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Developmental implications of HIV prevention during adolescence: Examination of the long-term impact of HIV prevention interventions delivered in randomized controlled trials in grade six and in grade 10

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Abstract

Dramatic changes occur in abstract reasoning, physical maturation, familial relationships and risk exposure during adolescence. It is probable that delivery of behavioral interventions addressing decision-making during the pre-adolescent period and later in adolescence would result in different impacts. We evaluated the intervention effects of an HIV prevention program (Bahamian Focus on Older Youth, BFOOY) administered to grade 10 Bahamian youth and parents to target HIV protective and risk behaviors. We also examined the effects of prior exposure to a similar intervention (Focus on Youth in the Caribbean, FOYC) four years earlier. At six months post-intervention, receipt of BFOOY by youth unexposed to FOYC increased HIV knowledge and condom-use skills. Differences based on BFOOY exposure were not present among FOYC-exposed youth, whose knowledge and condom-use skills were already higher than those of unexposed youth. Youth receiving both interventions displayed a carryover effect from FOYC, demonstrating the highest scores six months post-intervention.

Keywords

HIV prevention; Intervention; Adolescents

Much progress has been made in the field of HIV prevention through the development of behavioral intervention programs. Randomized, controlled trials have demonstrated that behavioral interventions can reduce HIV risk behaviors (Auerbach, Hayes, & Kandathil, 2006; Lyles et al., 2007; Mullen, Ramirez, Strouse, Hedges, & Sogolow, 2002). The “Prevention Research Synthesis” program of the Center for Disease Control and Prevention (CDC) identified 44 “Best-evidence” programs effective in HIV risk reduction (CDC, 2009). The CDC’s subsequent companion program, “Diffusion of Effective Behavioral

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Interventions” (DEBI) (CDC, n.d.) has proceeded further by helping communities to successfully implement a subset of the interventions demonstrated to be effective.

Behavioral intervention programs have generally been developed to target specific populations. Numerous interventions have been developed and have been found to be effective for HIV prevention among mid-and older adolescents (14–19 years old) and young adults (Jemmott et al., 2010; Johnson, Carey, Marsh, Levin, & Scott-Sheldon, 2003; Kirby, Laris, & Roller, 2007). In recent years, several interventions have been developed to target pre- and early adolescents (9–13 years old) (Deveaux et al., 2007; Gong et al., 2009; Miller, Levin, Whitaker, & Xu, 1998). Because many youth in this age group have yet to initiate sexual intercourse (Zimmer-Gembeck & Helfand, 2008), pre-and early adolescence could serve as a particularly important developmental period for prevention efforts. Providing these youth with the proper skills prior to sexual debut may serve to guide the developmental trajectory of future sexual behaviors toward the use of safer sexual practices.

Still needed in HIV prevention are intervention approaches that recognize and address the evolving concerns and vulnerabilities of individuals resulting from their cognitive and physical growth and new social and cultural exposures (Coates, Richter, & Caceres, 2008). Although logical-reasoning abilities are essentially fully developed by adolescence, pre-adolescents, adolescents and young adults are still acquiring the psychosocial skills which characterize adult-level decision-making and execution (such as the ability to regulate emotion, control impulses, and resist peer influence)(Steinberg, 2004). Additionally, hormonal changes occurring at the onset of puberty cause structural reorganization in the adolescent brain, promoting increased sensation- or novelty-seeking (Chambers, Taylor, & Potenza, 2003).

This developmental phenomenon of increased sensation-seeking is particularly important as the salience of peer relationships begins to increase during adolescence, peaking during mid-adolescence (Steinberg, 2004). As a result of the increasing influence of peers during adolescence, the influence of parents and families on adolescent behavior begins to change. As youth advance through the adolescent period, parental knowledge of their activities slowly decreases (Dishion, Nelson, & Bullock, 2004). Lower parental monitoring is associated with greater youth involvement in risk behaviors (Huebner & Howell, 2003; Wight, Williamson, & Henderson, 2006). Thus, decreased parental monitoring among older adolescents provides greater opportunity for risk involvement. Compared to preadolescents, older adolescents are also more likely to perceive lower vulnerability to adverse outcomes from a number of risk situations, including contracting HIV/AIDS (Millstein & Halpern-Felsher, 2002). Accordingly, as children progress through adolescence they must learn to resist increased peer influences while simultaneously experiencing increased sensitivity to emotional and social stimuli, diminishing parental oversight and nascent psychosocial maturity to help inhibit risk behaviors (Steinberg, 2007).

