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Evaluation of an HIV Prevention Intervention Designed for African American Women: Results from the SISTA Community-Based Organization Behavioral Outcomes Project

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Abstract

One of the Centers for Disease Control and Prevention's strategies for addressing racial disparities within the HIV epidemic is to support the implementation of HIV prevention behavioral

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interventions designed for African Americans. One such intervention is Sisters Informing Sisters about Topics on AIDS (SISTA), a culturally relevant and gender-specific, five-session, group-level, HIV prevention intervention designed for African American women. In 2008, the Centers for Disease Control and Prevention funded five community-based organizations to conduct outcome monitoring of SISTA to assess the outcomes associated with implementation in the field. Using a 90-day recall, demographic and sexual risk data were collected from participants at baseline and at 90 and 180 days post-intervention. Findings reveal that women participating in SISTA (n = 432) demonstrated a significant reduction in sexual risk between baseline and both follow-up time points for each of the six outcomes being measured (e.g., any unprotected sex, all protected sex).

Keywords

HIV; Risk reduction behavior; Behavioral interventions; African American; Women; Program evaluation; SISTA; Sisters Informing Sisters about Topics on AIDS

Introduction

The African American community bears a disproportionate burden of the HIV/AIDS epidemic [1–3]. Both the rate of new HIV infections and the estimated lifetime risk of becoming infected with HIV are higher among African Americans than any other racial/ethnic group [1]. Although recent data indicate that the overall rate of new HIV infections remains lower for African American females than African American males [4], greater disparities exist among African American females as compared to non-African American females [5]. Consequently, African American women are one of the most disproportionately affected U.S. sub-populations impacted by the HIV epidemic. For example, in 2008, African American women were diagnosed with HIV at 19 times the rate of their white counterparts and four times the rate of Hispanic/Latina women [1]. Furthermore, African American women account for more than half of all new HIV cases among women [6].

One of the primary objectives of the 2010 National HIV/AIDS Strategy is to reduce the HIV-related disparities and health inequalities that exist within the African American community, particularly for African American women [7–9]. Behavioral interventions that are gender-relevant and include cultural components may be more effective for African American women than behavioral interventions that do not include gender or cultural components [10–15]. CDC recognizes that these interventions could be essential to decreasing HIV/AIDS disparities for African American women [15–17].

Over the last decade, the dissemination of, and support for, effective behavioral interventions (EBIs) has been one of CDC's primary strategies to address the HIV/AIDS epidemic within the African American community, and among African American women [17]. One of the EBIs disseminated by CDC is Sisters Informing Sisters about Topics on AIDS (SISTA), an HIV prevention behavioral intervention designed specifically for African American women. Developed in the early 1990 s and based on the theory of Gender and Power and Social Cognitive Theory [18, 19], SISTA is a peer-led, group-level social skills intervention for heterosexual, HIV-negative African American women. The five SISTA sessions (and two optional booster sessions) are designed to be gender-specific and culturally relevant

[19]. SISTA includes seven core elements, which are integral intervention components based on the behavioral theory that cannot be altered or adapted without impacting the intervention's potential effectiveness. These elements include convening small groups, utilizing skilled female African American facilitators, using culture and gender-appropriate materials, developing communication and negotiation skills, discussing and practicing condom use skills, and enhancing partner norms supportive of condom use [19]. In the original randomized control trial (RCT) to determine efficaciousness, SISTA participants increased consistent condom use at 3 months (90 days) post-intervention (adjusted OR [AOR] = 2.1; 95 % confidence interval [CI] = 1.03–4.15, *P* 0.04 [13]). In addition, SISTA participants demonstrated positive changes among mediating outcomes, including HIV risk behavior knowledge, sexual communication, sexual assertiveness, partner norms and sexual self-control [18].

SISTA was the first intervention designed for African American women to be nationally disseminated by CDC [20]. SISTA has been implemented by CDC-funded community based-organizations (CBOs) and health departments for almost a decade. However, there are few data on the behavioral outcomes experienced by women who receive SISTA in the field as implemented by these CDC-funded HIV service providers. Between 2006 and 2010, the Division of HIV/AIDS Prevention at CDC provided funding to 25 CBOs across the United States (via a competitive cooperative agreement process) to deliver SISTA to African American women at very high risk for HIV infection. All 25 CBOs were trained by CDC-funded agencies on the implementation of SISTA. CDC provided supplemental funding to five of these 25 CBOs (also via a competitive cooperative agreement process) to conduct outcome monitoring on SISTA through the Community-based Organization Behavioral Outcomes Project (CBOP). Information was not available to systematically document how the five selected CBOs compared to the other 20 CBOs (e.g., demographic characteristics, implementation sites, and sexual risk). The five CBOs selected to participate in the outcome monitoring project were located in Atlanta, GA (CBO A and CBO E), Jackson, MS (CBO C), New Orleans, LA (CBO D) and Panama City, FL (CBO B).

The purpose of conducting outcome monitoring on SISTA was to determine whether women who participated in the intervention experienced a reduction in sexual risk behaviors and to explore client-level factors associated with observed changes. While the original SISTA RCT looked at behavior change at 90 days post-intervention, the outcome monitoring project extended the follow-up time period and evaluated changes at both 90 and 180 days post-intervention.

Intervention Methods

Intervention Procedures

All intervention guidance, training, and implementation monitoring were conducted by CDC program project officers charged with overseeing intervention delivery. As part of the Community-based Organization Behavioral Outcomes Project, CBOs were asked to report session-level process data related to intervention adaptations, incentives, introductory sessions, booster sessions, and participation through project manuals, which were updated over the project period.

Intervention Recruitment and Implementation Sites—The method of recruitment and number of participants recruited into the intervention was determined by each CBO and varied across the five CBOs. During the evaluation, four of the five CBOs (A, C, D, and E) were implementing the intervention in partnership with multiple organizations, or partner sites, located within their metropolitan area. The primary method of recruitment for these four CBOs was through referrals from those partner sites. In all instances where a CBO worked with partner sites, the partner site staff members were responsible for recruiting potential participants and providing the space for the intervention. CDC-funded CBOs were responsible for conducting eligibility screening, enrollment into the intervention, and delivering the intervention at partner sites.

Table 1 includes a list of SISTA delivery sites by each participating CBO. CBO B did not work with partner sites to implement the intervention. CBO B primarily recruited participants for the intervention through outreach in the surrounding communities (including rural areas). They also received referrals from internal programs and external agencies. CBO B staff delivered the intervention in public common spaces throughout the community (e.g., apartment complex community rooms) and private residences.

Intervention Participant Screening and Enrollment—CBO A, C, D and E conducted participant screening and enrollment at a pre-intervention introductory session, while CBO B conducted participant screening and enrollment activities during recruitment (see Table 1). HIV prevention activities conducted as part of the introductory session (e.g., HIV testing, sexual health and relationship-focused videos, HIV knowledge discussions, etc.) varied by CBO, partner site, and SISTA cycle. A cycle consisted of an intervention cohort of five sessions. Depending on the CBO and partner site, the first session of the SISTA intervention would take place anytime from immediately following the introductory session to up to 14 days after the introductory session.

The original SISTA RCT targeted African American women between 18 and 29 years old [18]. If individuals recruited by the CBO or partner sites were outside of the original target population of SISTA (e.g., older than 29, non-African American), the CBO would screen these individuals and enroll them into the intervention as long as they met the sexual risk eligibility criteria. This was done so that HIV prevention services would not be denied to those in need.

The sexual risk criteria for enrollment into SISTA at each of the participating CBOs was in accordance with CDC funding requirements which stated that SISTA participants must be at high risk or very high risk of either contracting HIV or transmitting HIV to others. Potential SISTA participants were considered to be at high risk or very high risk for HIV if they self-reported risky sexual behaviors or injection drug use preceding the intervention (e.g., unprotected sex, sex with a person living with HIV, sex in exchange for drugs or money, multiple sex or needle sharing partners, or a physician’s diagnosis of a STD). To be eligible for enrollment in the intervention, CBO A and CBO C required potential clients self-report risk behaviors within 3 months preceding the intervention, while CBO B and E employed a 6 month recall and CBO D utilized a 12 month recall.

At several intervention partner sites across three CBOs (CBO A, C and E), SISTA was considered by the partner site to be a mandatory component of an individual's treatment or service plan; therefore, participation was required by those sites for all women deemed eligible. Participation in the intervention was voluntary at all other intervention partner sites (see Table 1).

Intervention Implementation—All CBOs participating in the outcome monitoring project were trained on the intervention by CDC-contracted agencies, and each followed the SISTA guidelines for implementation. SISTA is designed to be implemented in small group sessions consisting of 10–12 participants over five, 2-hour sessions. Table 1 describes the intervention session characteristics of the SISTA cycles attended by participants in the outcome monitoring project by CBO. The average group size varied across the five CBOs from 6 to 16. The number of intervention cycles conducted by each CBO varied over the project period (range = 9–15; see Table 1).

