Sustained Institutional Effects of an Evidence-based HIV Prevention Intervention

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Abstract Limited data are available as to what happens in institutions involved in behavioral intervention trials after the trial has ended. Specifically, do the trainers continue to administer the behavioral intervention that had been the focus of the trial? To address this question, we examined data in grade six schools before a year-long behavioral intervention had been delivered in some schools (and a year-long control condition in others) and data obtained again 6 and 7 years later in the same two sets of schools. Data were derived from the baseline surveys of two interventions: (1) national implementation of the evidence-based Focus on Youth in the Caribbean (FOYC) intervention in 2011; and (2) the randomized, controlled trial of the FOYC intervention in 2004/2005. Cross-sectional, longitudinal comparisons and random coefficient regression analysis were conducted to evaluate long-term intervention effects. Results indicate that grade six students in 2011 from schools in which the FOYC intervention had been implemented in 2004/2005 had a higher level of HIV/AIDS knowledge, increased reproductive health skills, increased self-efficacy regarding their ability to prevent HIV infection, and greater intention to use protection if they were to have sex compared to their counterparts from schools where no such training took place. We concluded that new cohorts of students benefited from the extensive training and/or

experience in teaching the FOYC curriculum received by teachers, guidance counselors and administrators in schools which had delivered the FOYC intervention as part of a randomized trial several years earlier. The findings suggest that teachers who previously were trained to deliver the FOYC intervention may continue to teach at least some portions of the curriculum to subsequent classes of students attending these schools.

Keywords FOYC intervention · AIDS knowledge · Self-efficacy · Intention to use protection · Enduring effect

Introduction

Significant progress has been made in the development of HIV prevention interventions over the past decade. Forty-four “best evidence” effective HIV prevention programs have been identified by the Centers for Disease Control and Prevention’s “Prevention Synthesis Project” (Centers for Disease Control and Prevention (CDC) 2011a). These best-evidence interventions target several epidemiologically important HIV populations including heterosexual adults, drug users, HIV-positive individuals, high-risk youth, and men who have sex with men and have demonstrated effectiveness in reducing HIV-related risk behavior and/or sexually transmitted infections (STIs) (Lyles et al. 2007). Despite these encouraging achievements and advances in HIV prevention research, the overall trend of the global HIV/AIDS epidemic remains relatively stable, with recent resurgences and rapid spread of HIV transmission among some most-at-risk subgroups (USAID 2011). While HIV prevention efforts have helped to curb the global HIV/AIDS epidemic, their impact has been somewhat muted because of the difficulties in scaling up and/or sustaining effective delivery of evidence-based behavioral interventions (Global HIV Prevention Working Group

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2007; Wechsberg et al. 2010). There are many questions regarding implementation that are not understood, including uncertainty as to any long-term effects on a population or institution after an intensive intervention campaign has been completed.

The past decade has benefitted from multiple behavioral intervention trials with well-designed follow-up assessments (CDC 2011b). Common to virtually all such evaluations is an intervention evaluation examining the intervention effects immediately or shortly (up to 6 months) after the end of the intervention program (Jemmott et al. 1992; Li et al. 2006; Wang et al. 2005). A review of the eight CDC-designated “best evidence” HIV behavioral interventions targeting high-risk youth found that most interventions have only followed participants for a year or less (DiClemente et al. 2004; DiClemente et al. 2009; Jemmott et al. 1992; Jemmott et al. 2005; St Lawrence et al. 1995; Villarruel et al. 2006). Few studies have followed participants beyond 24 months of the intervention (Wechsberg et al. 2010). Until recently, little evidence has been available regarding long-term effects of behavioral interventions (Chen et al. 2010; Stanton et al. 2012). The evidence that is available has mixed findings; while some studies have found positive effects, most studies with longer follow-up periods fail to show sustained maintenance of the effects after the intervention has ended (Tu et al. 2008; Wechsberg et al. 2010).

The intervention follow-up assessments summarized in the prior paragraph have been assessed *among the recipients* of such interventions; the long-term durability of such interventions at *an institutional level* has not been assessed. That is, training of teachers or other implementers occurs in preparation for intervention delivery during the randomized, controlled intervention trial. What happens after the formal training and assessment has been completed; do the trainers continue to teach at least parts of the intervention, and, if so, do subsequent trainees continue to benefit?

