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# Effectiveness of a sports-based HIV prevention intervention in the Dominican Republic: a quasi-experimental study

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Previous observational and quasi-experimental studies in sub-Saharan Africa have suggested the effectiveness of youth-targeted HIV prevention interventions using sport as an educational tool. No studies have yet assessed the effect of similar programs in the Caribbean. A quasi-experimental trial was conducted to assess the effectiveness of a sports-based intervention in six migrant settlements in the Puerto Plata Province of the Dominican Republic. A total of 397 structured interviews were conducted with 140 adolescents prior to, immediately following, and four months following 10-hour interventions using the Grassroot Soccer curriculum. Interview responses were coded, aggregated into composite scores, and analyzed using logistic regression, adjusting for baseline differences as well as age, sex, community, and descent. At post-intervention, significant differences were observed between groups in HIV-related knowledge (adjOR = 13.02, 95% CI = 8.26, 20.52), reported attitudes (adjOR = 12.01, 95% CI = 7.61, 18.94), and reported communication (adjOR = 3.13, 95% CI = 1.91, 5.12). These differences remained significant at four-month follow-up, though declines in post-intervention knowledge were observed in the Intervention group while gains in knowledge and reported attitudes were observed in the Control group. Results suggest that this sports-based intervention could play a valuable role in HIV prevention efforts in the Caribbean, particularly those targeting early adolescents. Further evaluation of sports-based interventions should include indicators assessing behavioral and biological outcomes, longer-term follow-up, a larger sample, randomization of study participants, and strenuous efforts to minimize loss-to-follow-up.

**Keywords:** HIV; youth; sport; Dominican Republic; Caribbean

## Background

Sport is becoming an increasingly popular tool in youth-targeted HIV prevention. Proponents, funders, and implementers argue that sport can play a valuable role in preventing HIV by engaging youth as community leaders, educating them about risk reduction, and building valuable communication and life skills to prevent risky sexual behavior (SDP IWG, 2008). The evidence supporting this approach, however, is limited. Two quasi-experimental studies on sports-based HIV prevention programs in Zimbabwe (Clark, Friedrich, Ndlovu, Neilands, & McFarland, 2006) and Tanzania (Maro et al., 2009) found significant effects on HIV-related knowledge, reported attitudes, intentions, and perceived control in condom use. A recently published cross-sectional study found that participation in a sport-based HIV prevention program in Kenya was associated with greater self-reported condom use at first and last sex as well as higher reported frequency of condom use (Delva et al., 2010). No published evaluations have

assessed sports-based HIV prevention interventions outside the African continent.

Outside of sub-Saharan Africa, the Caribbean has the highest regional HIV prevalence in the world, with 75% of its HIV-infected individuals living in Haiti and the Dominican Republic (DR) (PAHO, 2007; UNAIDS, 2008). In recent years, national prevalences in both the DR and Haiti have begun to decline, though immigrants, men having sex with men (Gaillard et al., 2006; Halperin, De Moya, Pérez-Then, Pappas, & Garcia Calleja, 2009), and people who live in *bateyes*, impoverished settlements predominantly inhabited by Haitian immigrants and their children (CESDEM, 2007a), still remain vulnerable. Originally established as temporary work camps for sugarcane cutters, these geographically and socially isolated communities have become permanent settlements, where people endure substandard living conditions, suffer disproportionately from infectious diseases, and lack basic health services (Kreniske, 1997; Lopez Severino & De Moya, 2007, Simmons, 2010). The 2007 Demographic and Health Survey in

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DR found an adult HIV prevalence of 3.2% in *bateyes*, four times the national average of 0.8%, and roughly 1.5-times the Haitian national average of 2.2% (CESDEM, 2007a; UNAIDS, 2008).