All CBOs in the outcome monitoring project adapted SISTA to accommodate partner site or participant requirements (see Table 1). However, no adaptations or alterations were made to the core elements at any of the implementing sites. Session scheduling was the most commonly reported adaptation made to SISTA. Regardless of the timing of the intervention sessions, all intervention content from the five SISTA sessions was delivered. Other adaptations across the five sites included the addition of gender and culturally appropriate activities (e.g., games and role plays), the removal and addition of culturally appropriate videos, and the inclusion of discussions around sexually transmitted diseases. Adaptations of condom-related activities were also reported. CBOs A and C implemented SISTA in correctional facilities where there were limitations on the condom demonstration activity. To maintain fidelity with the SISTA core elements, CBO A continued with the condom demonstration using human hands instead of penis models. CBO C was prohibited from bringing either condoms or penis models into the facility; therefore, the CBO added a worksheet on condom use and used pictures to demonstrate how to put on a condom. In addition, the CBO included another activity where participants talked through the steps involved in using a condom.

All CBOs provided incentives to individuals for participation in SISTA, including monetary and non-monetary incentives (see Table 1). Monetary incentives were primarily provided in the form of low-denomination, retail store gift cards. Non-monetary incentives included condoms, hygiene kits and certificates for intervention completion.

The intervention implementation manual defines booster sessions as optional, unstructured sessions that are held 2 and 4 months post-intervention. SISTA participants can get together, ask questions of the facilitators and their peers and seek support from other participants during this time [19]. Four of the five CBOs (CBO B, C, D, and E) reported that they offered optional booster sessions for interested participants. Booster session implementation, session content, and participation varied by partner site and cycle. Table 1 describes when booster sessions were offered. Booster sessions were administered inconsistently and data were not reliably collected and reported across agencies.

SISTA Outcome Monitoring Project Evaluation Methods

Outcome Monitoring Participants and Procedures

Participants were recruited into the evaluation over a 15-month period from September 2008 through December 2009. CBOs were expected to enroll 80 participants in the evaluation and retain at least 64 participants at both the 90- and 180-day follow-up time points. Participation in the evaluation was voluntary at all implementation sites. Participants were recruited for and enrolled into the intervention prior to being enrolled in the evaluation. At CBOs A, C, D and E, every client who was eligible for the intervention at the participating sites during the project period was offered participation in the outcome monitoring project. At CBO B, only participants in cycles of the intervention for which outcome monitoring project data collection staff were available were offered participation in the outcome monitoring project. The evaluation did not include a control group, and was not designed to produce generalizable results; therefore, the evaluation did not include a comparison of participants and non-participants. As a result, demographic and risk data on individuals who declined participation in the outcome monitoring project were not collected. However, a review of project management documents (such as monthly status reports, annual reports, call notes, and site visit reports) indicated that fewer than 3 % of the individuals who were asked to participate in the evaluation declined.

Evaluation Design, Data Collection, and Data Entry—The outcome monitoring project employed a repeated measures design, with no control or comparison groups. Participants completed an in-person, interviewer-administered, baseline questionnaire within the 30 days prior to participating in the first intervention session of SISTA. All participants who completed a baseline interview, regardless of intervention participation, were contacted for follow-up interviews. Follow-up interviews were scheduled for 90 and 180 days following session five of their SISTA cycle. For individuals who did not attend any intervention sessions, follow-ups were scheduled using the session five date of their intended SISTA cycle. A window period of 14 days after the follow-up time points was employed to account for staff and participant availability. If a client was not available to complete a 90-day follow-up interview (follow-up 1), they were still contacted to complete a 180-day follow-up interview (follow-up 2). Telephone interviews were utilized by CBOs A, D and E for participants who were unable to attend an in-person interview at follow-up 1 (n = 60; 13 %) and follow-up 2 (n = 50; 11 %). On average, follow-up 1 data collection occurred 99 days (SD = 15) after SISTA session five, or the last intervention session. The average number of days from the last intervention session to follow-up 2 was 190 days (SD = 16). All five CBOs provided monetary incentives for participation in the evaluation (in addition to incentives received for participation in the intervention). Incentives were primarily provided in the form of gift cards to retail stores.

The National HIV Prevention Program Monitoring and Evaluation (NHM&E) variables are a set of standardized variables that all CDC-funded CBOs were required to collect and report one time during the funding period. As with previous outcome monitoring projects [21, 22], CBOs participating in the SISTA outcome monitoring project received additional funding to collect and report the required NHM&E variables, as well as a set of optional risk behavior

variables at not one, but at three time points. Data collection templates for the evaluation were developed by CDC using the NHM&E variables and were provided to the CBOs to use for data collection. None of the five participating CBOs altered the content of the data collection instrument templates beyond adding additional agency-specific data variables, which were not analyzed by CDC. Collected client-level data were entered, managed, and submitted to CDC by the CBOs using the Program Evaluation Monitoring System (PEMS), Web-based software designed for secure data entry and management [23].

Outcome Monitoring Project Data Procedures

Measures—Demographic variables were collected at baseline from participants in the outcome monitoring project, including sex at birth, current gender, age, race, ethnicity, primary language, relationship status, and education status. The only demographic variable used in the analytic model was age of clients.

HIV risk factor variables for the 12 months preceding baseline data collection were collected from evaluation participants, including incarceration, transactional sex, STD diagnosis, and data on current pregnancy status and HIV testing history. These variables are not included in the outcomes analysis, but are used to provide context on participant risk at the time of baseline data collection.

At baseline and both follow-up time points, participants were asked to report the following four outcome variables for the 90 days preceding data collection: (1) number of sex partners; (2) number of sex events; (3) number of unprotected sex events; and (4) number of unprotected sex events while intoxicated or high on non-injection drugs. For all sex-related variables, a “sex event” was defined as an episode of anal or vaginal sex with a male partner; “unprotected sex” was defined as engaging in anal or vaginal sex with a male partner without a condom.

Data Cleaning—Throughout the evaluation, CDC and the CBOs engaged in quality assurance checks for data entry and submission. Additional data cleaning was conducted prior to analysis; first, CBOs verified all records containing missing responses to all four outcome variables. Then, a series of four consistency recodes were applied to inconsistent outcome variable data. The following is a list of the recodes that were applied, as well as a count of the number of recodes that were made and at which data collection point: (1) if 0 sex events were reported, the number of sex partners was recoded to 0 ($n = 3$ at baseline); (2) if the number of sex partners was greater than the number of sex events, the number of sex partners was recoded to equal the number of sex events ($n = 5$ at baseline); (3) if unprotected sex events were greater than sex events, the unprotected sex events were recoded to equal the number of sex events ($n = 2$ at baseline and $n = 2$ at follow-up 2); (4) if unprotected sex while intoxicated or high on non-injection drugs was greater than unprotected sex events, then unprotected sex events while intoxicated or high on non-injection drugs were recoded to equal the number of unprotected sex events ($n = 10$ at baseline; $n = 2$ at follow-up 1). Outcome variables for 20 participants (3 % of sample) were affected by these recodes. Any “missing” data remaining are a result of “don’t know” or “refuse to answer” responses.

Site Types—This outcome monitoring project attempted to assess whether observed changes in the sexual risk-behaviors of participants were associated with the different types of delivery sites. The original evaluation design and sample size calculations did not account for site types; therefore, site types were defined during data analysis. Due to limited sample size, site types had to be consolidated into categories in order to result in meaningful analysis. Four categories were constructed, loosely based on similarities of population served. The four site type categories include: (1) community venue or private residence (i.e., public and private locations such as community meeting halls, apartment complex club houses, individual homes); (2) human service program or the CBO itself (i.e., church, CBO, or government agency providing a range of services including financial assistance, vocational training and job placement services, and mental and physical health and wellness services); (3) school/university (i.e., an organization with the primary goal of awarding GEDs, high school diplomas, or secondary degrees); and (4) correctional facility (a short-term jail/detention center where women were held for short-term sentences/while awaiting trial or a prison where women of all custody levels serve long-term sentences), residential substance abuse treatment facility (a live-in facility where women, voluntarily or by court-order, receive substance abuse treatment and/or counseling services) and homeless shelter (a facility offering shelter and/ or services to homeless individuals and their families).

Computed Outcome Measures—Following data cleaning, outcome variables were reviewed for distribution and outliers. Even after transformation (e.g., Arcsine and square root), the percentages of the number of unprotected sex events, and the number of sex events while intoxicated or high on non-injection drugs were found to be non-normally distributed. Thus, corresponding dichotomous variables were generated for these two variables.