The Bahamas has the second highest annual incidence of AIDS in the Caribbean and HIV seroprevalence was nearly 5 % of the adult population a decade ago (USAID 2011). Heterosexual activity is the predominant mode of transmission. In 2004/2005, a randomized controlled trial of Focus on Youth in the Caribbean (FOYC) was initiated among all grade six classes in 15 schools in The Bahamas. All grade six teachers in the ten schools randomized to deliver FOYC received intensive training in the FOYC intervention and were carefully monitored to assure fidelity of implementation during the implementation period of the study. Youth were followed for 4 years after receiving the intervention; the results from these follow-ups have been published and demonstrate significant intervention effects on the intervention recipients (Chen et al. 2009; 2010; Gong et al. 2009; Stanton et al. 2012). Evaluations at 12 and 24 months post-intervention showed that the intervention significantly

increased youth’s HIV/AIDS knowledge, perceptions of their ability to use condoms, condom-use intention and delayed sexual risk among Bahamian preadolescents (Chen et al. 2009; Gong et al. 2009). Long-term evaluations demonstrated that the intervention had sustained effects on HIV/AIDS knowledge, condom-use skills and self-efficacy at 36 and 48 months post-intervention and promoted actual condom use at 36 months post-intervention (Chen et al. 2010; Stanton et al. 2012). What has not been studied is whether subsequent classes of students attending grade six in these ten schools benefitted from the training received by these teachers and/or the potential cultural change occurring in these schools as a result of the intervention training. That is, is there evidence of increased knowledge and skills and decreased risk perceptions and intentions among students attending these schools that would suggest an enduring institutional effect of the training received by the teachers, guidance counselors and administrators who participated in the FOYC trial?

Using baseline data from national implementation of FOYC intervention in 2011 and baseline data from the previous FOYC intervention in 2004/2005, this analysis attempted to explore this question. First, a cross-sectional comparison using 2011 baseline data was conducted to determine whether current grade six students from schools in which the FOYC intervention had been implemented in 2004/2005 (FOYC schools) exhibit increased HIV/AIDS knowledge, reproductive health skills knowledge and supportive perceptions, and/or intentions to use protection compared to students from schools that had implemented the control condition, the Wondrous Wetland (WW schools). Second, longitudinal comparisons were made for students from FOYC schools or WW schools to ascertain whether at baseline the 2011 cohort of students demonstrate increased HIV/AIDS knowledge and reproductive health skills knowledge, self-efficacy and intentions compared to their peers from the 2004/2005 cohort.

Method

Study Site

The island of New Providence was selected as the study site because it houses 65 % of the population and 86 % of the HIV infected Bahamians reside on this island (Ministry of Health HIV/AIDS center 2006).

Intervention Description

Over the last decade, researchers from the Bahamian Ministry of Health and Wayne State University developed “Focus on Youth in the Caribbean (FOYC) with Caribbean

Informed Parents and Children Together (CImPACT)” by adapting the intervention programs FOYC and ImPACT (Deveaux et al. 2007). The CDC selected FOYC with ImPACT as a Best Evidence Program and has included it in the CDC’s Diffusion of Behavioral Intervention portfolio (Lyles et al. 2007). A detailed description of the development of FOYC with CImPACT can be found in our previous publications (Deveaux et al. 2007; Gong et al. 2009). Briefly, FOYC is a school-based, HIV prevention program consisting of 10 sessions, each approximately one hour in length. The curriculum of FOYC emphasizes healthy decision-making, goal setting, communication, negotiation, consensual relationships, abstinence, safer sex among sexually active youth, and, staying away from drugs. CImPACT is a 1-h parent intervention session consisting of a 24-min educational video, focused on parent–youth communication, parental monitoring, and HIV prevention. The video is followed by a condom demonstration and role-play emphasizing several concepts of parental monitoring and communication. The youth control condition, the WW, also consists of ten 1-h sessions, each of which presents information regarding the protection of the environment, including The Bahamas’ wetlands. The intervention is based on a social cognitive theory, Protections Motivation Theory (Rogers 1983).