These differences between pre-/early adolescents and mid-late adolescents underscore the importance of examining the potential effectiveness of prevention programs implemented at different developmental periods. Most, interventions are implemented only one time, without considering these developmental changes that may later interfere with the long-term

efficacy of a program. It is likely that specific efforts to augment or sustain the effect of an initial intervention would be beneficial to prevention efforts. Unfortunately, measurement of longitudinal HIV prevention intervention impact, typically by controlling for baseline differences, has not explored the possible impact of earlier interventions on subsequent intervention response. This issue has been explored in other fields. For example, the Abecedarian project, an early education intervention (Gottlieb & Blair, 2004), was able to examine the effect of an early intervention provided during preschool with the addition of a later intervention provided after the children had entered elementary school. Children who showed the greatest benefit were those who received both the early preschool experimental condition and the later school age experimental condition; those receiving only the later school age experimental condition fared the worst. Another program that focused on school achievement, but also targeted risk behaviors, found comparable results; students who received the complete intervention from grades one to six displayed less negative outcomes than the children receiving only the intervention in grades five and six (Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999). These results indicate that in some situations, there is positive impact from receipt of multiple interventions at different life stages, raising the possibility that significant benefit might arise from receipt of an HIV prevention intervention during the pre- or early adolescent phase as well as during later stages of adolescence or young adulthood. However, conducting such analyses in the context of intervention evaluations is complicated by the need to control for baseline differences which could potentially mask the effects of previous interventions.

To the best of our knowledge, in the field of HIV prevention, the possible interaction of two complete interventions delivered at different points during adolescence has not been explored. Because cognitive ability, physiology, and social experiences of children change through the course of development from pre-adolescence to young adulthood, children may benefit from receiving interventions during preadolescence (prior to the onset of sexual debut) and then again during adolescence and young adulthood (during the period of greatest sexual vulnerability).

The current study describes results from a randomized, controlled trial of a sexual risk-reduction intervention program among Bahamian high school students. Participants in this study were grade 10 students, some of whom had received a similar intervention four years earlier in grade six and some of whom had not received this intervention in grade six. Analyses through grade nine demonstrated that the grade six intervention resulted in improvements in HIV knowledge and condom-use skills, self-efficacy, and intentions, and condom-use behaviors in some subgroups (Chen et al., 2009; Deveau, et al., 2007; Gong, et al., 2009). The present study addresses the effect of the grade 10 intervention six months post-intervention, describing the overall effect as well as the impact of the presence or absence of prior intervention exposure four years earlier.

METHODS

Interventions

Grade six intervention (FOYC) evaluation—Focus on Youth in the Caribbean (FOYC), is a 10-session program targeting grade six students, followed by two booster

sessions (delivered in grades seven and eight). FOYC is based on a social cognitive model, Protection Motivation Theory (Rodgers, 1983). FOYC is comprised of risk avoidance, communication, negotiation strategies and condom-use skills and HIV-related knowledge taught through lectures, interactive discussions, games and exercises to reinforce main messages, and a fictional family story to contextualize decision-making (Deveaux, et al., 2007). The attention comparison for FOYC was a 10-session ecology intervention, The Wondrous Wetlands (WW) (Chen, et al., 2009; Deveaux, et al., 2007; Gong, et al., 2009). The WW curriculum, which was appropriate and useful to the region, emphasized the importance of preserving the wetlands and provided knowledge about water conservation. FOYC was evaluated through a randomized, controlled trial conducted among grade six youth from 15 of the 26 government elementary schools located on the island of New Providence, The Bahamas; the 15 participating schools were selected based on geographic distribution and the level of interest and willingness of the administrators to accept randomization and include either the WW or FOYC into the grade six curriculum. Neither FOYC nor WW was offered at the remaining 11 government elementary schools. Parents and youth in the 15 participating schools were presented the option to enroll in the evaluation; it was explained that all students would receive the FOYC curriculum but only assenting/consenting youth-parent dyads would participate in the evaluation. Approximately two-thirds of the students in grade six in the participating schools returned assent/consent forms before the desired sample size was reached and enrollment was terminated. Enrolled students completed baseline measures, prior to randomization which was conducted at the level of the school. The FOYC curriculum was delivered to all students enrolled in grade six in the 10 schools randomized to FOYC, (and the WW curriculum was delivered to all students in the five schools randomized to WW) regardless of whether a student was or was not participating in the evaluation of the interventions. Parents of youth participating in the study (but *not* parents of non-participating youth) received one of the two brief parent interventions. Parents of youth receiving FOYC and enrolled in the study received a brief one session intervention involving either a parental monitoring intervention or a parent goal-setting intervention (see Grade 10 intervention (BFOOY) evaluation for brief description). Parents of youth in the WW condition received the goal-setting intervention. *The Bahamian Youth Health Risk Behavioral Inventory* (BYHRBI) (Deveaux, et al., 2007; Stanton et al., 1995), a questionnaire assessing HIV knowledge and condom-use skills, self-efficacy, intentions and self-reported behaviors was administered to youth participating in the study (but not to non-participating youth) at baseline and at five follow-up assessments (6, 12, 18, 24 and 36 months post intervention).

Grade 10 intervention (BFOOY) evaluation—A randomized, controlled evaluation of an HIV-prevention intervention targeting youth attending grade 10 is ongoing in all eight of the government high schools in New Providence, The Bahamas. The grade 10 intervention, Bahamian Focus on Older Youth (BFOOY), is an age-appropriate adaptation of FOYC, also containing 10-sessions (with the same order and general content of FOYC), the discussions, exercises and games were changed to reflect the older age of the participants (for example, BFOOY includes a field visit to the community clinic to demonstrate where and how to obtain reproductive health services, discussing ways of expressing intimacy without sexual

intercourse, and other various skills and information needed to address the youths' increasing maturity level and subsequent increases in potential risk exposure).