Using the cleaned data, six outcome measures were computed for each client; five measured variables plus an additional calculated variable. Similar to previous outcome monitoring projects using NHM&E variables [21, 22], the final outcome measures in the outcomes analysis included: (1) number of sex partners (count), (2) any unprotected sex (yes/no), (3) any unprotected sex while intoxicated/high on non-injection drugs (yes/no), (4) any unprotected sex and multiple sex partners (yes/no), (5) all sex unprotected (yes/ no), and (6) all sex protected (yes/no). The all sex unprotected outcome was defined as “yes” when 100 % of the reported sex events were unprotected (i.e., without condoms); the all sex protected outcome was defined as “yes” when 0 of the reported sex events were unprotected (i.e., without condoms).

With respect to missing values for the six outcome measures at either baseline, follow-up 1 or follow-up 2, the models failed to identify a violation of the Missing Completely At Random condition (MCAR). As a check, imputation was performed and similar results were seen for models with missing values as compared to imputed values. Thus, imputation was not used for the analyses presented in this paper.

Exclusion Criteria—For GEE modeling, a series of non-mutually exclusive exclusion criteria were applied to the data to eliminate participants from the outcomes analysis who did not fall within established parameters of the outcome monitoring project. The

complete dataset contained 615 participants; after the following exclusions were applied, 432 participants remained in the GEE analysis dataset.

To focus the outcomes analysis on the influence of SISTA on HIV sexual risk behaviors, participants who did not attend any intervention sessions ($n = 59$) and participants who reported no sex events at all three time points were excluded ($n = 98$). An individual who participated in the same intervention session multiple times ($n = 1$) was excluded. During the outcome monitoring project, men ($n = 4$) (often partners of women attending SISTA) were enrolled into both the intervention and the evaluation. These individuals were removed from the dataset given that SISTA is a gender-focused intervention for women.

The women participating in the outcome monitoring project in the prison were removed from the outcomes analysis. No data were reported to CDC on the length of stay of the participants in the prison outside of the project period; therefore, it was not possible to determine the opportunity for risk for these participants. A total of 25 women were enrolled at the prison, 19 were excluded through the application of other exclusion criteria. The remaining women from the prison were excluded ($n = 6$). Women enrolled at the jail by CBO A remained in the GEE analysis as that was only a short-term detention center.

Participants with outlying data or data collection dates were excluded ($n = 15$). One participant with outlying data (e.g., 1,000 sex partners in 90 days) was removed from the dataset as the accuracy of the data could not be verified with the client. Fourteen individuals were removed because their data collection dates resulted in either an overlap in recall periods or a gap between recall periods.

Descriptive and Univariate Analyses—Descriptive statistics (i.e., frequency, percent) were used to analyze the baseline demographic characteristics and other HIV risk factors (i.e., incarceration, STD diagnosis and transactional sex) for all 615 participants. Chi-square tests were used to test the association between baseline demographic characteristics and HIV risk factors of participants and Poisson regression was used to test for differences in the number of reported outcomes comparing individuals who did not attend any intervention sessions to those individuals that participated in the intervention. Pearson Chi-square tests were used to assess association between baseline characteristics for participants in the total dataset as compared to those retained in the GEE analysis dataset, and participants completing at least one follow-up data collection as compared to those individuals lost to followup. Bonferroni-corrected Chi-square tests were used to assess statistically significant differences between groups. Poisson regression was used to test for differences in the number of reported outcomes comparing individuals who did not attend any intervention sessions to those individuals that participated in the intervention.

GEE Modeling—Generalized estimating equations (GEE) [24, 25] were used to assess the intervention effect of SISTA in reducing HIV sexual risk behaviors over time. GEE is an extension of generalized linear models (GLM) often used for longitudinal studies, in which outcomes are repeatedly measured over time for each subject. In this analysis, GEE models with Poisson distribution were used for the count data (number of sex partners) and GEE models with binominal distribution were used for dichotomous outcomes (yes/no).

The exponentiating coefficients from the Poisson models were characterized as relative risk (RRs), which are defined as the mean number of partners at the follow-up time points divided by the mean number of partners at baseline. The exponentiating coefficients from the binomial models were characterized as odds ratios (ORs), which are defined as the odds of the risk behavior at the follow-up time points divided by the odds at baseline.

Separate GEE analyses were conducted for each of the six outcome variables. Analysis 1 was used to assess the change in risk behaviors over time (unadjusted), so this model included only time as an explanatory variable. For analysis 2, CBO, age group and site type were simultaneously modeled with time and interaction terms for time by age group and time by site type. The interactions represent differences in post-intervention behavior change by age group/site type when controlling for other variables in the model. A parsimonious model was selected based upon goodness of fit (QIC), and the models with the best fit were selected for each outcome [26].

Results

Sample Characteristics

A total of 615 participants across the five CBOs were enrolled and completed a baseline interview. Table 2 presents the demographic characteristics for all participants by CBO, and for those participants retained in the GEE analysis. Intervention participants were almost exclusively Black or African American (93 %) and women (99 %). The mean age of participants was 29 years (SD = 10.2; range = 18–62). Approximately three-quarters of participants (74 %) were single and never married, and almost half (44 %) had not received a high-school diploma. The CBOs enrolled a small percentage (7 %; $n = 46$) of non-Black or African American women. All GEE models were run including and excluding non-Black or African American participants. No appreciable changes were observed, and these individuals were included in the final GEE model.

Table 3 presents the HIV risk factors at baseline for all participants by CBO, and for those participants retained in the GEE analysis. Thirteen percent of participants reported that they had been diagnosed with a STD in the 12 months preceding baseline, 22 % of participants had been incarcerated for a period of at least 24 hour within the last year and one-quarter (25 %) of participants had engaged in transactional sex in the year preceding baseline data collection. CBOs A and C were both implementing SISTA in correctional facilities in addition to other sites. As expected, these two CBOs had the highest percentage of participants who had been incarcerated in the 12 months preceding baseline data collection (33 and 24 %, respectively), although CBOs D and E did have similarly high values (20 and 21 %, respectively). CBOs A and C also had the highest percentage of participants who had engaged in transactional sex (30 and 46 %, respectively), with CBOs D and E also having high values (14 and 27 %, respectively). CBO B, which often worked in traditionally underserved rural areas and did not collaborate with partner sites to implement the intervention, had the lowest percentages of participants who had been diagnosed with a STD (1 %), been incarcerated (2 %), or engaged in transactional sex (2 %).

Table 3 also presents baseline data for participants' pregnancy and HIV test status. Thirteen percent of participants were pregnant at the time of baseline data collection. CBO A was implementing SISTA at a site that targeted pregnant women and had the highest percentage of pregnant participants at baseline (29 %). At baseline, the majority ($n = 544$; 89 %) of participants reported that they had ever received an HIV test, with CBO C having the highest HIV test rate (100 %). Of the 544 participants reporting a previous HIV test, nine participants (2 %), reported that they were HIV-positive at baseline.

Table 3 presents the percentage of participants at the four site types. The sites type with the largest proportion of participants were 'correctional facility, residential substance abuse treatment facility and homeless shelter' (33 %) and 'school/university' (32 %). All CBOs, except CBO B, were implementing the intervention in a correctional facility, residential substance abuse treatment facility and/or a homeless shelter. Individuals that received the intervention at the school/university site type were not necessarily working toward a GED or high school diploma, as SISTA was open to a range of individuals at these sites, not just those enrolled in courses or programs where a GED or high school diploma would be awarded.

Descriptive statistics were generated using the complete dataset prior to the application of the outcomes analysis exclusion criteria to determine who was receiving SISTA at the five participating sites. The last two columns in Tables 2 and 3 represent the total data set ($n = 615$) and the GEE analysis dataset ($n = 432$), respectively. A comparison of these two columns revealed that there were differences between participants in the total dataset and participants that were retained for the GEE analysis. Chi-square testing revealed statistically significant differences for exclusion rates between age groups ($\chi^2(2) = 18.04$, $P < 0.001$), between site types ($\chi^2(3) = 17.10$, $P < 0.001$) and relationship status ($\chi^2(2) = 6.5$, $P < 0.05$). Pairwise testing with Bonferroni correction demonstrated that the proportion excluded from the GEE models was significantly higher for participants aged 35 and older (42 %) than for those aged 18–24 (24 %; $P < 0.001$) and those aged 25–34 (28 %; $P < 0.05$). Participants who reported being separated/divorced/widowed were significantly more likely to be excluded from the GEE models than those participants reporting their relationship status as single/ never married (41 % compared to 27 %; $P < 0.05$), but the difference with married/partnered participants (29 % excluded) was not significant ($P = 0.419$). The proportion excluded among participants receiving the intervention in site type 4 (38 %) was significantly higher than participants in site type 1 (20 %; $P < 0.05$) and site type 3 (22 %; $P < 0.01$). The rate of exclusion was only slightly higher for site type 4 (38 %) than site type 2 (35 %), and the difference was not statistically significant.