Participants and Intervention Assignment

The participants in the present study included: (a) 1,724 sixth grade students from 15 public elementary schools in New Providence who participated in the baseline survey of national implementation of FOYC in 2011; and (b) 1,360 sixth grade students who were recruited from 15 public elementary schools from New Providence to participate in the randomized controlled trial of FOYC intervention from 2004/2005. After the baseline surveys in 2004/2005, the 15 schools were randomly assigned to the intervention group (10 schools received FOYC) and to the control group (five schools received WW). The study design of the 2004/2005 randomized, controlled trial and baseline survey of the 2011 national implementation of FOYC Intervention is displayed using a flowchart (Fig. 1).

Approximately two thirds of eligible youth from each of the 15 schools voluntarily participated in the 2004/2005 survey. As the data being collected in the 2011 study are part of curriculum evaluation being conducted by the Bahamian Ministry of Education, not as part of research, none of the 2011 students are enrolled in a study. The Ministry of Education expects that most or all of the students present on the day that the assessment instrument was administered in the schools completed the instrument for the baseline survey in the 2011 national implementation.

Data Collection Procedures

The 2004/2005 and 2011 baseline data were collected using a shortened version of the Bahamian Youth Health Risk Behavioral Inventory (BYHRBI), the paper-and-pencil assessment battery that was utilized in the 2004/2005 study. The BYHRBI had been adapted from the Youth Health Risk Behavioral Inventory (Stanton et al. 1995) for use in The Bahamas (Deveaux et al. 2007). The questionnaire was read out loud by project staff while the students marked their responses on the questionnaires. The questionnaire assesses demographic information, knowledge regarding HIV/AIDS, reproductive health skills knowledge, self-efficacy, perceptions and intentions to engage in risk and protective behaviors in the next 6 months. Participants of the 2004/2005 survey were given a gift certificate worth \$5 Bahamian after completing the survey. Parental consent and youth assent were obtained before participation in the 2004/2005 study only. The 2011 survey was conducted by the Ministry of Education as a baseline measure to assess the impact of FOYC as part of grade six Health Family Life Education (HFLE) curriculum. The research protocol and questionnaires were approved by the institutional review boards at Wayne State University and Public Hospitals Authority in Nassau.

Measures

Because of the sensitive nature of sexual and condom-use questions (especially for sixth grade students), the Ministry of Education preferred to limit questions regarding risk behaviors. Although most important variables in the questionnaires for 2004/2005 and 2011 baseline surveys were designed to be the same, the 2011 questionnaire was shorter and therefore several items assessing HIV/AIDS knowledge, preventive reproductive health skills knowledge and self-efficacy were eliminated from the 2011 survey. We carefully matched each item in the longitudinal analysis. In addition, the modified brief versions of the three scales also exhibit high reliability in the present study (alphas are greater than 0.80).

HIV/AIDS Knowledge An 18-item scale including true and false statements was used to assess level of knowledge regarding HIV transmission and prevention (e.g., “A person can get HIV by sharing a glass of water with someone who has HIV,” “A person will not get HIV if he or she is taking antibiotics”). The internal consistency of these items was high (Cronbach’s $\alpha=0.84$ for both boys and girls). Correct responses were scored 1 and incorrect 0, resulting in a summary score of 0 to 18 for each participant.

Fig. 1 Flowchart for 2004/2005 randomized, controlled trial and 2011 national implementation of FOYC Intervention

Reproductive Health Skills Knowledge Knowledge regarding reproductive health skills was assessed through an adaptation of the Condom-use Skills Checklist (Stanton et al. 2009). The validated scale includes true and false statements describing the steps of correct condom-use from opening a condom pack for use to disposal after use. The internal consistency of these items was high (Cronbach's $\alpha=0.86$ for boys, and 0.88 for girls). Correct responses were scored 1 and incorrect 0, resulting in a summary score of 0 to 9 for each participant.

