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Rate of Decay in Proportion of Condom Protected Sex Acts among Adolescents Following Participation in an HIV Risk-Reduction Intervention

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Abstract

Objective—HIV risk-reduction interventions have demonstrated efficacy in enhancing the proportion of condom protected sex acts (CPS) among diverse populations. While post-intervention exposure increases in CPS are often observed, there is scant empirical data quantifying decay of intervention efficacy (declines in CPS following cessation of the intervention among participants reporting an initial post-intervention increase in CPS). Thus, the objective of this study was to quantify the rate of decay in intervention efficacy over a 24-month follow-up.

Design—African-American adolescent females (ages 14–20; N = 349) completed a baseline ACASI, participated in an HIV risk-reduction intervention, and were assessed at 6-month intervals for 24-months post-intervention. Intervention efficacy was conceptualized as an increase in participants' CPS relative to baseline.

Methods—Analyses focused on the subset of participants who reported an initial increase in CPS from baseline to the 6-month post-intervention assessment (n = 121) to quantify the rate of decay in intervention efficacy over a 24-month follow-up period.

Results—CPS increased markedly from baseline to 6-month follow-up assessment. However, from 6- to 12-months, a marked decline in CPS was observed. Further CPS declines, though not statistically significant, were observed from 12- to 18-months and 18- to 24-months. Cumulative reductions in CPS over the entire 24-month follow-up resulted in no statistical difference between baseline and 24-month follow-up; indicative of a non-significant intervention effect at 24-month assessment.

Conclusions—Innovative post-intervention optimization strategies are needed to minimize CPS decay over protracted time periods by reinforcing, sustaining, and potentially amplifying initial gains in condom use.

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Keywords

HIV prevention interventions; condom; African American adolescents

Introduction

African American young women experience elevated rates of sexually transmitted diseases (STDs) [1]. Recent national estimates indicate that African American female adolescents between the ages of 15 and 19 experience the highest rates of chlamydia and gonorrhea [2]. This is particularly alarming given that STDs pose a number of negative health consequences and increase susceptibility to HIV [3–5]. African American adolescents have also been disproportionately affected by the HIV epidemic [6], accounting for 73% of adolescent HIV infections, with a diagnosis rate nearly 23 times the rate for Caucasian adolescents [7]. Among African American adolescent women, the majority of incident STD/HIV infections are acquired via heterosexual transmission [7, 8]. Given the high prevalence of STDs and HIV among African American female adolescents, there is a clear and compelling need to develop and disseminate efficacious STD/HIV prevention interventions for this population.

Recent reviews indicate that behavioral HIV risk-reductions are efficacious in enhancing adoption of HIV-preventive sexual behaviors among adolescents, including African American females [9–18]. Indeed, a number of reviews and meta-analyses indicate that risk-reduction interventions often result in increased rates of condom protected sexual encounters, fewer sexual partners, and decreased frequency of sexual episodes [9–18]. Interventions that include condom skills training, address barriers to consistent condom use, and provide strategies to improve sexual communication with sex partners are most efficacious [14, 15] as well as those that are designed to be culturally- and gender-tailored to the target population [15]. While the cumulative findings suggest that HIV risk-reduction interventions offer protection from HIV and some STDs, they typically use a short-term follow-up period to assess programmatic efficacy. For example, in a recent meta-analysis of adolescent HIV risk-reduction interventions, the median follow-up period was 13 weeks post-intervention [14]. For behavior change to be meaningful it must be durable; however, there is scant empirical data quantifying decay of intervention efficacy (declines in condom protected sex acts following an initial post-intervention increase in condom protected sex acts) over a longer follow-up period.

Recent studies conducted with high risk adults and adolescents have recognized the variability of initial and sustained responses to HIV/STD risk-reduction interventions [19–22]. These studies have demonstrated that even homogeneous subgroups show different patterns of change in response to tailored interventions [20–22]. For example, Sales and colleagues found that 43% of African American adolescent females did not increase their condom use behavior following participation in an evidence-based HIV prevention intervention [23]. Those who did not change their condom use behavior were more likely to endorse a history of physical abuse, having a current boyfriend, and elevated levels of sensation seeking [23]. A second study examined patterns of sexual behaviors among adult STD clinic patients who received risk reduction counseling and were subsequently followed for 9 months post-counseling [21]. Cluster analyses identified three subgroups: 1) sustained low risk behaviors over time, 2) significant reduction in risk behaviors over time, and 3) increased risk behaviors over time [21]. However, no baseline behaviors differentiated the three subgroups over time, post-intervention. These studies highlight the variability in condom use behavior subsequent to participation in an STD/HIV prevention intervention. However, there is a lack of empirical data examining the rate of condom use over longer

periods of time subsequent to intervention participation among high-risk African American female adolescents.