All BFOOY teachers [the grade 10 Health and Family Life Education (HFLE) teachers and school nurses] were trained during a five-day training workshop. The HFLE teachers were the principle teachers of the curriculum; the school nurses were able to assist if a teacher were absent and/or transferred to another school. Research team members were also trained and were available to fill-in as needed.

The control condition was the current "standard of care", the Bahamian HFLE curriculum. Grade 10 students were exposed to the HFLE curriculum once a week through the duration of the school year. The HFLE curriculum is a broad-based life-skills program which addresses a wide range of subjects including character education, self-esteem promotion, parenting, violence prevention, reproductive health, and HIV/AIDS prevention (Greenberg, Gold, & Holt, 1999). The HIV/AIDS component of the HFLE curriculum is limited to facts and is taught through a lecture format. By contrast, the BFOOY curriculum is highly interactive, skills-based, and developmentally oriented; it emphasizes communication, decision-making and negotiation. It addresses changes in peer and family relationships and biologic maturation. Therefore, while some of the basic concepts in HIV prevention are presented in both curricula, the volume of HIV-related prevention information, the skills building component and the contextualization of decision-making are substantially less in the HFLE curriculum compared to the BFOOY curriculum

Two parent interventions were also provided. Informed Parents and Children Together (ImPACT), similar to the parental monitoring intervention of the grade six intervention trial, includes a 24-minute video discussing an age-appropriate parent-child communication regarding sexual behaviors and decision making, a role playing session covering communication between parents and adolescents, and a condom demonstration. The other parent intervention, Goal For It (GFI) served as the attention control intervention for parents who received a 20-minute video covering career-planning, followed by a discussion on how to apply the steps described in the video. This parent intervention was the same intervention provided in the grade six trial for parents of youth receiving the control condition (WW). Students were randomized by classroom to receive one of four intervention conditions, BFOOY only, BFOOY plus GFI, BFOOY plus ImPACT, and HFLE only.

To assess the possible effects of exposure from the grade six intervention, FOYC, we stratified students into three groups (see Figure 1). The first group, **Controls + HFLE**, contained those students who did not attend the schools receiving FOYC in grade six and received the control condition in grade 10 study, the HFLE curriculum. The second group, **Controls + BFOOY**, includes the youth who did not attend the schools receiving FOYC in grade six, but did receive BFOOY in grade 10. The final group, **FOYC + BFOOY**, included students who received both experimental conditions, FOYC in grade six and BFOOY in grade 10.

Human Subjects Protection

Grade six and grade 10 youth participating in the FOYC and BFOOY evaluations and their parents provided written consent and assent. The grade 10 questionnaires asked the students to identify the elementary school they attended in grade six. This information linked with records as to which elementary schools delivered FOYC, delivered WW or did not deliver either to their grade six students, enabled us to determine whether each individual student in grade 10 had been exposed to FOYC, to WW, or, to neither. The study protocols and consenting procedures were approved by both the Human Research Protection Boards of Wayne State University and the Princess Margaret Hospital, Public Hospitals Authority, The Bahamas.

Data Sources and Variables

Data used in these analyses were derived from responses to the study questionnaire (i.e., the BYHRBI) at baseline and six months follow-up of the grade 10 BFOOY evaluation. The BYHRBI and the variables used in these analyses have been described in detail in prior publications (Deveaux, et al., 2007; Stanton, et al., 1995). A true-false scale consisting of an 16-item scale was used to assess *level of knowledge* regarding HIV/AIDS. Correct responses were scored 1 (while incorrect responses were scored 0), resulting in a mean score of 0 – 1 based on the number of correct answers divided by the total number of questions answered. Condom-use skills were assessed using a validated scale, the Condom-use Skills Checklist (Stanton et al., 2009). The scale includes eight correct steps and eight incorrect steps. Youth were asked to mark from among the 16 statements the eight correct steps involved in condom-use; again, correct responses were scored “1” and incorrect “0”. *Condom-use self-efficacy* was assessed by a six-item scale measured through a five-point Likert scale (1=No, I could not to 5=Yes, I could). Self-efficacy items assess how effective participants perceived themselves to be in using a condom, obtaining condoms, and negotiating condom usage with a partner. *Intention to have sex* in the next six months and *intention to use a condom* if a youth were to have sex were assessed by self-reported likelihood along a five-point Likert scale (5 = “Yes, I will” to 1= “No, I will not”) with higher scores indicating higher levels of behavioral intention. Adolescents were asked if they had engaged in sexual intercourse (vaginal or anal) in the last six months (one item). Youth who reported having sex within the last six months were also asked whether or not they had used a condom at their last episode of sex (yes/no).

Statistical Analyses

Analyses were conducted in two steps, 1) *to test the effectiveness of the BFOOY intervention among grade 10 youth who were or were not exposed to FOYC* and 2) *to further investigate the effect of FOYC in addition to receipt of BFOOY*.