Outcome Monitoring Project Attrition Analysis

All CBOs exceeded the goal of enrolling a minimum of 80 participants and retaining 64 participants (providing data at both follow-up time points). Three of the five agencies achieved a retention rate of at least 80 %. The retention rates ranged from 64 to 93 % for follow-up 1 and from 56 to 93 % for the follow-up 2, with an overall retention rate of 77 and 76 % for the two follow-up interviews, respectively. CBO C had the highest retention rate

(93 % for both follow-up interviews), and CBO A had the lowest retention rate (64 and 56 % for follow-up 1 and follow-up 2, respectively).

All 615 participants completed a baseline interview, 475 participants (77 %) completed a follow-up 1 interview and 469 participants (76 %) completed a follow-up 2 interview. Overall, 84 % of participants were retained for at least one of the follow-up interviews. Chi-square tests demonstrated that age group ($\chi^2(2) = 12.63$, $P < 0.01$) and site type ($\chi^2(3) = 40.61$, $P < 0.001$) were associated with differences in attrition (missing both follow-up time points). The proportion lost to follow-up was significantly higher among participants 35 and older (23 %) than participants 18–24 (11 %; $P < 0.01$), although the difference was not statistically significant when compared to participants 25–34 (17 %; $P = 0.272$) The attrition rates for participants in site type 4 (28 %) was higher than those in site type 1 (8 %; $P < 0.01$) and site type 3 (6 %; $P < 0.001$). The attrition rate for site type 2 (17 %) was significantly higher than site type 3 (6 %; $P < 0.01$).

Intervention Participation

A small percentage of the 615 participants (10 %; $n = 59$) did not complete any intervention sessions. Data were not systematically collected on reasons for non-participation. All individuals were contacted to complete follow-up data collection regardless of intervention participation and/or completion. Of the individuals who did not complete any intervention sessions, 44 % ($n = 26$) returned for follow-up 1, and 54 % ($n = 32$) returned for follow-up 2. No statistical differences were found between baseline characteristics or HIV risk factors of those individuals who did not participate in the intervention as compared to those individuals who participated in the intervention. A Poisson regression test of the mean outcomes at baseline revealed that individuals who did not attend any intervention sessions had statistically fewer sex events ($\chi^2(1) = 113.96$, P < 0.001), fewer instances of unprotected sex ($\chi^2(1) = 60.44$, $P < 0.001$) and fewer instances of unprotected sex while intoxicated or high on non-injection drugs ($\chi^2(1) = 29.55$, $P < 0.001$).

Intervention Dosage

The majority of evaluation participants completed all five SISTA sessions ($n = 373$; 60 %). Approximately one-third of participants completed between one and four SISTA sessions ($n = 183$; 30 %), and a small number of participants completed no SISTA sessions ($n = 59$; 10 %). Of those who completed between one and four SISTA sessions, 2.6 was the mean number of intervention sessions attended. Dosage was not included in the GEE models as the sample size of participants in each category (0, 1, 2, 3, 4, 5 sessions) was not sufficient to create meaningful analytical categories.

When comparing the association between baseline demographic characteristics for those participants who completed some (one to four) versus all (five) SISTA sessions, Chi-square testing revealed statistically significant differences among education status ($\chi^2(2) = 17.6$, $P < 0.01$) and site type ($\chi^2(3) = 40.29$, $P < 0.001$) groups. The five education groups were collapsed from five groups to three groups due to sample size considerations. Pairwise testing with Bonferroni correction demonstrated that participants with less than a high school diploma or GED were significantly less likely to attend all five SISTA intervention

sessions than those who were high school graduates or had a GED ($P < 0.001$) and those with some college or higher ($P < 0.05$). Participants attending the intervention in site type 1 had the highest rate of participation for all five SISTA intervention sessions (100 %). As a result, participants receiving the intervention in site type 1 were significantly more likely to attend all sessions than participants in site type 2 (64 %; $P < 0.001$), site type 3 (61 %; $P < 0.001$) and site type 4 (63 %; $P < 0.001$). In terms of HIV risk factors, Chi-square tests revealed that participants who had been diagnosed with a STD or engaged in transactional sex in the 12 months preceding baseline ($\chi^2(1) = 5.07$, $P < 0.05$; $\chi^2(1) = 5.86$, $P < 0.05$, respectively) were significantly more likely to complete all intervention sessions.

Changes in Behavior Over Time

Sexual Risk Behaviors Over Time—Table 4 shows the summary statistics for outcome measures over time, averaged across the five CBOs, excluding those individuals who reported no sex or had missing outcomes data at all three data collection time points. The data in Table 4 were recoded for consistency. This table highlights the general risk-reduction trends that were observed for all outcome measures across all agencies. Reported outcome measures were tested for significance. For all reported measures, there was a significant decrease in sexual risk behavior point estimates between baseline and follow-up 1. For all reported measures, except “number of sex events”, there was a significant change in sexual risk behavior point estimates between baseline and follow-up 2.

GEE Analysis 1: Outcome Changes Over Time Without Adjusting for Covariates (Table 5)—In Analysis 1 the RRs/ORs demonstrate a highly significant ($P < 0.001$; $P < 0.01$) risk reduction for each of the six outcome measures, at the two follow-up time points (90, 180 days) compared to baseline. For example, the proportion of participants reporting “all unprotected sex events” significantly decreased between baseline and follow-up 1 (OR = 0.41, 95 % CI: 0.31, 0.54, $P < 0.001$) and baseline and follow-up 2 (OR = 0.43, 95 % CI: 0.33, 0.57, $P < 0.001$). The proportion of participants reporting “all protected sex events” significantly increased between baseline and follow-up 1 (OR = 1.84, 95 % CI: 1.31, 2.60, $P < 0.001$), as well as baseline and follow-up 2 (OR = 2.53, 95 % CI: 1.80, 3.55, $P < 0.001$). To characterize potential differences between the first and second follow-up, the outcomes at the two time points were also compared. While the results were similar for some outcomes, “any unprotected sex events while intoxicated and high on non-injection drugs” (OR = 0.59, 95 % CI: 0.40, 0.87, $P < 0.01$), showed a larger decrease between baseline and follow-up 2 than between baseline and follow-up 1, and “all protected sex events” (OR = 1.37, 95 % CI: 1.03, 1.83, $P < 0.05$) showed a larger increase between baseline and follow-up 2 than between baseline and follow-up 1.

Figure 1 demonstrates the trend (growth curve) for each outcome over time. The GEE model results were used to obtain the population average-level estimate, which can be used to gauge the overall change for each outcome through the three time points (baseline through follow-up 1 to follow-up 2). The trends showed that each risk behavior demonstrated significant change in a positive direction from baseline through follow-up 1 to follow-up 2. For “number of sex partners”, the average monthly percentage change (AMPC) is −14.63 % (the negative sign indicates decrease from baseline across the whole observed time period).

GEE Analysis 2: Outcome Changes Over-Time Adjusting for Covariates and Interactions (Table 5)—GEE analysis 2 incorporates all covariates simultaneously with interactions between time and age, and time and site type. Reference groups are identified in Table 5. Significant differences in post-intervention behavior change over time by age were not observed for any outcome, and therefore the age/time interaction has been removed from the table.

Significant differences in post-intervention behavior change over time by site type were observed; and, one or more site types were associated with less improvement at the first follow-up for four of the six outcomes. At the second follow-up only site type 2 (human service program/agency) was associated with a smaller reduction in any unprotected sex events while high/drunk. Reductions in the number of sex partners, for example, were significantly lower for site type 1 (OR = 6.86, 95 % CI: 2.99, 15.72, $P < 0.001$), site type 2 (OR = 8.18, 95 % CI: 3.59, 18.65, $P < 0.001$) and site type 3 (OR = 7.98, 95 % CI: 3.54, 17.95, $P < 0.001$) when compared to the post-intervention change in site type 4. At the second follow-up; however, significant differences were not observed. For the outcome “any unprotected sex” reductions were also lower at the first follow-up for site type 1 (OR = 2.65, 95 % CI: 1.01, 6.94, $P < 0.05$) and site type 3 (OR = 2.68, 95 % CI: 1.27, 5.62, $P < 0.01$), but significant differences were no longer observed at follow-up 2. Figure 2 shows the observed proportion of “any unprotected sex” at each time point by site type and overall for the 432 participants in the GEE analysis dataset. The plot shows graphically that all site types exhibited a reduction in risk between baseline and follow-up 1 and baseline and follow-up 2. Despite the observation of smaller decreases in site types 1 and 3 at follow-up 1, stratified analyses demonstrated significant reductions as compared to baseline for all site types at both follow-up time points.

