health self-efficacy. With rates of HIV infection, other STIs, and unplanned pregnancy especially high among black adolescents,[1,2] there is an urgent need to address factors that may lead to improvements in sexual decision-making among this group. This meta-analysis shows that sexual health interventions are an important part of the solution to this health crisis because these programs can promote healthy sexual behavior and psychological outcomes among black adolescents. These findings were consistent across factors such as participant sex, age, and intervention dose.

We found that sexual health interventions for black adolescents were associated with improvements in sexual health intentions, sexual health knowledge, and sexual health self-efficacy, which are psychological outcomes associated with positive behavior change.[37,38,75] Most of the studies[26,27,55,56,61] that we included assessed behavior change after only 12 months (at most), at which point many adolescents may not have become sexually active, making behavior change in sexual situations more difficult to detect. However, if this association of interventions with psychological outcomes persists, it is expected based on health

Figure 2. Forest Plot for Condom Use Outcome

Source	Participants, No.	Cohen *d* (95% CI)
Delamater et al,[54] 2000	120	0.27 (-0.09 to 0.63)
DiClemente et al,[55] 2004	460	0.66 (0.34 to 0.98)
DiClemente et al,[56] 2009	605	0.25 (0.07 to 0.44)
DiClemente et al,[27] 2014	136	-0.16 (-0.54 to 0.22)
DiIorio et al,[22] 2006	93	0.77 (-0.13 to 1.67)
DiIorio et al,[21] 2007	78	0.82 (0.29 to 1.35)
Dixon et al,[57] 2000	65	0.31 (-0.34 to 0.96)
Fang et al,[58] 1998	100	0.62 (0.13 to 1.12)
Howard et al,[60] 1990	109	0.46 (0.03 to 0.89)
Jemmott et al,[62] 1992	43	0.74 (0.12 to 1.36)
Jemmott et al,[63] 1998	410	0.67 (0.48 to 0.87)
Jemmott et al,[64] 2010	76	-0.11 (-0.70 to 0.47)
Klein et al,[65] 2011	82	0.07 (-0.36 to 0.50)
Kogan et al,[23] 2012	502	-0.01 (-0.22 to 0.20)
Li et al,[66] 2002	80	0.30 (-0.14 to 0.74)
Markham et al,[20] 2012	105	-0.09 (-0.47 to 0.30)
Morrison et al,[67] 2007	142	-0.08 (-0.49 to 0.33)
Murry et al,[68] 2011	219	0.35 (-0.49 to 1.19)
Peskin et al,[46] 2015	79	0.35 (-0.10 to 0.81)
Roye et al,[69] 2007	44	0.22 (-0.43 to 0.88)
Shepherd et al,[70] 2017	26	-0.27 (-1.04 to 0.51)
St. Lawrence et al,[71] 1995	225	0.16 (-0.11 to 0.42)
Stanton et al,[72] 2004	151	0.14 (-0.27 to 0.55)
Sznitman et al,[24] 2011		
≤15 y of age	1003	-0.14 (-0.26 to -0.01)
>15 y of age	514	0.54 (0.37 to 0.72)
Wechsberg et al,[73] 2017	237	-0.01 (-0.31 to 0.29)



Forest plot displaying effect size and 95% CIs for condom use. Positive effect sizes indicate that condom use was increased in intervention participants compared with control individuals. Error bars indicate 95% CIs; diamond, overall effect size.

behavior theory that when adolescents start to become sexually active, this association may lead to healthier sexual decision-making.[38]

No significant association was found between sexual health interventions and pregnancy or STI contraction among black adolescents. However, with only 4 studies[55,57,60,72] reporting on pregnancy as an outcome and only 4 studies[24,27,55,56] reporting on STI contraction, caution is warranted in interpreting this finding. Although it is time and resource intensive to collect information on biological outcomes, such as pregnancy, HIV infection, and other STIs, additional work is needed to determine whether current intervention strategies are effective at preventing these outcomes.[34,76] After more studies evaluate the effectiveness of interventions on biological outcomes, another meta-analysis will be warranted to evaluate the long-term success of primary prevention sexual health programs.

Significant variability was found in the association between sexual health interventions and adolescent abstinence and condom use. Two significant moderators were identified: intervention setting and study publication year. Programs delivered in schools had a stronger association with abstinence than those delivered in community centers. Adolescents spend most of their waking hours at school[77]; thus, school-based sexual health education programs can reach a large number of teens. Only 24 states require sex education to be taught in schools despite 96% of parents in the US supporting school-based sex education.[78,79] Implementing evidence-based (eg, comprehensive) sexual health programming in more schools may promote abstinence and be associated with reduced racial disparities in sexual health outcomes.[80]

Interventions reported in older studies had a stronger association with improvements in condom use among black adolescents than those published in more recent years. It is possible that over time adolescents have become more likely to use forms of contraception other than condoms, particularly intrauterine devices, as their primary form of birth control.[81,82] Alternate methods (eg, intrauterine devices, birth control pills, and injectables) have become more accessible and cost-effective within the past decade.[83] Hormonal birth control use is effective at preventing pregnancy but associated with decreased condom use[84,85]—a behavior pattern that is problematic because hormonal contraceptives and intrauterine devices do not protect against HIV infection and other STIs.[86] This finding suggests that future interventions should incorporate components aimed at increasing dual contraception use to prevent pregnancy as well as contraction of HIV infection and other STIs. In addition, future studies should consider evaluating the effect of hormonal contraceptive use on adolescents' change in condom use in response to sexual health programming.