Preventive Reproductive Health Self-efficacy A three-item scale was used to assess self-efficacy for using pregnancy/STI prevention methods. Agreement was measured through a five-point Likert scale (1=strongly disagree to 5=strongly agree). The internal consistency (Cronbach's alpha) of the scale was 0.79 for boys and 0.84 for girls. A

composite score was calculated as a mean score across the three items (range 1 to 5).

Perceived Parental Monitoring An eight-item parental monitoring scale was employed to assess parental monitoring (Small and Kerns 1993; Li et al. 2000). The validated scale assesses the youths' perceptions of whether their parent(s)/guardian usually know where they are and what they are doing after school. Responses to such items (e.g., "my parent(s)/guardian know where I am after school") were based on a five-point Likert scale (1=never to 5=always). The internal consistency (Cronbach's alpha) of the scale was 0.72 for boys and 0.69 for girls. Individual items were averaged to yield a scale score ranging from 1 (*low levels of parental monitoring*) to 5 (*high levels of parental monitoring*).

Risk and Protective Intentions Intentions to engage in risk and protective behaviors were measured using four items. Intention to drink alcohol (or use marijuana) in the next 6 months was examined by asking youth the question, “How likely do you think it is that within the next six months you will drink alcohol (or use marijuana)?” Youth rated the likelihood on a five-point Likert scale ranging from 1 (very unlikely) through 5 (very likely). Intention to use condom protection was measured using the question, “if you were to have sex in the next six months, how likely is it that you or your partner would use a condom?” Intention to remain abstinent was measured by a similar question with the same five-point Likert scale.

Teacher’s Exposure to FOYC Training Information was collected as to whether the teachers had attended a FOYC/CimPACT training workshop and, if so, what year they attended the workshop and how many days of training they completed.

Analysis

First, cross-sectional analyses were performed using baseline data of national implementation of FOYC intervention in 2011 to compare HIV/AIDS knowledge, reproductive health skills, self-efficacy for HIV prevention, and intention to use protection among two subsets of youth: students from schools in which the FOYC intervention had been implemented in 2004/2005; and students from schools that were assigned to the control condition, the WW in 2004/2005. The group differences were examined using Student’s *t* test (for continuous variables) and χ^2 (for categorical variables). The test statistics (*t*, χ^2) were adjusted for the clustering effects of classroom and/or school using variance inflation factors (VIFs).

Second, longitudinal comparisons of HIV/AIDS knowledge, reproductive health skills, self-efficacy, and intentions to engage in risk and protective behaviors were made between the 2004/2005 cohort of students and the 2011 cohort of students in those 15 schools which had been randomized to FOYC and WW in 2004/2005. The cohort differences (2004/2005 cohort and 2011 cohort of sixth grade students) were examined using Student’s *t* test. The test statistics were adjusted for the clustering effects of classroom and/or school using VIFs.

Given the hierarchical nature of our data (students clustered within classes in 15 schools), multi-level analysis was conducted using the random coefficient model procedure to examine group differences in HIV/AIDS knowledge, reproductive health skills knowledge, self-efficacy for HIV prevention, and intention to use protection when needed. Independent variables included subgroups of youth (i.e., youth from FOYC schools and WW schools), age, sex,

and a school-level variable (school-score on the English–Math proficiency examination delivered to all grade six youth annually in The Bahamas). School and class were included as random effect variables in the model. Regression coefficients were calculated for all variables. To adjust for the clustering effects of classroom and/or school, intra-class correlation coefficients were calculated for all outcome variables.

All statistical analyses were performed using the SAS 9.2 statistical software package (SAS Institute Inc., Cary, NC, USA). A significance level of 0.05 was adopted in bivariate comparisons and multivariate analyses.

Results

Cross-sectional Comparisons

Both male and female students from former FOYC schools (e.g., schools which had been randomized to receive FOYC after the 2004/2005 baseline surveys) scored higher in HIV/AIDS knowledge, reproductive health skills, and self-efficacy regarding their ability to prevent HIV infection than students from WW schools. Male students from former FOYC schools also reported significantly higher levels of intention to use protection if they were to have sex, compared to male students from former WW (control) schools (Table 1).