First, to assess intervention effect of BFOOY among youth without prior intervention exposure, analyses were conducted among youth unexposed to FOYC, comparing youth who received BFOOY with youth who received HFLE. Evidence of significant improvements among BFOOY youth would indicate BFOOY to be effective above the current HFLE curriculum. Subgroup analyses examined the pair-wise comparisons between parent interventions, BFOOY with ImPACT, BFOOY with GFI, and BFOOY with no parent

intervention and HFLE only. Significant results would determine whether a parent intervention focused on either HIV prevention or career planning, or no intervention improved the effectiveness of BFOOY. The effectiveness of the grade 10 intervention, BFOOY, on youth who received FOYC in grade six was also assessed in a separate analysis. To assess if the intervention and control youth differed from each other at baseline, ANOVA (for continuous variables) and χ^2 test (for categorical) were employed. Tukey corrections were applied for pair-wise comparisons. Post-intervention effect was examined using mixed modeling for continuous variables to control for baseline differences, gender, age, and grade 10 classroom clusters and generalized mixed modeling for categorical variables.

Second, further analyses were conducted to evaluate whether effects from receipt of the grade six intervention, FOYC, were still evident. We examined recipients of both BFOOY and FOYC and compared them to the controls who subsequently received BFOOY and those who subsequently received HFLE. Significant differences between those who received FOYC and BFOOY compared to the controls who received BFOOY would indicate a carry over effect from the grade six FOYC intervention. These analyses were conducted with and without correcting for baseline differences. Including differences present at baseline in grade 10 in the model would determine the net program effect of the BFOOY intervention despite their previous knowledge resulting from exposure to other intervention programs. Contrarily, because the BFOOY intervention was received 48 months after FOYC was administered, controlling for baseline differences pre-BFOOY exposure would eliminate the effects of FOYC 54 months post-intervention. In all analyses, age, gender and clustering (grade six school and grade 10 classroom) were included as covariates. Statistical analyses were conducted using the software SAS v. 9.2 (SAS Institute Inc, Cary, NC).

Results

The grade 10 study had 2593 youth, (1468 (56.6%) females) at baseline; 2143 youth (82.6%) were available at the six month follow-up. Because we were interested in the effect of BFOOY among those who had received versus those who had not received the previous intervention, FOYC, or the intervention comparison condition, the Wondrous Wetlands, we removed: 1) students whose grade six school is unknown; and 2) students who attended elementary schools that were no longer apart of the grade six study in year two but had received FOYC during the previous year (year one of the grade six trial) and thus it is unclear whether or not teachers continued to teach FOYC the following year after the trial was complete.

Table 1 depicts the unadjusted rates for baseline means and rates of targeted behavioral outcomes for students who had not received FOYC in grade six (controls N=1459) as well as for those who had received FOYC in grade six (N=537). At baseline in grade 10 among the 1459 youth (853 females (58.5%) who had not received FOYC in grade six, none of the three BFOOY subgroups or the HFLE group differed significantly. However, when the three BFOOY subgroups were combined and compared to the HFLE group, BFOOY youth at baseline demonstrated significantly higher condom-use skills than HFLE youth. As shown in Table 2, six months post-intervention among the control youth 1225 (728 females (59.4%) completed the follow –up (84.0% retention). After controlling for baseline

differences, age, gender and grade 10 classroom clustering, results showed that overall the BFOOY program significantly increased HIV knowledge and condom-use skills compared to the HFLE program. Subgroup comparisons showed that the BFOOY + ImPACT group showed greater condom-use skills than the HFLE only. The BFOOY only group also had significantly higher condom-use skills than the HFLE group. Behaviors and other perceptions did not vary significantly.

Among the 537 students who had received FOYC in grade six (N=537, 283 females (52.7 %), at baseline in grade 10, the groups were comparable across all measures (see Table 1). However, as shown in Table 2, unlike the results among the grade 10 youth who had not received FOYC in grade six (controls), grade 10 youth who had received FOYC in grade six showed no differences between the four groups six months post-intervention (N=434, 239 females (55.1%)). Although scores were overall elevated for FOYC youth compared to grade six control youth (unexposed to FOYC) (see tables 1 and 2), when restricting the comparison to youth who had received FOYC five years earlier, BFOOY did not confer additional protection.

Tables 3 show the results of comparison of three groups: two groups who received BFOOY in grade 10 but differed based on prior exposure to FOYC (yes/no), and a third group of control youth (had not received FOYC in grade six and received HFLE in grade 10). Table 3 displays results at baseline prior to receipt of the BFOOY intervention (N=1860, 1066 females (57.3%)). At baseline students who had received FOYC in grade six and were randomized to receive BFOOY had significantly higher HIV knowledge than both control groups (those who would receive HFLE and those who would receive BFOOY). FOYC + BFOOY youth also had significantly better condom-use skills scores than both groups without exposure to FOYC. The FOYC + BFOOY students also had higher condom-use self-efficacy than the control + BFOOY group. To investigate the effect of BFOOY six months post-intervention while controlling for prior FOYC exposure, baseline differences, age, gender, and grade 10 classroom and grade six school clustering were controlled (see Table 3). Students in the FOYC + BFOOY and the control + BFOOY had significantly higher HIV knowledge than the control + HFLE group. Also, the FOYC + BFOOY and the control + BFOOY groups both exhibited significantly higher condom use skills scores than the controls + HFLE.