Discussion

Since 2006, CDC has allocated resources to identify changes in sexual risk outcomes associated with HIV prevention behavioral interventions disseminated by CDC and implemented in the field [21, 22, 27]. This effort has become increasingly important with the release of the 2010 National HIV/AIDS Strategy, which emphasized the need to identify behavioral interventions that produce sustainable outcomes [7]. This outcome monitoring project supports SISTA as an HIV prevention behavioral intervention capable of producing positive changes in sexual risk outcomes when implemented in the field by CDC-funded CBOs. Additionally, this project demonstrates that these positive outcomes can be sustained up to 180 days following the intervention. Although the use of the NHM&E variables precluded this study from recreating the main outcome defined in the original RCT (consistent condom use) [18], the calculated variable “all protected sex events” was similar, and the OR for this outcome significantly increased across all statistical models when accounting for the main effect of time.

SISTA is a popular EBI that has been implemented across the United States [28]. The unique gender and culturally relevant approach has made SISTA desirable for adaptation [14, 28–31]. All CBOs in this evaluation adapted the intervention for implementation in a range of settings for women of various ages and races and the overall results indicate

that women receiving the adapted intervention experienced positive behavior change. The adaptations implemented during the evaluation often varied by site type, and sometimes by cycle. CDC worked closely with the CBOs to document the adaptations that were made at each site. It is important that service providers considering adaptation remain faithful to the original intent of the intervention as well as the core elements. Service providers planning to adapt SISTA should consult available SISTA resources, including the Effective Interventions website (www.effectiveinterventions.org), the SISTA implementation manual and peer reviewed literature related to SISTA and/or EBI adaptation prior to adaptation [32]. Evaluation plans for SISTA should include a process monitoring component in order to document adaptation activities for each site and cycle.

Findings from this evaluation demonstrate that participation in SISTA was associated with sexual risk reduction across a range of site types. Although some differences in post-intervention behavioral changes existed by site type at follow-up one, few variations existed at follow-up two. This suggests that the intervention may be effective when adapted for a range of different settings when delivery is conducted in accordance with the core elements; although, the findings are limited to 180 days post-intervention and to the individuals participating in this outcome monitoring project.

At least one-third of evaluation participants completed baseline data collection and received the SISTA intervention while they were in jail, residing in substance abuse treatment facilities or homeless shelters (site type 4). Participants in these sites demonstrated significantly higher numbers of sex partners, rates of unprotected sex and multiple partners, and rates of sex while intoxicated or high at baseline. This suggests that the women in this evaluation who were incarcerated, receiving substance abuse treatment or unstably housed were at significantly higher risk for HIV transmission and acquisition. The length of stay in these facilities prior to SISTA varied by participant, and at the two follow-ups the length of time elapsed in these facilities varied as well. Despite observed positive changes in several behavioral outcomes between baseline and the follow-ups in site type 4, the smaller improvement observed at follow-up two as compared to follow-up one, may indicate that once released from these facilities these women returned to some of the behaviors (e.g., transactional sex, substance-use/abuse) that brought them to site type 4. While the results demonstrated that SISTA produced some positive behavioral changes when implemented in jails, substance abuse treatment facilities and homeless shelters, findings from this evaluation also suggest that this population may benefit from additional services or interventions designed to address their unique needs and disproportionately-high risk behaviors.

This evaluation yielded several important considerations for service providers planning to implement and evaluate SISTA in similar site types. Site policies or local laws may restrict access to participants and/or prohibit certain activities, such as condom demonstrations and incentive distribution, which can impact intervention participation and delivery, and potentially influence the effectiveness of the intervention. Day-to-day client access and intervention participation may be restricted due to a change in inmate status or change in a treatment plan; individuals may cycle in and out of a facility or program making it difficult for a client to complete an intervention cycle. Additionally, clients in correctional

and substance abuse treatment facilities may have limited privacy and confidentiality rights which could impede their willingness or ability to meaningfully participate in the intervention or data collection.

The original SISTA RCT evaluated the efficacy of the intervention among young women, ages 18–29 years old [18]; however, the current procedural guidance for SISTA does not specify an age range for participants [19]. The participating CBOs enrolled women aged 30 and over into SISTA. All women enrolled in SISTA were eligible for participation in the evaluation regardless of age and were therefore included in the sample. The analytic models used in this evaluation failed to identify significant differences in behavior change for any of the outcomes by age when controlling for site type. This may be due to insufficient power to identify significant differences in this study, and does not necessarily indicate that age was not associated with the observed changes in behavior among SISTA participants. Model selection via goodness of fit resulted in the omission of age by time interactions in the multivariate models for all outcomes. As with older women, non-African American women receiving SISTA were included in this evaluation. However, there were an insufficient number of non-African American participants to stratify the results by race. Additional research is needed to asses the efficacy of SISTA when adapted for these groups.

The overall positive results from this evaluation suggest that women of all ages and races experienced positive behavioral changes after participating in SISTA; this, coupled with the interest among these women to participate in the intervention, suggests that there is a need and an opportunity for gender and culturally specific interventions for older African American women and similar interventions for women of other racial and ethnic groups.

The findings reported in this paper should be considered in conjunction with the following limitations. First, this project did not include a randomized sampling plan or a control group. Therefore, findings are limited to the SISTA participants enrolled in the outcome monitoring project at these five participating CDC-funded CBOs. Second, there is potential for biases associated with self-selection and self-reported data. Demographic and risk data on nonparticipants was not collected as part of this outcome monitoring project and could not be compared to that of participants to assess selectivity. The non-random selection of SISTA participants and the subset of those who were offered participation in CBOP limit the generalizability of the findings in this paper to participants. Biases and effects associated with self-reported data cannot be overlooked as potential contributors to behavior change. It is possible that participants could have exaggerated their responses or provided more socially desirable responses. Without a comparison group it is not possible to assess these biases as potential contributors to the observed behavior change. Third, as mentioned earlier, over the project period at least one-third of participants were incarcerated or residing in substance abuse treatment facilities or homeless shelters which may have affected the opportunity for, or reporting of, risk. This analysis did not explore the number of days each participant had spent in these facilities prior to each data collection point. Fourth, this project did not collect information on additional HIV prevention services being received by participants nor were data on participants' knowledge and attitudes toward HIV collected. Fifth, the outcomes were dictated by NHM&E variables; thus, this evaluation was unable to recreate all of the outcomes used in the original RCT. Additionally, variable definitions and

value choices were standardized, but the questions used to solicit responses to the variables were not. Lastly, we relied on PEMS as our primary data source for not only the behavioral data, but for some session-level data as well. PEMS updates over the project period as well as problems extracting the data from the system rendered some of the collected data unusable.

CBOP-SISTA is part of a portfolio of evaluations conducted by CDC [21, 22]. CDC has used lessons learned to inform the design and implementation of subsequent outcome monitoring projects conducted by CDC. For example, alternative data collection and reporting systems are being employed. Additionally, more recent projects are using standardized questions and capturing outcomes not covered by the NHM&E variables. As part of these projects, CBOs have been given opportunities to inform questionnaire development and receive expanded technical assistance related to conducting program evaluation. Current EBI evaluations are incorporating a fidelity assessment and collecting routine process monitoring data that identifies the characteristics of the agency environment and intervention delivery that may be associated with intervention effectiveness. Service providers and program planners may use the results and considerations discussed in this paper when developing their own SISTA implementation, monitoring, and evaluation plans.

The findings presented in this paper advance the research on SISTA by detailing intervention implementation and adaptation, and indicating that evaluation participants receiving SISTA as delivered by participating CBOs reported declines in sexual risk behaviors up to 180 days post-intervention. These results, along with other work on SISTA provide evidence that SISTA may be an important component to decreasing HIV/AIDS among African American women and reaching the objectives of the National HIV/AIDS Strategy.

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References

1. Centers for Disease Control and Prevention. Disparities in diagnosis of HIV infection between Blacks/African American and other racial/ethnic populations-37 states, 2005–2008. MMWR. 2011;60(04):93–8. [PubMed: 21293323]
2. Centers for Disease Control and Prevention. HIV surveillance report, 2009; vol. 21. Available at: http://www.cdc.gov/hiv/topics/surveillance/resources/reports/. Accessed 1 March 2011.
3. Hall HI, et al. Estimation of HIV incidence in the United States. J Am Med Assoc. 2008;300(5):520–9.
4. Centers for Disease Control and Prevention. Subpopulation estimates from the HIV incidence surveillance system—United States, 2006. MMWR. 2008;57(36):985–9. [PubMed: 18784639]
5. Hall HI, Hughes D, Dean HD, Mermin JH, Fenton KA. HIV infection-United States, 2005–2008. Centers for Disease Control and Prevention. MMWR. 2011;60(01):87–9.
6. Centers for Disease Control and Prevention. HIV among women fact sheet. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; August 2011. Available at: http://www.cdc.gov/hiv/topics/women/index.htm. Accessed 22 November 2011.