As shown in Table 1, there were significant differences in knowledge, self-efficacy and intentions regarding preventive reproductive health skills and perceived parental monitoring between males and females. Male students scored higher in knowledge regarding preventive reproductive health skills and self-efficacy ($t=6.21$, $p<0.001$; $t=4.07$, $p<0.001$) while female students indicated significantly higher parental monitoring ($t=14.08$, $p<0.001$). Male students reported significantly higher levels of intention to engage in risk behaviors than female students.

Longitudinal Comparisons

Baseline equivalence of the intervention (FOYC) and control (WW) groups in 2004/2005 were examined. The two groups (WW and FOYC) did not differ with respect to age and sex distribution, reproductive health skills, self-efficacy, parental monitoring, and intentions to engage in risk behaviors except that youth in the control (WW) group scored higher in HIV/AIDS knowledge than the intervention group. Longitudinal comparison revealed that the 2011 cohort of students from former FOYC schools scored significantly higher in HIV/AIDS knowledge, preventive reproductive health skills, self-efficacy and intention to use condom protection than the 2004/2005 cohort of youth. Stratified

Table 1 Cross-sectional comparisons of HIV/AIDS knowledge and preventive reproductive health skills, self-efficacy, risk and protective intentions among three subset of youth in The Bahamas 2011 ($n=1,724$)

Variables	Male students				Female students			
	Overall	FOYC	WW	adj. t	Overall	FOYC	WW	adj. t
Sample size (n)	845	575	270		879	557	322	
HIV/AIDS knowledge (Score range 0~18)	9.77 (2.50)	9.93 (2.51)	9.45 (2.45)	2.01 ^a	9.65 (2.65)	9.82 (2.52)	9.34 (2.82)	1.99 ^a
Reproductive health skills (Score range 0~9)	5.36 (1.72)	5.53 (1.64)	5.00 (1.84)	2.89 ^b	4.83 (1.82)	5.00 (1.82)	4.52 (1.78)	2.78 ^b
Self-efficacy (range 1~5)	2.46 (1.35)	2.56 (1.36)	2.24 (1.30)	2.41 ^a	2.20 (1.30)	2.31 (1.32)	2.02 (1.24)	2.37 ^a
Parent monitoring (Score range 1~5)	3.88 (0.78)	3.86 (0.78)	3.92 (0.77)	0.85	4.36 (0.63)	4.37 (0.65)	4.33 (0.61)	0.76
Intentions to engage in risk and protective behaviors in the next 6 months (Score range 1~5)								
Smoke marijuana	1.18 (0.70)	1.19 (0.71)	1.17 (0.68)	0.17	1.04 (0.35)	1.05 (0.39)	1.02 (0.24)	1.13
Drink alcohol	1.85 (1.44)	1.90 (1.48)	1.74 (1.36)	1.27	1.56 (1.22)	1.61 (1.28)	1.47 (1.12)	1.38
Remain abstinent	4.26 (1.36)	4.19 (1.42)	4.39 (1.21)	1.77	4.76 (0.79)	4.75 (0.79)	4.77 (0.79)	0.35
Use protection if I have sex	4.18 (1.28)	4.32 (1.16)	3.71 (1.55)	2.08 ^a	3.84 (1.45)	3.77 (1.45)	3.94 (1.48)	0.32
Have a boy- or girl-friend [†]	49.7 %	50.9 %	47.2 %	0.45	21.8 %	21.9 %	21.7 %	0.01
Age of boy- or girl-friend [‡]								
9–10 years	40.9 %	37.3 %	49.2 %	3.00	38.3 %	35.0 %	44.3 %	1.44
11–12 years	52.1 %	54.5 %	46.7 %		53.4 %	54.5 %	51.4 %	
13–15 years	7.0 %	8.2 %	4.1 %		8.3 %	10.6 %	4.3 %	

All test statistics (t , χ^2) were adjusted using the variance inflation factors (VIFs)

[†] Pearson's χ^2 test; [‡] Cochran–Mantel–Haenszel χ^2 test; ^a $p<0.05$; ^b $p<0.01$; ^c $p<0.001$

analysis revealed these positive effects were mainly sustained among male students. Female students from FOYC schools did not differ between 2004/2005 and 2011 in knowledge, self-efficacy or intentions. Likewise, there were no cohort differences (e.g., differences between grade six students in 2004/2005 and grade six students in 2011) in knowledge, self-efficacy or intention for students from former WW schools (Table 2).