Finally, because controlling for baseline would remove the effects from the FOYC intervention (54 months post-intervention), analyses were conducted on the six months data without controlling for baseline differences except gender, age and clustering. Results revealed that youth who were in the FOYC + BFOOY group had significantly higher HIV knowledge than youth who were in both, the control + BFOOY and the control + HFLE, groups. Youth in the control + BFOOY group had significantly higher HIV knowledge than youth in the control + HFLE group. Students who received FOYC + BFOOY had significantly higher condom-use skills than students in both the control + HFLE and control + BFOOY groups. Control + BFOOY youth also exhibited significantly better condom-use skills scores than the control + HFLE group.

Discussion

We assessed the effectiveness of a grade 10 HIV prevention program (BFOOY) six months post-intervention among youth who had and had not received a similar prevention intervention (FOYC) four years earlier. The BFOOY intervention does result in higher prevention scores regarding knowledge and skills six months post-intervention among youth without prior exposure to FOYC, but did not significantly increase perceptions, behaviors or intentions. In grade 10, youth with prior exposure to FOYC demonstrated higher condom-use self-efficacy, condom-use skills and HIV knowledge compared to youth who had not received the grade six intervention. When controlling for grade 10 baseline differences, the youth with prior FOYC exposure did not experience a further significant increase after receiving BFOOY and thus at six months post-intervention youth who had received and had not received FOYC were comparable with respect to HIV prevention skills. However, if these residual effects from FOYC that are still present at the grade 10 baseline are not controlled, the youth who received both the FOYC and BFOOY interventions fare better six months post- BFOOY than youth who only received BFOOY or the control condition.

Analyses also revealed that youth without previous exposure to an intervention (FOYC) who received BFOOY in grade 10 achieved improved condom-use skills and HIV knowledge compared to youth who received the control condition (HFLE) indicating that the intervention had a greater effect than the current standard of care currently in the Bahamas. Subgroup analyses revealed that BFOOY youth including both those whose parents received ImPACT or BFOOY alone had higher condom-use skills compared to the control youth who received HFLE in grade 10. Overall BFOOY was effective in increasing condom-use skills because it contained a condom-use demonstration and practice session which was an in-depth and interactive opportunity to learn proper condom usage that the current curriculum, HFLE, did not have. Additionally, BFOOY also provided more extensive coverage of HIV prevention and transmission knowledge that results in greater HIV knowledge scores.

The results of the current intervention trial did not mirror the results from the grade six trial, which found significant improvements in condom-use behavior, self-efficacy, and intention scores among those who received FOYC (Chen, et al., 2009; Gong, et al., 2009). Grade 10 students, who received BFOOY, while demonstrating increased HIV knowledge and condom-use skills, did not report significantly higher condom-use self-efficacy, actual condom-use or intention to use a condom. It is possible that the measures used for this sample may not have been sensitive enough to detect significant differences between groups when performance was already very high (e.g., a “ceiling effect”). For example, both intention to use a condom (mean= 4.56 out of a maximum of 5) and condom-use self-efficacy (mean = 4.11 out of a maximum of 5) were highest among the BFOOY + ImPACT group but the difference was non-significant which may be attributed to a “ceiling effect” (Stucki, Stucki, Brühlmann, & Michel, 1995). This phenomenon of a ceiling effect may also explain the absence of significant findings among the subsample of youth who had received the intervention in grade six (see Table 1 and 2). The group previously exposed in grade six had scores that were elevated on measures such as intention, knowledge, skills, and perception measures at baseline compared to those who had no previous exposure (Table 1). It is also possible that parents and teachers are less effective in influencing intentions and

risk behaviors among older youth such as our high school sample. As previously noted, when adolescents mature there is an increased reliance on peers and the presence of parents and family begin to decline (Dishion, Nelson & Bullock, 2004) and as a result could lower their influence on the adolescent. As adolescents mature, they spend increased time with peers; as well, peer norms and expectations become increasingly salient. Correspondingly, time in the presence of parents and family begins to decline possibly resulting in a lessening of their influence on the adolescent (Dishion, Nelson & Bullock, 2004). The effectiveness of interventions directed towards older adolescents might be increased by the inclusion of peer groups as well as parents and teachers. Such an approach would potentially provide protection through both the family and the school and community, leading to a more robust effect.

At baseline those youth who had received FOYC four years earlier still retained higher condom-use skills, HIV knowledge, and condom-use self-efficacy compared to students who had not received FOYC. When controlling for baseline differences six months following receipt of BFOOY, group receiving BFOOY and FOYC was more effective than the control group. However, when not controlling for baseline differences, FOYC + BFOOY performed better in HIV knowledge and condom-use skill than both groups who had not received FOYC in grade six. This result suggests that there is a carryover effect in which FOYC is still effective in addition to BFOOY.