7. Office of National AIDS Policy. National HIV/AIDS Strategy for the United States. July 2010. Available at: http://www.whitehouse.gov/administration/eop/onap/nhas/. Accessed 18 March 2011.
8. Centers for Disease Control and Prevention. A heightened national response to the HIV/AIDS crisis among African Americans. Atlanta: U.S. Department of Health and Human. Services, Centers for Disease Control and Prevention; March 2007. Available at: http://www.cdc.gov/hiv/topics/aa/resources/reports/heightendresponse.htm. Accessed 24 June 2011.
9. Centers for Disease Control and Prevention. Division of HIV/AIDS Prevention Strategic Plan, 2011–2015. Available at: http://www.cdc.gov/hiv/strategy/dhap/pdf/dhap-strategic-plan.pdf. Accessed 25 June 2012.
10. Darbes L, Crepaz N, Lyles C, Kennedy G, Rutherford G. The efficacy of behavioral interventions in reducing HIV risk behaviors and incident sexually transmitted diseases in heterosexual African Americans. AIDS. 2008;22(10):1177–94. [PubMed: 18525264]
11. Johnson BT, Scott-Sheldon LA, Smoak ND, Lacroix JM, Anderson JR, Carey MP. Behavioral interventions for African Americans to reduce sexual risk of HIV: a meta-analysis of randomized controlled trials. J Acquir Immune Defic Syndr. 2009;51(4):492–501. [PubMed: 19436218]
12. Mize SJ, Robinson BE, Bockting WO, Scheltema KE. Meta-analysis of the effectiveness of HIV prevention interventions for women. AIDS Care. 2002;14(2):163–80. [PubMed: 11940276]
13. Gilbert D, Goddard L. HIV prevention targeting African American women: theory, objectives, and outcomes from an African-centered behavior change perspective. Family Community Health. 2007;30(1):S109–11. [PubMed: 17159625]
14. Prather C, Fuller TR, King W, et al. Diffusing an HIV prevention intervention for African American women: integrating Afrocentric components into the SISTA diffusion strategy. AIDS Educ Prev. 2006;18(Supp A):149–60. [PubMed: 16987096]
15. Rose M, Telfair Sharpe T, Raleigh K, Reid L, Foley M, Cleveland J. An HIV/AIDS crisis among African American women: a summary for prevention and care in the 21st century. J Women's Health. 2008;17(3):321–4.
16. McDavid K, Li J, Lee L. Racial and ethnic disparities in HIV diagnoses for women in the United States. J Acquir Immune Defic Syndr. 2006;42(1):101–7. [PubMed: 16763498]
17. Sutton MY, Jones RL, Wolitski RJ, Cleveland JC, Dean HD, Fenton KA. A review of the Centers for Disease Control and Prevention's response to the HIV/AIDS crisis among Blacks in the United States, 1981–2009. Am J Public Health. 2009;99(S2): S351–9. [PubMed: 19797748]
18. DiClemente RJ, Wingood GM. A randomized controlled trial of an HIV sexual risk reduction intervention for young African American women. J Am Med Assoc. 1995;274(16):1271–6.
19. DANYA Intl. Diffusion of Effective Behavioral Interventions (DEBI) Web site. Available at: http://www.effectiveinterventions.org/en/HighImpactPrevention/Interventions/SISTA.aspx. Accessed 18 March 2011.
20. Collins C, Harshbarger C, Sawyer R, Hamdallah M. The diffusion of effective behavioral interventions project: development, implementation, and lessons learned. AIDS Educ Prev. 2006;18 (suppl.A):5–20. [PubMed: 16987085]
21. Fisher HH, Patel-Larson A, Green K, et al. Evaluation of an HIV prevention intervention for African Americans and Hispanics: findings from the VOICES/VOCES community-based organization behavioral outcomes project. AIDS Behav. 2011;15(8): 1691–706. [PubMed: 21573724]
22. Heitgerd JL, Kalayil EJ, Patel-Larson A, et al. Reduced sexual risk behaviors among people living with HIV: results from the Healthy Relationships outcome monitoring project. AIDS Behav. 2011;15(8):1677–90. [PubMed: 21390538]
23. Thomas CW, Smith BD, Wright-DeAguero L. The Program Evaluation and Monitoring System: a key source of data for monitoring evidence-based HIV prevention program processes and outcomes. AIDS Educ Prev. 2006;18(suppl. A):74–80. [PubMed: 16987090]
24. Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. Biometrika. 1986;73:13–22.
25. Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. Biometrics. 1986;42:121–30. [PubMed: 3719049]

26. Pan W. Akaike's information criterion in generalized estimating equations. Biometrics. 2001;57:120–5. [PubMed: 11252586]

27. Smith BD, Kalayil EJ, Patel-Larson A, Chen B, Vaughn M. Retaining clients in an outcome monitoring evaluation study: HIV prevention efforts in community settings. Eval Program Plan. 2012;35(1):16–24.

28. Wingood GM, Simpson-Robinson L, Braxton ND, Raiford JL. Design of a faith-based HIV intervention: a successful collaboration between a university and a church. Health Promot Pract. 2011;12(6):823–31. [PubMed: 21511996]

29. Saleh-Onoya D, et al. SISTA South Africa: the adaptation of an efficacious HIV prevention trial conducted with African American women for isiXhosa-speaking South African women. J Soc Aspects HIV/AIDS. 2008;5(4):186–91.

30. Cornelius JB, Moneyham L, LeGrand S. Adaptation of an HIV prevention curriculum for use with older African American women. J Assoc Nurses AIDS Care. 2008;19(1):16–27. [PubMed: 18191765]

31. Card JJ, Kuhn T, Solomon J, Benner TA, Wingood GM, DiClemente RJ. Translating an effective group-based HIV prevention program to a program delivered primarily by a computer: methods and outcomes. AIDS Educ Prev. 2011;23(2):159–74. [PubMed: 21517664]

32. McKleroy VS, Galbraith JS, Cummings B, et al. Adapting evidence-based behavioral interventions for new settings and target populations. AIDS Educ Prev. 2006;18(suppl. A):59–73. [PubMed: 16987089]

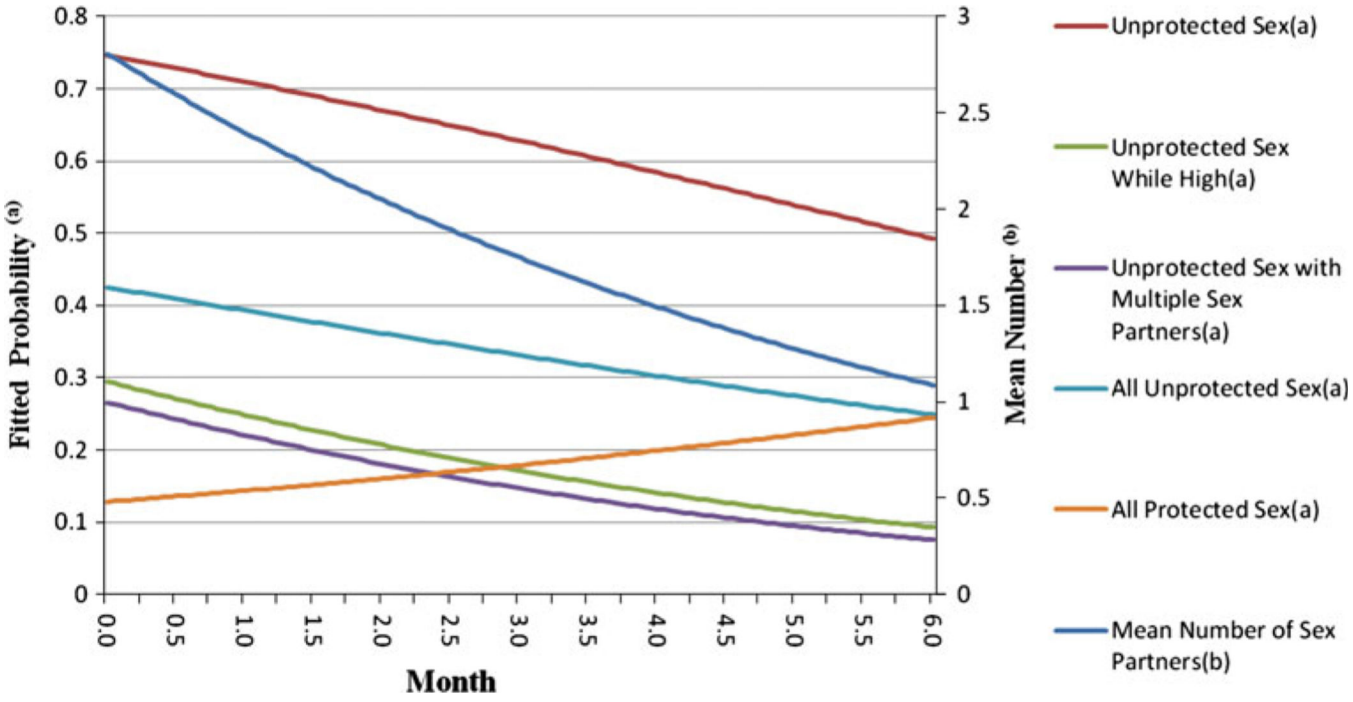

Fig. 1.