Multi-level Analysis

Results of the random coefficient regression analysis are presented in Table 3. The estimated coefficients for individual-level and class-level variables are listed under models 1 through 4. The results of models 1–4 indicate that students from former FOYC schools had significantly higher scores in the four outcome measures (i.e., HIV/AIDS knowledge, reproductive health skills, self-efficacy, and intention to use protection) compared to students from former WW schools. There were significant gender differences in knowledge regarding reproductive

health skills, self-efficacy and intentions, with male students scoring higher. In addition, schools where students scored average and/or above average on the national examination had relatively lower levels of intention to use protection compared to schools where students scored below average. The effect size of the intervention based on AIDS knowledge, reproductive health skills, self-efficacy and intention to use condom protection was 0.21, 0.30, 0.24, and 0.32, respectively.

Teachers' Exposure to FOYC Training

In 2011, 61 teachers (40 from former FOYC schools and 21 from former WW schools) reported on their previous exposure of FOYC training. Three-quarters (75 %, 30 teachers) of teachers from FOYC schools reported that they had attended a FOYC/CImpACT training workshop, which is significantly higher than teachers from WW schools (42.8 %, 9 teachers) ($\chi^2=6.17$, $p=0.013$). Among the nine teachers in WW schools who attended FOYC training, two teachers received training when they were teaching at

Table 2 Longitudinal comparisons of HIV/AIDS knowledge and preventive reproductive health skills, self-efficacy and intentions and parental monitoring among sixth grade students between the 2004/2005 cohort and the 2011 cohort, The Bahamas

Variables	FOYC males			WW males			FOYC females			WW females		
	Year 2005	Year 2011	adj. <i>t</i>	Year 2005	Year 2011	adj. <i>t</i>	Year 2005	Year 2011	adj. <i>t</i>	Year 2005	Year 2011	adj. <i>t</i>
Sample size (<i>n</i>)	411	575		228	270		452	557		269	322	
HIV/AIDS knowledge (Score range 0–18)	9.39 (2.30)	9.93 (2.51)	2.56 ^a	9.08 (2.37)	9.45 (2.45)	1.25	9.85 (2.21)	9.82 (2.52)	0.12	9.36 (2.38)	9.34 (2.82)	0.09
Reproductive health skills (score range 0–8)	4.28 (1.44)	4.70 (1.53)	2.91 ^b	4.25 (1.59)	4.27 (1.67)	0.08	4.18 (1.40)	4.22 (1.66)	0.31	4.08 (1.42)	3.79 (1.60)	1.39
Self-efficacy (score range 1–3)	2.21 (1.24)	2.56 (1.36)	3.05 ^b	2.31 (1.27)	2.24 (1.30)	0.48	2.22 (1.28)	2.31 (1.32)	0.82	2.06 (1.16)	2.02 (1.24)	0.31
Parent monitoring (score range 1–5)	3.97 (1.06)	3.86 (0.78)	1.55	4.02 (0.95)	3.92 (0.77)	1.17	4.46 (0.78)	4.37 (0.65)	1.71	4.38 (0.82)	4.33 (0.61)	0.72
Intentions to engage in risk and protective behaviors in the next 6 months												
Smoke marijuana	1.72 (1.13)	1.18 (0.71)	4.47 ^c	1.69 (1.05)	1.17 (0.68)	3.30 ^b	1.41 (0.80)	1.05 (0.39)	4.48 ^c	1.57 (0.92)	1.02 (0.24)	4.91 ^c
Drink alcohol	1.95 (1.33)	1.90 (1.48)	0.35	2.12 (1.34)	1.74 (1.36)	1.96	1.72 (1.11)	1.61 (1.28)	0.98	1.85 (1.14)	1.47 (1.12)	2.55 ^a
Remain abstinent	3.93 (1.38)	4.19 (1.42)	1.72	4.01 (1.21)	4.39 (1.21)	2.07 ^a	4.41 (1.02)	4.75 (0.79)	3.36 ^b	4.47 (0.92)	4.77 (0.79)	2.53 ^a
Use protection if I have sex	3.77 (1.33)	4.19 (1.21)	2.02 ^a	3.57 (1.41)	3.58 (1.55)	0.02	3.74 (1.12)	3.52 (1.38)	0.73	3.10 (1.12)	3.59 (1.62)	0.96