A growing proportion of Haitian immigrants live not in *bateyes* but in *barrios* predominantly inhabited by Haitian immigrants and their descendents (Ferguson, 2003). These communities, while more urban, reflect similar living conditions to *bateyes*, though little public health research has focused on these communities. Though predominantly Haitian, these *barrios* (as well as *bateyes*) are home to many Dominicans. Analysis of data from 2002 to 2006 at obstetrical sites in La Romana – a region with a substantial Haitian population, both in *bateyes* and *barrios* – revealed a significantly higher HIV prevalence among Haitian mothers than among Dominican mothers, with the difference being especially pronounced (5.2% vs 2.3%) among mothers aged 21–25 years (Roman-Poueriet et al., 2009). Given this difference, it is important for HIV prevention studies within this population to consider participants' nationality (or descent, in the case of youth) as a potential risk factor.

The limited available data on HIV-related knowledge, attitudes, and beliefs among the Haitian migrant population in the DR suggests that prevention knowledge is low (Lopez Severino & De Moya, 2007; Martinez, 2005). Stigma and belief in myths about HIV transmission are more common in *bateyes* than nationally, while the proportion of residents with comprehensive knowledge of HIV is nearly 30% lower (CESDEM, 2007b). Risky behavior is also of concern in *bateyes*, particularly multiple concurrent partnerships, dry sex practices, and early sexual debut (Halperin, 1999; Population Services International, 2006). Among young *batey* females, roughly a quarter report initiating sex before age 15 and about two-thirds before age 18, compared to national averages of 15% and 51%, respectively (CESDEM, 2007b). Nevertheless, more than 60% of 15- to 19-year-old *batey* youth perceive they have no risk of HIV infection and more than 85% perceive they have little or no risk (CESDEM, 2007b). While this underscores the need to reach *batey* adolescents with effective prevention programs, no published studies to date have assessed the outcomes of HIV prevention interventions serving this population.

The *Fútbol Para la Vida* (FPV) program, initiated at Batey Libertad, is a partnership between the University of Vermont, the Batey Libertad Coalition, the DREAM Project, and Grassroot Soccer. Drawing from lessons learned from a successful sports-based program in Zimbabwe (Clark et al., 2006), the partners trained local *batey* soccer players – role models in their communities – to deliver FPV interventions in community centers after school. The programs reached at-risk youth, including children not attending school, orphans, and other vulnerable children.

Using a Spanish version of the Grassroot Soccer curriculum (www.grassrootsoccer.org), FPV camps consist of 10 hours of instruction, typically administered over the course of five days. Each of the 13 activities has an interactive component and a discussion component. For example, in "Risk Field," participants dribble a soccer ball through cones representing HIV-related risks – unprotected sex, multiple partners, drugs and alcohol, older sexual partners, etc. If one player hits a cone, the participant and his or her teammates must complete three pushups, showing how the consequences of one person's risk can not only affect him or her, but also friends, family, and the community. Other activities follow this same pattern of soccer-themed, interactive, discovery-based learning. The program aims to improve youths' knowledge about HIV and AIDS, to engender a feeling that they can protect themselves from contracting the virus, and to foster an open environment in which they feel comfortable discussing sexual and reproductive health issues amongst peers and with community role models. With these objectives in mind, this study assessed the short-term outcomes of FPV interventions to determine whether they significantly influenced what young people knew, thought, and communicated about HIV and whether any observed effects were sustained over several months.

## Methods

Structured face-to-face interviews were conducted at baseline with 164 adolescents aged 10–20 years in four *bateyes* and two Haitian barrios in the north coast province of Puerto Plata.[1] All participants were invited to participate in a five-day FPV camp. Ninety-nine chose to participate (the Intervention group), 41 chose not to participate (the Control group), and 24 were lost-to-follow-up. Baseline characteristics of the two groups are presented in Table 1. The median age of study participants was 13 years, with the Control group (median = 14 years) being slightly older than the Intervention group (median = 13 years, $t = 1.94$, $p = 0.056$). Forty-seven per cent of the study participants were female and 79% identified as being of Haitian descent, with no significant differences in sex or descent across groups. Interviews were conducted prior to, immediately following, and four months after the program. At follow-up, 24 Intervention

Table 1. Group characteristics and knowledge, reported attitudes, and reported communication at baseline.