Predicted growth curves of outcomes over time from the GEE containing only the time covariate (Analysis 1), SISTA Community-based Organization Behavioral Outcomes Project, 2008–2010

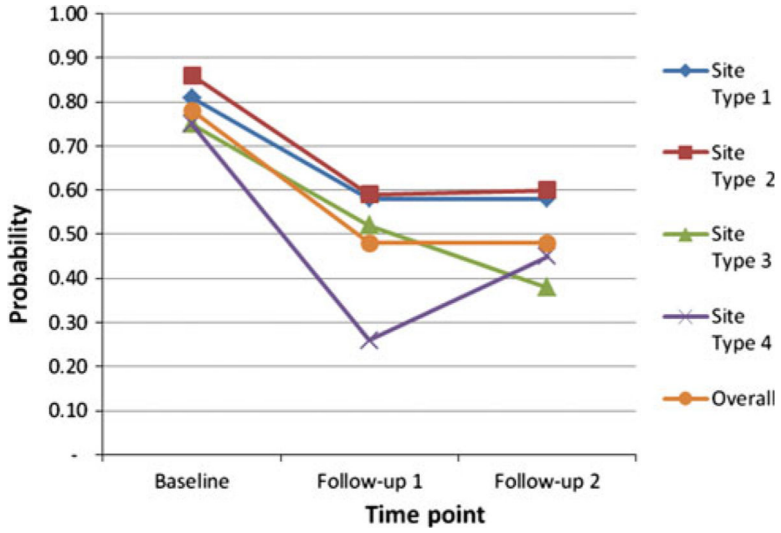

Fig. 2.

Observed probabilities of any unprotected sex using GEE (overall and by site type), SISTA Community-based Organization Behavioral Outcomes Project, 2008–2010

Table 1

Characteristics of SISTA sessions attended by evaluation participants by agency, SISTA Community-based Organization Behavioral Outcomes Project, 2008–2010

	CBO A	CBO B	CBO C	CBO D	CBO E
Agency location Intervention delivery sites	Atlanta, GA CBO for African American/ Black women; day shelter for homeless individuals; job readiness CBO; residential substance-abuse facility[a]; short term jail: university	Panama City, FL Agency; private residences and other community venues (e.g., apartment complex community rooms)	Jackson, MS Apartment complex community room; homeless shelter[a]; Job Corps; job readiness program; prison	New Orleans, LA High school; homeless shelter; Job Corps; residential substance abuse treatment facilities (women with and without mental health issues); transitional housing facility	Atlanta, GA Church; residential substance-abuse treatment facility[a]; technical college; women's health initiative
Number of intervention cycles	12	15	12	11	9
Average number of participants per cycle	12.6 (range = 5–21)	5.7 (range = 1–12)	9.3 (range = 5–13)	11.6 (range = 2–26)	15.6 (range = 4–30)
Adaptations[b]	• Adjusted intervention schedule • Removed video; penis model was replaced by hand demonstration of condom use; homework was not given (in jail)	• Adjusted intervention schedule • Added culturally appropriate video	• Added new activities to each session, including a discussion about STDs • Added culturally appropriate videos • Replaced condom demonstration with a verbal activity describing condom use (in prison)	• Adjusted intervention schedule • Added activities to sessions 1, 3, and 4 • Reduced the number of role-plays • Offered HIV testing as part of session 4 or 5, at times	• Adjusted intervention schedule • Added poems • Removed video from session 2
SISTA pre-intervention introductory session Incentives offered	Yes Non-monetary incentives[c]	No Monetary incentives	Yes Non-monetary incentives	Yes Monetary and non-monetary incentives	Yes Monetary and non-monetary incentives
Optional booster sessions[d]	No booster sessions offered	2 booster sessions offered, 60 and 120 days post-intervention	1 booster session offered, 7–14 days post-intervention	1 booster session offered, 90 days post-intervention	1 booster session offered, 7 days post-intervention

[a] Participation in SISTA was required in order for client to receive services

[b] Some adaptations varied slightly by intervention delivery site

[c] Individuals in the correctional facility received a low denomination transportation fare card

[d] Booster sessions were optional; therefore, attendance was not required. Booster sessions varied by delivery site, and were not always offered in every site or for all cycles delivered at that site

Table 2

Baseline demographic characteristics of participants stratified by agency and overall, SISTA Community-based Organization Behavioral Outcomes Project, 2008–2010

	CNBO A *n* = 151 (%)[a]	CBO B *n* = 85 (%)[a]	CBO C *n* = 111 (%)[a]	CBO D *n* = 128 (%)[a]	CBO E *n* = 140 (%)[a]	All participants *n* = 615 (%)[a]	GEE analysis *n* = 432 (%)[a]
Gender							
Male	4 (2.6)	0	0	0	0	4 (0.7)	0
Female	146 (96.7)	85 (100.0)	111 (100.0)	128 (100.0)	140 (100.0)	610 (99.2)	432 (100.0)
Transgender	1 (0.7)	0	0	0	0	1 (0.2)	0
Race							
Black or African American	142 (94.0)	85 (100.0)	104 (93.7)	100 (78.1)	138 (98.6)	569 (92.5)	402 (93.1)
White	9 (6.0)	0	6 (5.4)	27 (21.1)	2 (1.4)	44 (7.2)	28 (6.5)
Other	0	0	1 (0.9)	1 (0.8)	0	2 (0.3)	2 (0.5)
Ethnicity							
Hispanic or Latino	4 (2.6)	0	1 (0.9)	1 (0.8)	3 (2.1)	9 (1.5)	5 (1.2)
Not Hispanic or Latino	147 (97.4)	85 (100.0)	110 (99.1)	127 (99.2)	137 (97.9)	606 (98.5)	427 (98.8)
Age (years)							
18–24	35 (23.2)	28 (32.9)	82 (73.9)	91 (71.1)	65 (46.4)	301 (48.9)	230 (53.2)
25–34	51 (33.8)	23 (27.1)	9 (8.1)	20 (15.6)	34 (24.3)	137 (22.3)	99 (22.9)
35–44	30 (19.9)	21 (24.7)	9 (8.1)	12 (9.4)	25 (17.9)	97 (15.8)	66 (15.3)
45–54	28 (18.5)	11 (12.9)	10 (9.0)	4 (3.1)	15 (10.7)	68 (11.1)	35 (8.1)
55+	7 (4.6)	2 (2.4)	1 (0.9)	1 (0.8)	1 (0.7)	12 (2.0)	2 (0.5)
Primary language							
English	146 (99.3)	85 (100.0)	111 (100.0)	128 (100.0)	140 (100.0)	610 (99.8)	428 (99.8)
Other	1 (0.7)	0	0	0	0	1 (0.2)	1 (0.2)
Relationship status							
Single, never married	90 (61.2)	40 (47.1)	99 (89.2)	107 (83.6)	112 (81.2)	448 (73.6)	325 (75.9)
Married or partnered	19 (12.9)	27 (31.8)	4 (3.6)	8 (6.3)	7 (5.1)	65 (10.7)	46 (10.7)
Married, separated	11 (7.5)	9 (10.6)	3 (2.7)	4 (3.1)	8 (5.8)	35 (5.7)	22 (5.1)
Divorced	24 (16.3)	9 (10.6)	5 (4.5)	9 (7.0)	9 (6.5)	56 (9.2)	33 (7.7)
Widowed	3 (2.0)	0	0	0	2 (1.4)	5 (0.8)	2 (0.5)
Education							
Less than high school graduate	38 (25.9)	7 (8.2)	51 (45.9)	87 (68.0)	82 (59.4)	265 (43.5)	187 (43.7)
High school graduate or GED	64 (43.5)	39 (45.9)	41 (36.9)	20 (15.6)	27 (19.6)	191 (31.4)	136 (31.8)
Some college	38 (25.9)	34 (40.0)	13 (11.7)	19 (14.8)	23 (16.7)	127 (20.9)	86 (20.1)

	CNBO A *n* = 151 (%)[a]	CBO B *n* = 85 (%)[a]	CBO C *n* = 111 (%)[a]	CBO D *n* = 128 (%)[a]	CBO E *n* = 140 (%)[a]	All participants *n* = 615 (%)[a]	GEE analysis *n* = 432 (%)[a]
Bachelor or postgraduate degree	6 (4.1)	5 (5.9)	6 (5.4)	2 (1.6)	6 (4.3)	25 (4.1)	18 (4.2)
Not asked/other	1 (0.7)	0	0	0	0	1 (0.2)	1 (0.2)

[a]Percentages may not total to 100 because of missing data or rounding

Table 3

Baseline risk factors of participants and site types stratified by agency and overall, SISTA Community-based Organization Behavioral Outcomes Project, 2008–2010