All test statistics (*t*, χ^2) were adjusted using the variance inflation factors (VIFs)

^a*p*<0.05; ^b*p*<0.01; ^c*p*<0.001

FOYC schools before 2009 but subsequently relocated to WW schools and seven teachers received training in 2011 in preparation for the 2011 national implementation. Among those teachers who attended FOYC training, 52 % of teachers from former FOYC schools said that they had completed a 5-day FOYC training workshop compared to 22 % of teachers from former WW schools ($\chi^2=2.56$, *p*=0.097).

Continued Use of FOYC Curriculum after Study Completion

We interviewed teachers who had received training in FOYC during 2004/2005 and current school administrators in 12 of the 15 study schools (9 FOYC schools and 3 control schools). We were unable to contact teachers from the other three schools. We investigated whether the schools continued to teach some or all of the FOYC curriculum after the research ended and if so for how long, and whether it was integrated into other curriculum. The results indicate that six of the nine FOYC schools continued to teach some or all of the FOYC curriculum. Among the six schools, two schools continued to teach some of the FOYC curriculum through 2011 while the other four schools taught the FOYC curriculum for one to three years after the research was completed.

In the four schools which continued to teach FOYC, teachers integrated the FOYC curriculum into the HFLE class. Teachers and school administrators were very supportive of the FOYC curriculum in schools where FOYC was continued. In some of these schools, teachers and administrators expressed a sense of “ownership” of FOYC.

One of the three control schools also taught FOYC for 2 years (the two other control schools did not teach any components of FOYC). The two teachers in this school who received training in FOYC in 2004/2005 integrated part of FOYC curriculum into their HFLE class in 2007 and 2008. The vice principal of this school received training in FOYC and thus supported teaching the FOYC curriculum.

Discussion

This study examined the question as to whether there is an “institutional” enduring effect after involvement in a school-wide intensive risk reduction intervention. The grade six respondents in 2011 from schools in which FOYC had been implemented in 2004/2005 appear to have benefited from the earlier training that the teachers and other school personnel had received. Our evaluation has shown that students from schools where the FOYC intervention had been

Table 3 Results of random coefficient regression analysis of factors associated with AIDS knowledge, and reproductive health skills, self-efficacy, and intentions among sixth grade students in The Bahamas, 2011

Variables	Estimated models							
	HIV/AIDS knowledge (1)		Reproductive health skills (2)		Self-efficacy (3)		Intention to use protection (4)	
	β	SE	β	SE	β	SE	β	SE
Fixed effect								
Intercept	9.861	(0.380)	5.122	(0.263)	2.237	(0.191)	3.807	(0.877)
Subgroups of youth								
WW	-0.437	(0.249) [#]	-0.429	(0.170) [*]	-0.314	(0.120) ^{**}	-0.528	(0.203) ^{**}
FOYC (ref)								
Age	0.008	(0.024)	-0.003	(0.017)	0.010	(0.013)	0.031	(0.080)
Gender								
Male	0.101	(0.119)	0.517	(0.086) ^{***}	0.283	(0.063) ^{***}	0.446	(0.193) [*]
Female (ref)								
School national examination								
Above average	-0.414	(0.336)	-0.050	(0.229)	-0.050	(0.161)	-0.613	(0.225) ^{**}
Average	-0.444	(0.316)	-0.191	(0.215)	-0.057	(0.151)	-0.454	(0.225) [*]
Below average (ref)								
Random effect								
Class (nested within school)	0.617	(0.155) ^{***}	0.275	(0.071) ^{***}	0.130	(0.035) ^{***}	0.268	(0.071) ^{***}
Intra-class correlation	0.098		0.088		0.074		0.090	

School random effects were not significant; the school variable was removed from the models

SE standard error

[#] $p < 0.10$; ^{*} $p < 0.05$; ^{**} $p < 0.01$; ^{***} $p < 0.001$

implemented have a higher level of HIV/AIDS knowledge, increased reproductive health skills, increased self-efficacy and greater intention to use protection if they were to have sex compared to students from school where no such training took place. These findings suggest that the FOYC with ImPACT intervention may have residual positive effect among subsequent classes of students attending these schools.