It is possible that an intervention would have a greater impact on a naïve individual versus someone previously exposed to the program whose greatest boost in knowledge was likely to have occurred after their first exposure to the intervention. Children who have already gained condom-use skills and HIV knowledge are limited in the amount of knowledge they can additionally acquire, similar to our unexposed youth who experienced a significant intervention effect but the previously exposed youth did not (see Table 2). However, although the effect of BFOOY was less impactful among the FOYC-exposed youth than among youth who had not been exposed to FOYC in grade six, youth who received **both** FOYC and BFOOY did show the greatest protective effect. This result suggests that a second intervention may be more useful in reinforcing or sustaining previously gained knowledge or acquiring knowledge never retained at the first intervention exposure.

Potential Limitations

The current standard of care in The Bahamas, the HFLE curriculum, was used as the control group. The HFLE class does contain units on HIV/AIDS, sexuality and social relationships. Therefore, the effectiveness of BFOOY may be underestimated due to the comparison group having been possibly exposed to similar information. Differences in HIV knowledge and condom-use skills were found regardless and may have been more evident had we assigned the control class to an experimental control intervention with no overlap in curriculum rather than to HFLE. However, these results indicate that the BFOOY intervention was more effective in increasing knowledge and skills than the current standard of care.

The data used in these analyses are derived by student self-report. Although the students were reassured that their data would be kept confidential it is possible that due to the sensitive nature of the questions and the small Bahamian communities, there may have been

some misreporting of behaviors. The likelihood of such misreporting may be greater among older youth who may be more aware of and understand the stigmas associated with the risk behaviors.

Conclusions

These data support the idea of presenting an HIV risk reduction period at two vulnerable periods in (pre-adolescence and mid-adolescence). The data also suggest that regardless of prior receipt or not of a risk reduction intervention, mid-adolescents derive benefit from receipt of a behavioral risk-reduction intervention emphasizing decision-making.

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Figure 1.

Intersection of Grade Six (FOYC) and Grade 10 (BFOOY) Interventions

†Four years later when the youth entered grade 10 they were sampled again, in addition to all other students attending the public high schools, to participate in the BFOOY trial

*Youth with unclear exposure as they were in a FOYC or WW school the year after the intervention was delivered to that school; thus some teachers may have continued to teach some or all of the curricula

Table 1

Baseline characteristics of grade 10 students by BFOOY randomized intervention groups who had and had not been exposed to FOYC in grade six

Control Youth (had not been exposed to FOYC)					
	BFOOY +ImPACT	BFOOY +GFI	BFOOY Only	BFOOY Subtotal	HFLE
Sample (%), N=1459	395(27.07)	299(20.49)	342(23.44)	1036(71.01)	423(28.99)
Males (%)	163(41.27)	122(40.80)	141(41.23)	426(41.12)	180(42.55)
Mean Age (SD)	14.49(0.66)	14.44(0.66)	14.44(0.65)	14.46(0.66)	14.49(0.75)
<i>Knowledge/Skills- mean (SD)</i>					
HIV/AIDS Knowledge	0.76(0.13)	0.77(0.14)	0.77(0.113)	0.76(0.13)	0.75(0.13)
Condom Skills	0.65(0.12)	0.64(0.14)	0.65(0.13)	<i>a</i> *0.65(0.13)	0.63(0.14)
Condom-Use Self-Efficacy	3.54(1.08)	3.62(1.09)	3.57(1.10)	3.57(1.09)	3.60(1.05)
<i>Intentions- mean (SD)</i>					
Intention to have sex	2.30(1.50)	2.22(1.51)	2.43(1.57)	2.32(1.53)	2.31(1.48)
Intention to use condom	4.17(1.42)	4.15(1.49)	4.23(1.45)	4.19(1.45)	4.25(1.41)
<i>Behaviors- n (%)</i>					
Had sex in the last 6 months	54(13.67)	37(12.37)	54(15.79)	145(14.00)	54(12.77)
Condom-use during last episode of sex	45(83.33)	30(81.08)	44(81.48)	119(82.07)	38(70.21)
Had two or more sexual partners	25(46.30)	21(56.76)	30(55.56)	76(52.41)	23(42.59)
FOYC Exposed Youth					
Sample (%), N=537	143(26.63)	140(26.07)	118(21.97)	401(74.67)	136(25.33)
Males (%)	57(39.86)	74(52.85)	58(49.15)	189(47.01)	65(47.79)
Mean Age (SD)	14.47(0.72)	14.58(0.64)	14.52(0.66)	14.52(0.68)	14.59(0.89)
<i>Knowledge/Skills- mean (SD)</i>					
HIV/AIDS Knowledge	0.78(0.14)	0.78(0.14)	0.80(0.14)	0.78(0.14)	0.78(0.13)
Condom Skills	0.69(0.15)	0.70(0.14)	0.72(0.13)	0.70(0.14)	0.70(0.13)
Condom-Use Self-Efficacy	3.83(1.17)	3.69(1.17)	3.85(1.05)	3.79(1.14)	3.90(1.06)
<i>Intentions- mean (SD)</i>					
Intention to have sex	2.56(1.67)	2.24(1.42)	2.48(1.60)	2.43(1.57)	2.56(1.61)
Intention to use condom	4.33(1.25)	4.15(1.44)	4.32(1.37)	4.26(1.35)	4.39(1.29)
<i>Behaviors- n (%)</i>					
Had sex in the last 6 months	20(13.99)	21(15.00)	19(16.10)	60(14.93)	21(15.44)