| | Intervention ($n = 99$) | Control ($n = 41$) | Unadjusted *t*- or *z*-test | |
|---|---|---|---|---|
| **Demographics** | | | | |
| Mean age (standard deviation) | 13.5 years (2.3) | 14.4 years (2.2) | $t = 1.93$, $p = 0.06$ | |
| Female | 47.5% (47/99) | 46.3% (19/41) | $z = 0.12$, $p = 0.90$ | |
| **H**aitian descent | 77.8% (77/99) | 80.5% (33/41) | $z = 0.77$, $p = 0.44$ | |
| | % 'Correct' responses (*n/N*) | | Unadjusted OR (95% CI) | Adjusted OR (95% CI)[a] |
| **Knowledge (correct response)** | | | | |
| How is *sida* transmitted? (sex) | 59% (58/99) | 68% (28/41) | 0.66 (0.30–1.42) | 0.90 (0.38–2.12) |
| Is *sida* transmitted by sharing a drinking glass? (No) | 56% (51/91) | 63% (26/41) | 0.74 (0.34–1.57) | 0.97 (0.42–2.28) |
| How can a person protect themselves from *sida?* (Faithfulness/partner reduction) | 1% (1/99) | 2% (1/41) | 0.41 (0.02–6.69) | 0.68 (0.24–18.84) |
| How can a person protect themselves from *sida?* (using condoms) | 52% (51/99) | 61% (25/41) | 0.68 (0.32–1.43) | 0.92 (0.37–2.28) |
| Are HIV and AIDS the same thing? (No) | 28% (28/99) | 32% (13/41) | 0.85 (0.39–1.87) | 0.90 (0.39–2.07) |
| Can *s*ida be cured? (No) | 64% (63/99) | 73% (30/41) | 0.64 (0.29–1.43) | 0.64 (0.28–1.48) |
| Overall knowledge | 44% (257/586) | 50% (123/246) | 0.75 (0.56–1.02) | 0.89 (0.65–1.22) |
| **Reported attitudes ('correct' response)** | | | | |
| Can you protect yourself from *sida?* (Yes) | 56% (55/99) | 76% (31/41) | 0.40 (0.18–0.91)* | 0.46 (0.20–1.09) |
| Is contracting *sida* a question of bad luck? (No) | 21% (21/98) | 24% (10/41) | 0.85 (0.36–2.00) | 0.97 (0.39–2.40) |
| Can someone control whether or not they get *sida?* (Yes) | 41% (41/99) | 49% (20/41) | 0.74 (0.36–1.54) | 0.89 (0.41–1.92) |
| Can a person with *sida* live a normal life? (Yes) | 35% (34/98) | 37% (15/41) | 0.97 (0.45–2.07) | 1.02 (0.47–2.24) |
| What would you do if you found out your friend had *sida?* (support/help them) | 41% (28/68) | 23% (6/26) | 2.28 (0.81–6.38) | 3.72 (1.13–12.16)* |
| Overall attitudes | 39% (179/462) | 43% (82/190) | 0.84 (0.60–1.18) | 0.97 (0.68–1.39) |
| **Reported communication ('correct' response)** | | | | |
| Are you comfortable talking about *sida?* (Yes) | 55% (54/99) | 63% (26/41) | 0.72 (0.34–1.53) | 0.80 (0.37–1.73) |
| With whom have you talked about *sida?* (mentioned at least one family member) | 24% (20/84) | 22% (8/37) | 1.13 (0.45–2.87) | 1.05 (0.40–2.74) |
| With whom have you talked about *sida?* (mentioned at least one friend) | 34% (34/99) | 41% (17/41) | 0.74 (0.35–1.56) | 0.88 (0.40–1.94) |
| Can you name 3 people with whom you can speak about *sida?* (Yes) | 59% (58/99) | 66% (27/41) | 0.73 (0.34–1.57) | 0.77 (0.35–1.68) |
| Overall communication | 44% (166/381) | 49% (78/160) | 0.82 (0.56–1.18) | 0.88 (0.60–1.29) |

[a]Adjusted for age, sex, community, and descent.
*$p < 0.05$, not below Bonferroni-adjusted critical value.

participants and 22 Control participants had been lost-to-follow-up (see Figure 1).