The finding that there is an enduring intervention effect among new respondents was not unexpected as it has been our observation that some well-trained teachers continued teaching many of the FOYC curriculum components in their health and family life education classes after the intervention is ended. Classroom (not school) random effects were found to be highly significant in all four models, indicating significant variation among classrooms with regard to students' knowledge of HIV/AIDS, reproductive health skills, self-efficacy, and intention to use condom protection. This may be because teachers' previous experiences with the FOYC curriculum impact the classroom environment. Teachers with FOYC experience may have continued teaching some components of FOYC in their classrooms, a conjecture which is supported by our observations that FOYC posters are still posted on the classroom walls in several of the 2004/2005 FOYC schools.

Evaluating the enduring effect of an HIV prevention program among new respondents is a complex and challenging task. First, because of the increasing awareness of adolescent HIV risk behaviors, other HIV prevention programs might have been implemented in the study sites and subsequent classes of students may have been exposed to similar educational programs during the long-term follow-up period. The 2011 baseline data from 90 grade six teachers in New Providence revealed that 17 teachers taught other HIV risk reduction programs in their classes. These teachers are approximately equally distributed in both intervention and control schools (i.e., FOYC or WW schools). Second, an enduring effect of an intervention program may be difficult to ascertain when great differences in demographic characteristics between two cohorts of study participants exist. Third, school is not a closed environment and students may have been exposed to STI/HIV messages in the mass media or other sources. The levels of exposure to HIV/AIDS public health campaigns are not likely to vary significantly from school to school as all 15 elementary schools are located in a small, densely populated island.

The results of the cross-sectional comparison of the 2011 cohort of students between FOYC schools and WW schools indicate that both males and females benefited from FOYC

intervention in 2004/2005. However, in longitudinal comparison between the 2004/2005 cohort of students and the 2011 cohort of students, only males displayed higher AIDS knowledge, reproductive health skills and self-efficacy. We speculate that this may be caused by the differences in the two cohorts of students as females had a significantly higher AIDS knowledge than males in 2004/2005. Future studies are needed to further examine gender differences in long-term effects of HIV interventions.

There are several potential limitations in this study. First, although we interviewed teachers who received training in FOYC during 2004/2005 and current school administrators regarding whether they continued to teach some or all of the FOYC curriculum, we were not able to locate and interview all the teachers who received training in FOYC during 2004/2005 in all 15 schools. Thus, the exact rate of teacher-turnover (transfer from FOYC schools to control schools or the opposite) cannot be calculated for each study condition. We estimate that two thirds of the teachers who received formal training in FOYC were still in the classrooms at the 6-year follow-up in 2011. Second, because some of the public elementary schools only have one or two small grade six classes, between schools-institutional effects is difficult to evaluate due to low statistical power.

Despite these potential limitations, the current study represents one of the first efforts to examine the long-term (approximately 6 years later) effect at an institutional level of an effective HIV intervention among new respondents who were not exposed to the original intervention. The seemingly positive enduring effects of the intervention suggest that high-quality training of teachers, guidance counselors and administrators, and teachers' high fidelity to the intervention's core elements in the implementation can lead to sustained intervention delivery by the trained teachers after the trial period. The successful implementation of the intervention, which was accompanied by many supportive activities in the schools and in the wider community, resulted in sustained delivery of some or all of the important prevention messages of FOYC. These sustained changes appear to have benefited subsequent cohorts of students as teachers appear to have continued teaching intervention components after the end of the randomized trial of the intervention. Future studies are needed to assess the long-term effects of behavioral interventions at the level of the institutions delivering the intervention among new respondents who were not exposed to the original intervention.

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