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	BFOOY +ImPACT	BFOOY +GFI	BFOOY Only	BFOOY Subtotal	HFLE
Condom-use during last episode of sex	16(80.00)	18(85.71)	18(94.74)	52(86.67)	14(66.67)
Had two or more sexual partners	11(55.00)	7(33.33)	13(68.42)	31(51.67)	10(47.62)

Abbreviations: BFOOY , Bahamian Focus on Older Youth; FOYC, Focus on Youth in the Caribbean; ImPACT, Informed Parents and Children Together; GFI, Goal for It; HFLE, Health and Family Life Education

* p<.05 ;

^a BFOOY (Subtotal) compared to HFLE

Table 2

Adjusted means (and 95% confidence intervals) six months post-BFOOY intervention among 10th grade students for those youth who had and had not been exposed to FOYC in grade six

	BFOOY +ImPACT	BFOOY +GFI	BFOOY Only	BFOOY Subtotal	HFLE
Control Youth (had not been exposed to FOYC)					
Sample (%), N=1225	350 (28.57)	250 (20.41)	283 (23.10)	883 (72.08)	342 (27.92)
Males (%)	142 (50.57)	97 (38.80)	111 (39.22)	350 (39.64)	147 (42.98)
Age (SD)	15.44 (0.63)	15.34 (0.65)	15.40 (0.67)	15.42 (0.67)	15.42 (0.73)
Knowledge/Skills- means(95% CI)					
HIV/AIDS Knowledge	0.84 (0.82–0.85)	0.82 (0.81–0.84)	0.83 (0.81–0.85)	$b^{**}0.81$ (0.80–0.82)	0.79 (0.77–0.80)
Condom Skills	$a^{**}0.74$ (0.72–0.76)	0.71 (0.69–0.73)	$c^{*}0.72$ (0.70–0.74)	$b^{**}0.72$ (0.71–0.74)	0.68 (0.66–0.70)
Condom-Use Self-Efficacy	4.10 (4.00–4.21)	4.04 (3.92–4.16)	4.05 (3.93–4.16)	4.06 (3.99–4.14)	4.01 (3.90–4.11)
Intentions- mean(95% CI)					
Intention to have sex	2.71 (2.55–2.87)	2.72 (2.54–2.91)	2.66 (2.49–2.84)	2.70 (2.60–2.80)	2.58 (2.42–2.73)
Intention to use condom	4.42 (4.28–4.56)	4.50 (4.33–4.67)	4.36 (4.20–4.51)	4.42 (4.33–4.52)	4.41 (4.27–4.56)
Behaviors- n(%)[†]					
Had sex in the last 6 months	80 (24.69)	54 (19.90)	63 (22.78)	197 (22.89)	65 (20.28)
Condom-use at last episode of sex	75 (93.22)	44 (79.49)	53 (85.19)	172 (86.84)	54 (80.70)
Had two or more sexual partners	26 (35.59)	26 (48.72)	31 (51.85)	83 (44.74)	29 (45.61)
FOYC Exposed Youth					
Sample, n=434	117 (26.90)	118 (27.36)	94 (21.61)	329 (75.81)	105 (24.14)
Males (%)	45 (38.46)	60 (50.88)	45 (47.87)	150 (45.59)	45 (42.86)
Age (SD)	15.40 (0.74)	15.51 (0.65)	15.37 (0.66)	15.43 (0.68)	15.45 (0.65)
Knowledge/Skills- mean(95% CI)					
HIV/AIDS Knowledge	0.84 (0.82–0.87)	0.83 (0.82–0.87)	0.82 (0.80–0.85)	0.82 (0.82–0.85)	0.82 (0.79–0.84)
Condom Skills	0.77 (0.74–0.80)	0.76 (0.73–0.79)	0.74 (0.71–0.77)	0.76 (0.74–0.78)	0.73 (0.71–0.76)
Condom-Use Self-Efficacy	4.15 (4.01–4.28)	4.21 (4.08–4.35)	4.17 (4.02–4.31)	4.18 (4.10–4.26)	4.16 (4.02–4.30)
Intentions- mean(95% CI)					
Intention to have sex	2.67 (2.41–2.93)	2.85 (2.59–3.11)	2.62 (2.33–2.92)	2.72 (2.57–2.88)	2.71 (2.44–2.98)
Intention to use condom	4.33 (4.12–4.55)	4.68 (4.47–4.89)	4.55 (4.32–4.79)	4.52 (4.39–4.66)	4.40 (4.18–4.63)
Behaviors - n(%)[†]					