Thus, the aim of the present study was to quantify the rate of decay in the efficacy of an evidence-based HIV prevention intervention for African American adolescent females (HORIZONS) over a 24-month follow-up period. Specifically, this study examined the durability of intervention efficacy by monitoring changes in the proportion of condom protected sex acts (CPS) post-intervention among those adolescent females reporting an increased proportion of CPS at the 6-month post-intervention assessment.

Methods

Participants

From June 2005 to June 2008 African American adolescent females, ages 14–20 years, were recruited from three clinics providing sexual health services to predominantly inner-city adolescents in Atlanta, Georgia. An African American female recruiter approached adolescents in clinic waiting areas, described the study, solicited participation, and assessed eligibility. Eligibility criteria included self-identifying as African American, 14–20 years of age at time of enrollment, and reporting at least one episode of unprotected vaginal sex in the past 6 months. Adolescents were excluded from participation if they were married, pregnant, or attempting to become pregnant. Adolescents meeting inclusion criteria and interested in participating were scheduled to return to the clinic to complete informed consent procedures, baseline assessments, and be randomized to trial conditions. Written informed consent was obtained from all adolescents. Parental consent was waived for those younger than 18 due to the confidential nature of clinic services. Of the eligible adolescents, 94% (N=701) enrolled in the study, completed baseline assessments and were randomized to study conditions. Participants were compensated for travel and childcare to attend the intervention and complete assessments. The Emory University Institutional Review Board approved all study protocols.

Procedures

Study design—The study was a two-arm randomized controlled supplemental treatment trial [24]. In supplemental treatment trials, participants receive a “primary” treatment and, subsequently, receive a different (supplemental) treatment to enhance effects of the primary treatment. In this study, participants randomized to the experimental condition (n = 342) received as their primary treatment a CDC evidence-based, culturally- and gender-appropriate HIV intervention for African American adolescent female adolescents known as HORIZONS [25]. The supplemental treatment, phone-delivered HIV prevention maintenance counseling (PMC), initiated following HORIZONS, consisted of a health educator administering 9 brief, tailored phone contacts approximately every 8 weeks for 18 months. Participants randomized to the comparison condition (n = 359) also received HORIZONS as their primary treatment and a placebo-control; time- and dose-equivalent phone-delivered General Health Promotion (GHP) supplemental treatment. The GHP condition was administered on the same schedule, 9 brief, phone contacts every 8 weeks for 18 months, by a health educator.

To quantify the rate of decay in HORIZONS intervention efficacy over a 24-month follow-up period we examined initial increases to CPS among adolescents in the Comparison condition; the condition in which adolescents were *only* exposed to the HORIZONS intervention without the supplemental phone-delivered HIV PMC. Analyses in the present study focused on the subset of participants in the HORIZONS-only condition who reported

an initial increase in the proportion of CPS from baseline to the 6-month post-intervention assessment ($n = 121$).

Data collection—Data collection occurred at baseline, prior to randomization, and at 6-, 12-, 18- and 24-months following participation in HORIZONS. Data collection consisted of an audio computer-assisted self-administered interview (ACASI). ACASI enhances accurate reporting, reduces social desirability bias, and minimizes reporting errors associated with low literacy [26, 27]. The ACASI assessed sociodemographics, sexual behaviors, and attitudes associated with HIV-preventive behaviors. Sexual behaviors were assessed at 6-month intervals post-HORIZONS intervention using strategies to facilitate recall and enhance validity of self-report (i.e., Timeline Followback methodology) [28, 29].

Measures

Sociodemographics—Participants reported their age and current educational status.