	CBO A *n* = 151 (%)	CBO B *n* = 85 (%)	CBO C *n* = 111 (%)	CBO D *n* = 128 (%)	CBO E *n* = 140 (%)	All participants *n* = 615 (%)	GEE analysis *n* = 432 (%)
STD diagnosis Yes	18 (11.9)	1 (1.2)	32 (28.8)	15 (11.7)	12 (8.6)	78 (12.7)	69 (16.0)
Incarceration Yes	50 (33.1)	2 (2.4)	27 (24.3)	26 (20.3)	30 (21.4)	135 (22.0)	85 (19.7)
Exchange sex for money Yes	45 (29.8)	2 (2.4)	51 (45.9)	18 (14.1)	38 (27.1)	154 (25.0)	117 (27.1)
Pregnant Yes	44 (29.1)	8 (9.4)	8 (7.2)	8 (6.3)	11 (7.9)	79 (12.8)	60 (13.9)
Previous HIV test Yes	141 (93.4)	70 (82.4)	111 (100.0)	96 (75.0)	126 (90.0)	544 (88.5)	385 (89.1)
Of those previously tested HIV-positive	4 (2.6)	0	0	0	5 (3.6)	9 (1.5)	8 (1.9)
Site type[a] Community venue/private residence	0	68 (80.0)	12 (10.8)	0	0	80 (13.0)	64 (14.8)
Human service program/agency	87 (57.6)	12 (14.1)	5 (4.5)	18 (14.1)	13 (9.3)	135 (22.0)	88 (20.4)
School/university	5 (3.3)	5 (5.9)	65 (58.6)	62 (48.4)	62 (44.3)	199 (32.4)	155 (35.9)
Correctional facility, residential substance abuse treatment facility and homeless shelter	59 (39.1)	0	29 (26.1)	48 (37.5)	65 (46.4)	201 (32.7)	125 (28.9)

[a]Percentages may not total to 100 because of missing data or rounding

Table 4

Sexual risk behaviors reported by participants over time, SISTA Community-based Organization Behavioral Outcomes Project, 2008–2010

	Baseline (n = 498)[a]		Follow-up 1 (90 days) (n = 401)[a]		Follow-up 2 (180 days) (n = 394)[a]	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Number of sex partners	2.9	15.2	0.98***	1.0	1.2*	4.2
Number of sex events	17.9	27.5	13.7*	18.2	15.4	22.7
Number of unprotected sex events	11.8	19.6	6.5***	11.1	6.4***	11.8
Number of unprotected sex events while intoxicated or high on non-injection	3.2	9.5	0.8***	3.3	0.7***	4.0
	n	**%**	***n***	**%**	***n***	**%**
Unprotected sex events and multiple partners[b]	125	25.1	38	9.5	28	7.1
All unprotected sex events	219	44.0	98	24.4	97	24.6
All protected sex events	69	13.9	86	21.4	110	27.9

*$P < 0.05$

***$P < 0.001$

[a]Excludes individuals who reported no sex events or were missing outcomes data at all three time-points

[b]Individuals who reported more than one sex partner and at least one unprotected sex event

Table 5

Generalized estimating equations (GEE) regression results, SISTA Community-based Organization Behavioral Outcomes Project, 2008–2010

	Number of sex partners	Any unprotected sex events	Any unprotected sex events while intoxicated or high on non-injection drugs	Any unprotected sex events and multiple sex partners	All unprotected sex events	All protected sex events
	RR (95 % CI)	OR (95 % CI)	OR (95 % CI)	OR (95 % CI)	OR (95 % CI)	OR (95 % CI)
Analysis 1: Changes in risk behaviors over time (unadjusted)						
Time (ref = baseline)						
Follow-up 1	0.31 (0.18, 0.51) ***	0.27 (0.21, 0.35) ***	0.33 (0.25, 0.44) ***	0.29 (0.20, 0.40) ***	0.41 (0.31, 0.54) ***	1.84 (1.31, 2.60) ***
Follow-up 2	0.41 (0.22, 0.75) **	0.26 (0.19, 0.35) ***	0.20 (0.13, 0.29) ***	0.19 (0.12, 0.30) ***	0.43 (0.33, 0.57) ***	2.53 (1.80, 3.55) ***
Analysis 2: Changes in risk behaviors over time, site, CBO, and age group and interaction terms group (adjusted for emanates)						
Time (ref = baseline)						
Follow-up 1	0.09 (0.04, 0.21) ***	0.13 (0.07, 0.24) ***	0.07 (0.03, 0.15) ***	0.12 (0.06, 0.26) ***	0.36 (0.26, 0.49) ***	2.62 (1.85, 3.73) *
Follow-up 2	0.33 (0.11, 0.93) *	0.29 (0.14, 0.58) **	0.08 (0.03, 0.18) ***	0.17 (0.08, 0.37) ***	0.38 (0.28, 0.52) **	3.71 (2.62, 5.25) *
Age group (ref = 18–24)						
Age >34	NA [b]	NA [b]	NA [b]	0.66 (0.32, 1.53)	NA [b]	0.79 (0.47, 1.34)
Age 25–34	NA [b]	NA [b]	NA [b]	1.69 (0.85, 3.34)	NA [b]	0.42 (0.24, 0.76) **
CBO (ref = CBO E)						
CBO A	NA [b]	1.83 (1.11, 3.02) *	1.10 (0.57, 2.14)	1.88 (1.00, 3.54) *	0.99 (0.60, 1.63)	0.50 (0.27, 0.96) *
CBO B	NA [b]	1.37 (0.56, 3.33)	0.12 (0.02, 0.57) **	0.90 (0.33, 2.44)	1.84 (0.86, 3.95)	0.46 (0.23, 0.9) *
CBO C	NA [b]	2.05 (1.24, 3.38) **	6.45 (3.38, 12.32) ***	4.06 (2.09, 7.89) ***	0.37 (0.22, 0.62) ***	0.75 (0.43, 1.30)
CBO D	NA [b]	1.01 (0.65, 1.58)	0.33 (0.16, 0.68) **	0.74 (0.39, 1.43)	0.89 (0.55, 1.43)	1.06 (0.62, 1.84)
Site (ref = site 4)						
Site 1 [a]	0.16 (0.08, 0.33) ***	1.18 (0.40, 3.46)	0.41 (0.09, 1.84)	0.11 (0.03, 0.37) **	1.67 (0.79, 3.52)	NA [b]
Site 2 [a]	0.19 (0.09, 0.40) ***	1.66 (0.79, 3.49)	0.15 (0.07, 0.33) ***	0.16 (0.08, 0.34) ***	1.68 (1.04, 2.72) *	NA [b]
Site 3 [a]	0.20 (0.1, 0.42) ***	0.93 (0.52, 1.65)	0.15 (0.07, 0.29) ***	0.31 (0.14, 0.69) **	0.79 (0.51, 1.21)	NA [b]
Interactions						
ref = Follow-up 1 × site 4						

	Number of sex partners	Any unprotected sex events	Any unprotected sex events while intoxicated or high on non-injection drugs	Any unprotected sex events and multiple sex partners	All unprotected sex events	All protected sex events
	RR (95 % CI)	**OR (95 % CI)**	**OR (95 % CI)**	**OR (95 % CI)**	**OR (95 % CI)**	**OR (95 % CI)**
Follow-up 1 × site 1	6.86 (2.99, 15.72)***	2.65 (1.01, 6.94)*	4.46 (1.39, 14.35)*	1.32 (0.13, 12.97)	NA[b]	NA[b]
Follow-up 1 × site 2	8.18 (3.59, 18.65)***	1.88 (0.76, 4.63)	10.95 (3.71, 32.27)***	4.83 (1.78, 13.13)**	NA[b]	NA[b]
Follow-up 1 × site 3	7.98 (3.54, 17.95)***	2.68 (1.27, 5.62)**	5.82 (2.33, 14.53)**	2.56 (0.99, 6.57)	NA[b]	NA[b]
ref = Follow-up 2 x site 4						
Follow-up 2 × site 1	2.16 (0.74, 6.28)	1.18 (0.44, 3.18)	2.02 (0.50, 8.1)	1.87 (0.29, 12.17)	NA[b]	NA[b]
Follow-up 2 × site 2	2.23 (0.77, 6.45)	0.88 (0.33, 2.38)	5.92 (1.53, 22.86)**	2.15 (0.62, 7.45)	NA[b]	NA[b]
Follow-up 2 × site 3	1.74 (0.61, 5.01)	0.68 (0.30, 1.56)	1.78 (0.58, 5.47)	0.50 (0.15, 1.67)	NA[b]	NA[b]

*$P < 0.05$

**$P < 0.01$

***$P < 0.001$

[a]Site 1 = Community venue/private residence; site 2 = human service program/agency; site 3 = school/university; site 4 = correctional facility, residential substance abuse treatment facility and homeless shelter

[b]*NA* not applicable. Covariate removed from the model based upon selection of multivariate model using goodness of fit testing