	BFOOY +ImPACT	BFOOY +GFI	BFOOY Only	BFOOY Subtotal	HFLE
Had sex in the last 6 months	31 (26.50)	24 (20.17)	22 (23.40)	77 (23.33)	24 (22.86)
Condom-use at last episode of sex	24 (80.00)	18 (78.26)	18 (81.81)	60 (80.00)	20 (83.33)
Had two or more sexual partners	8 (25.81)	8 (33.33)	12 (54.55)	28 (36.36)	9 (37.50)

Abbreviations: BFOOY, Bahamian Focus on Older Youth; ; FOYC, Focus on Youth in the Caribbean; ImPACT, Informed Parents and Children Together; GFI, Goal for It; HFLE, Health and Family Life Education Note: Gender, age, baseline differences and classroom clustering were used as covariates for all significance testing

* p<.05;

** p<.01;

^a BFOOY+ImPACT compared HFLE ;

^c BFOOY only compared to HFLE;

^b BFOOY (Subtotal) compared to HFLE;

[†] Frequencies and unadjusted rates were presented for categorical variables; however, odds ratios were used to examine between group differences

Baseline (N=1860 and six months (N=1555) post-BFOOY intervention effect among 10th grade students by prior FOYC exposure, BFOOY exposure and presence/absence of controlling for baseline differences

	FOYC + BFOOY			Controls + BFOOY			Controls + HFLE		
	Baseline	Controlling for Baseline	Not Controlling for Baseline	Baseline	Controlling for Baseline	Not Controlling for Baseline	Baseline	Controlling for Baseline	Not Controlling for Baseline
Sample	401(21.56)	330(21.22)	330(21.22)	1036(55.70)	883(56.78)		423(22.74)	342(21.99)	
Males (%)	188(46.88)	150(45.59)	150(45.59)	426(41.12)	350(42.02)		180(42.55)	147(42.98)	
Mean Age (SD)	14.52(0.68)	15.43(0.68)	15.43(0.68)	14.49(0.67)	15.42(0.67)		14.48(0.76)	15.4(0.73)	
Knowledge/Skills- mean (SD)									
HIV/AIDS Knowledge	<i>ac</i> *0.78(0.14)	<i>a</i> *0.83(0.84–0.85)	<i>ac</i> *0.84(0.82–0.85)	0.76(0.13)	<i>b</i> *0.81(0.81–0.81)	<i>b</i> *0.81(0.80–0.82)	0.75(0.13)	0.79(0.78–0.81)	0.78(0.76–0.80)
Condom Skills	<i>ac</i> *0.70(0.14)	<i>a</i> *0.74(0.72–0.76)	<i>ac</i> *0.77(0.75–0.79)	0.65(0.13)	<i>b</i> *0.73(0.72–0.74)	<i>b</i> *0.72(0.71–0.74)	0.63(0.14)	0.69(0.67–0.71)	0.67(0.65–0.74)
Condom-Use Self-Efficacy	<i>ac</i> *3.79(0.14)	4.09(3.99–4.18)	4.18(4.08–4.30)	3.57(1.09)	4.09(4.02–4.15)	4.07(4.01–4.16)	3.60(1.05)	4.03(3.93–4.12)	4.03(3.90–4.12)
Intentions- mean (SD) [†]									
Intention to have sex	2.43(1.57)	2.67(2.52–2.82)	2.75(2.58–2.92)	2.32(1.53)	2.72(2.62–2.82)	2.79(2.66–2.89)	2.31(1.48)	2.59(2.44–2.75)	2.65(2.47–2.82)
Intention to use condom	4.27(1.35)	4.50(4.36–4.64)	4.53(4.38–4.68)	4.19(1.47)	4.42(4.32–4.52)	4.42(4.32–4.52)	4.25(1.41)	4.42(4.27–4.56)	4.41(4.26–4.54)
Behaviors- n (%)[‡]									
Had sex in the last 6 months	60(14.96)	77(23.33)	77(23.33)	145(14.00)	197(23.31)	197(23.65)	54(12.77)	65(19.01)	65(19.01)
Condom-use at last episode of sex	52(86.67)	60(77.92)	60(77.92)	119(82.07)	172(87.31)	172(87.31)	38(70.37)	54(83.08)	54(83.08)
Had two or more sexual partners	31(51.67)	28(36.36)	28(36.36)	76(52.41)	83(42.13)	83(42.13)	23(42.59)	29(44.62)	29(44.62)

Note: Gender, age, and grade 10 classroom and grade six school clustering were used as covariates for all significance testing six month post-intervention

*
p<.05;

^aFOYC+BFOOY vs. Controls+HFLE;

^bControls+BFOOY vs. Controls+HFLE;

^cFOYC+BFOOY vs. Controls+BFOOY

[†] Adjusted means and (95% confidence intervals) were presented for continuous variables six months post-intervention

Frequencies and unadjusted rates were presented for categorical variables six months post-intervention; however, odds ratios were used to examine between group differences

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