Proportion of CPS—The proportion of CPS during vaginal sex in the 6 month period prior to assessment was calculated by dividing the number of times condoms were used during vaginal sex by the number of times the participant reported having vaginal sex. At each assessment participants were asked, “In the past 6 months, how many times have you had vaginal sex?” Following this question, participants were asked, “Out of the XX times you've had vaginal sex, in the past 6 months, how many times did you use a condom?”

Analysis Plan

Analyses focused on the subset of participants who reported initial gains in the proportion of CPS from baseline to the 6-month post-intervention assessment among those randomized to the comparison condition (HORIZONS only). Change in the proportion of CPS was calculated by comparing participants' reported proportion condom use in the 6 months prior to baseline (prior to intervention participation) to their reported proportion of condom use in the 6 months prior to the six-month follow-up assessment (post-intervention). Proportion of CPS at the six-month follow-up post-intervention was selected because most HIV risk-reduction programs observe the largest intervention impact on behavior change (i.e., increased condom use) closer to intervention participation [30]. Participants in the comparison condition (HORIZONS only) who reported increases in their proportion condom use from baseline levels were included in the analyses ($n = 121$).

All analyses were performed using STATA version 12.0. First, descriptive statistics were calculated to examine the rate of CPS at each of the assessment time points (6-, 12-, 18-, 24-months post-intervention). Second, a series of Ordinary Least Squares (OLS) regression analyses were performed to examine change in the proportion of CPS between each of the assessment points (e.g., difference in proportion of CPS between 12- and 18-month post-intervention assessments and between 18–24 months post-intervention assessments).

Results

Participant Characteristics

Analyses were limited to participants in the comparison HORIZONS only condition who reported an increased proportion of condom protected sex acts from the baseline to 6-month post-intervention assessment ($n = 121$). Participants were between 14 and 20 years old with mean (SD) age of 17.6 (1.7). With regards to education level at the baseline assessment, 9.9% completed the eighth grade or below, 45.5% were in high school (grades 9–12), 22.3% had graduated from high school or earned a GED, 18.2% had completed one or more years

of college, and 4.1% described their level of education as “other.” Participants were recruited from three clinical venues that provide adolescent sexual health services: a county health department STD clinic (n = 59), a hospital-based adolescent sexual health clinic (n = 17), and a Planned Parenthood clinic (n = 45).

Proportion of CPS

Gains in CPS reported at the 6-month assessment decayed steadily over the 24-month follow-up (see Figure 1, Table 1). The mean (standard error) of CPS was .39 (.03), .74 (.03), .60 (.04), .54 (.04), and .45 (.05) at the baseline, 6-, 12-, 18-, and 24-month assessment, respectively. Differences in CPS between assessments were measured using a series of OLS regression analyses (see Table 2). There was an increase in CPS from baseline to 6-month follow-up assessment ($t = 3.6, p < .001$). From the 6- to 12-month assessments, the rate of CPS decreased significantly ($t = -2.6, p = .01$). Further CPS declines, though not statistically significant, were observed from the 12- to 18-month follow-up assessment and the 18- to 24-month follow-up assessment. Cumulative reductions in CPS over the entire 24-month follow-up resulted in no statistical difference between the baseline and the 24-month follow-up assessment ($t = 1.4, p = .17$); indicative of a non-significant intervention effect at 24-month follow-up assessment. Overall, across the entire 24-month follow-up, we observed significant monotonic decay in intervention efficacy.

Discussion

Results indicate that approximately one-third of African American female adolescents increased the proportion of CPS in the first six months post-intervention exposure. However, among those demonstrating initial increases in condom use, there was a steady, monotonic decay in the proportion of CPS over a two-year follow-up period. The greatest decline in the proportion of CPS occurred between the 6- and 12-month post-intervention follow-up assessments. Additionally, at two years post-intervention there was no difference in the proportion of CPS relative to baseline levels.

HORIZONS is a CDC defined evidence based HIV prevention intervention that is culturally- and gender-tailored for African American female adolescents [25]. However, results from this study suggest even a demonstrated evidence-based HIV/STD risk-reduction intervention may not be capable of sustaining health protective behavior changes over a protracted time period of two years. These findings suggest that innovative post-intervention optimization strategies are needed to minimize decay in intervention effects over extended periods of time. One promising strategy is the use of phone-delivered HIV prevention maintenance counseling. Such an approach offers a potentially cost-effective strategy to provide tailored prevention information and behavioral skills coaching to sustain HIV-preventive behaviors [31, 32]. Indeed, results from the parent study indicate that repeated phone-delivered health coaching sessions result in decreased sexual risk behaviors and incident STDs over extended follow-up periods [33].