Limitations

This study has limitations. First, there was variability across studies in the measures used to evaluate sexual health outcomes. For example, in evaluating condom use, some studies[55,56] asked about condom use exclusively during vaginal intercourse, whereas others[24,55] asked about condom use during vaginal, oral, and anal sex. In addition, the time frame on which participants were asked to report varied. For example, in evaluating abstinence, some studies[21,22] asked participants about lifetime sexual activity, whereas others[26,58] asked whether participants had become sexually active after their participation in the intervention. Standardization of the methods used to assess adolescent sexual health outcomes may lead to more meaningful syntheses of research in the future.

Second, we hoped to more thoroughly report and analyze the participant characteristics that could influence intervention effectiveness. However, inconsistent and brief reporting of participant characteristics (eg, socioeconomic status and sexual orientation) across studies made this difficult. In addition, many of the studies[87,88] that we reviewed for inclusion reported race with large "other" categories with no explanation of who was included in this group; thus, the racial composition of samples was difficult to determine. We encourage researchers to use online supplemental materials or spaces such as the open science framework or ClinicalTrials.gov to provide additional detail about their study design and participants. This approach would assist with data reproducibility and ensure thorough and high-quality synthesis of study characteristics and findings in future meta-analyses.

Third, many of the sexual health programs evaluated in this study demand adolescents' time and resources; thus, only 5 of 29 evaluations reported that all adolescents received the full program dose. Emerging literature on intervention science highlights the importance of evaluating the appropriateness and feasibility of health programming to maximize the sustained success of evidence-based interventions.[89] Although some studies included in this review evaluated fidelity,[23,55,56,63] participant satisfaction,[55,56,62,63,71] session attendance,[21,46,67,90] and/or attrition,[23,25,27,55,63,90] more comprehensive intervention evaluations are needed to understand why black adolescents may not receive the full program dose. We believe that researchers developing or implementing sexual health interventions for black adolescents should reduce barriers to activity or session attendance.

Fourth, technology-based interventions may aid in improving the accessibility and fidelity of sexual health programming.[91-93] However, almost all of the interventions included in this meta-analysis were delivered primarily in person, with only 3 reaching adolescents through computer-based programming.[46,61,65] This finding highlights an important avenue for future program development. If technology-based programs are developed, adolescents may be able to complete effective sexual health interventions on demand and at their convenience.

Fifth, although risk factors that affect health in black populations exist at all levels of the socioecological model,[8,94] most interventions identified in this meta-analysis focused on affecting adolescent sexual health at the individual level. Individual-level variables (ie, knowledge, self-efficacy, and intentions) are important to the promotion of safer sexual decision-making; however, interpersonal,[95] community-level,[12,13,15] institutional,[10,11] and structural[9] barriers to the sexual health of black adolescents must also be addressed. Some studies had components aimed at increasing parental communication[25,72] and challenging cultural narratives,[24] which may be especially helpful.[96] A few of the interventions in this meta-analysis were conducted with adolescents attending a clinic,[54-56,61,69,71] and 2 programs provided short-term sexual health services (eg, an STI test)[27,56]; however, none of the interventions that we identified evaluated a component that facilitated adolescent access to long-term sexual health care services (eg, birth control counseling and regular STI testing). Programs that connect black adolescents to accessible sexual health services appear to be needed.

Conclusions

Results from this meta-analysis suggest that sexual health interventions are associated with increases in abstinence and condom use and improved sexual health knowledge, self-efficacy, and intentions. More thorough reporting of participant characteristics and details regarding intervention design and implementation may facilitate future research synthesis. These findings may inform important future directions for researchers, practitioners, and community members invested in improving the sexual health and well-being of black adolescents.

ARTICLE INFORMATION

Accepted for Publication: December 3, 2019.

Published Online: April 20, 2020. doi:10.1001/jamapediatrics.2020.0382

Author Contributions: Ms Evans had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Evans, Widman, Hope.
Acquisition, analysis, or interpretation of data: Evans, Widman, Stokes, Javidi, Brasileiro.
Drafting of the manuscript: Evans, Widman, Javidi, Hope.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Evans, Widman, Stokes, Javidi, Brasileiro.
Obtained funding: Evans.
Administrative, technical, or material support: Evans, Widman.
Supervision: Widman, Hope.

Conflict of Interest Disclosures: Ms Evans reported receiving grants from the Rural Center for AIDS/STD Prevention, Indiana University School of Public Health–Bloomington (Doug Kirby Adolescent Sexual Health Research Grant), and grants from North Carolina State University Department of Psychology and Center for Family and Community Engagement during the conduct of the study. No other disclosures were reported.

Funding/Support: This study was supported in part by the Doug Kirby Adolescent Sexual Health Research Grant from the Rural Center for AIDS/STD Prevention, Indiana University School of Public Health–Bloomington, and by the Center for Family and Community Engagement, North Carolina State University.

Role of the Funder/Sponsor: The funders provided support for the design and conduct of the study and the collection, management, and analysis.

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