New advances in mobile technology are transforming public health [31, 32]. Mobile phones, unlike other technological innovations, which are often unavailable to lower socioeconomic groups, are common among adolescents; 75% own a cell phone and 38% make daily calls [34]. African American adolescents, in particular, demonstrate mobile phone use that is equal to or surpasses their Caucasian peers [34, 35]. Thus, the increasing availability of mobile phones suggests that mobile-delivered intervention strategies that provide HIV/STD prevention maintenance counseling can capitalize on a technology that is rapidly being adopted and integrated into African American adolescents' lifestyle to impact HIV/STD racial disparities [36, 37]. Thus, the development and dissemination of efficacious and feasible prevention maintenance interventions, such as phone-delivered maintenance

counseling, could be a valuable adjuvant to sustain the prevention impact of CDC evidence-based interventions and enhance the capacity of community-based agencies and health departments to reduce HIV/STD-related disparities. Currently there are no HIV/STD prevention maintenance interventions available in the “toolkit” of prevention approaches.

Limitations

This study is not without limitations. First, the measure of intervention efficacy focused exclusively on the proportion of CPS. Thus, analyses may not have fully captured participants who endorsed other behavior changes (e.g., reduced number of sexual partners) subsequent to participating in the intervention. However, while HORIZONS addressed a number of HIV/STD-associated behaviors, the primary target for change was condom use. Thus, many of the HORIZONS activities targeted increasing condom use. Second, the measure of intervention efficacy was collected via self-report data, which may be subject to motivational biases to underreport risk behaviors [38]. While the study employed ACASI and other enhancements to encourage accurate self-report, we cannot rule out this threat to the validity of the findings. Fourth, the data employed in this study were only from participants who returned for post-intervention follow-up assessments. Thus, it is possible that adolescents who completed follow-up assessments may differ in meaningful ways from those who did not return for follow-up. The findings of this study may not generalize to other young women who have participated in STD/HIV prevention programs, especially if they participated in programs that varied dramatically in content from HORIZONS. Lastly, this study was conducted with African American female adolescents recruited from urban, Southern sexual health clinics. Results may not generalize to other populations.

Conclusions

African American adolescent females are at increased risk for STD/HIV acquisition. To address this growing health disparity, there is a need for efficacious STD/HIV prevention interventions that can sustain HIV/STD-protective health behaviors over extended periods of time. While group-delivered interventions often demonstrate initial behavioral improvements following participation in the intervention, innovative, cost-effective strategies to bolster intervention efficacy need to be developed, evaluated, and disseminated. Technology-delivered intervention formats offer one promising approach to reinforce and sustain HIV/STD prevention messages and HIV/STD-preventive behavior changes.

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Figure 1.
Change in CPS among participants reporting an initial increase in condom use post-intervention exposure.
Note: Mean proportion condom use presented for each assessment time point with corresponding standard error bars.

Table 1

Proportion of CPS among participants reporting initial increase in condom use

Assessment Time Point (Months Post-Intervention)	Number of observations	Mean CPS (SE)	Absolute Change in CPS	Relative Change in CPS
Baseline assessment		0.39 (.03)		
6-month follow-up assessment	121	0.74 (.03)	+0.35	+89.7%
12-month follow-up assessment	97	0.60 (.04)	−0.14	−18.9%
18-month follow-up assessment	94	0.54 (.04)	−0.06	−10.0%
24-month follow-up assessment	89	0.45 (.05)	−0.09	−16.6%

Table 2

Change in proportion of condom protected sex acts across follow-up assessments.

Assessment Time Point (Months Post-Intervention)	Baseline	6-months	12-months	18-months	24-months
1. Baseline	---	t = 3.6, p < .001	---	---	t = 1.4, p = .17
2. 6-months	---	---	t = -2.6, p = .01	---	t = -5.8, p < .001
3. 12-months	---	---	---	t = -1.1, p = .28	---
4. 18-months	---	---	---	---	t = -1.6, p = .12
5. 24-months	---	---	---	---	---