The interview schedule included 15 indicators assessing HIV-related knowledge, attitudes and communication (KAC). Through pilot testing with 45 youth (non-study participants) in two of the communities, the instrument was calibrated to ensure that questions were understood and translated appropriately. Notably, during pilot testing, the use of the term *VIH* (HIV) confused the majority of youth, who had only heard the virus referred to as *Sida* (AIDS). Thus, the term *SIDA* was used in the study's interviews, with the exception of two questions: whether HIV and AIDS were the same thing and whether a person with HIV could live a normal life. The schedule utilized both agree/disagree questions and open-ended questions regarding HIV transmission and prevention. For open-ended questions, answers
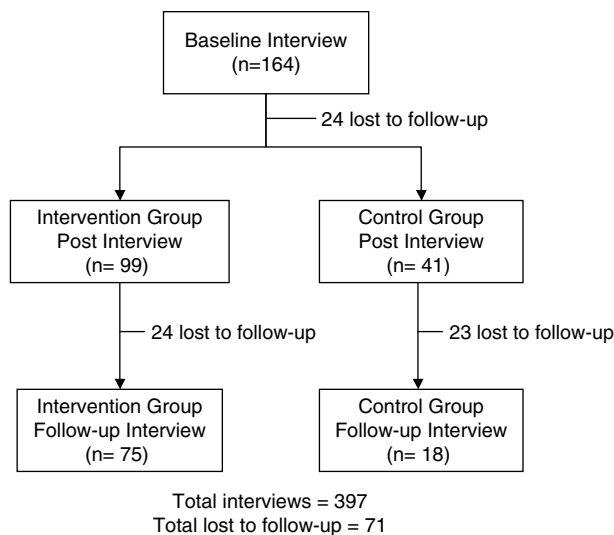
Figure 1. Flow chart of study participants and data collection points.

were post-coded, with spontaneous mention of the desired answer being coded as a "correct" response. When participants provided any response to "How can a person avoid getting *sida*?" they were asked to name additional methods of prevention until they could not think of any more. Mention of "condoms" and mention of "faithfulness" were coded separately and answers that implied condoms (e.g., "using protection") or faithfulness (e.g., "not sleeping around" or "having just one partner") were coded as correct.

Overall composite indicators for knowledge, reported attitudes, and reported communication were created as the overall proportion of "correct" responses in each of the three categories. The proportions of "correct" responses for individual and composite indicators were analyzed comparing the two groups at pre, post and follow-up using logistic regression in Stata. All analyses were adjusted for age, sex, community, and descent (i.e., whether participants self-identified primarily as Dominican or Haitian). Post and follow-up analyses were adjusted for baseline differences. For all tests, interpretation of *p*-values was adjusted using the Bonferroni Correction to allow for multiple comparisons.

## Results

After adjusting for age, sex, community and descent, no significant differences were observed at baseline between the Intervention and Control groups in overall knowledge (adjOR = 0.89, 95% CI = 0.65, 1.22), overall reported attitudes (adjOR = 0.97, 95% CI = 0.68, 1.39), or overall reported communication

(adjOR = 0.88, 95% CI = 0.60, 1.29). While the older Control group scored slightly higher on 13 out of the 15 indicators, both groups demonstrated low proportions of "correct" responses. A strikingly high proportion of adolescents (42%) reported believing that *sida* can be transmitted by sharing a drinking glass with an infected person. Numerous other myths about transmission surfaced, for example, that *sida* can be spread by touching, kissing, hugging, eating off the same plate, sharing eating utensils, using the same bathroom, wearing the same clothing, sleeping in the same bed, or living with an infected person. When asked how sexually active people can protect themselves from *sida*, only two adolescents mentioned faithfulness or partner reduction, whereas roughly 50% mentioned condoms. Fewer than one in four youth reported having spoken with a family member about *Sida* and only 36% reported having spoken about it with a friend.

After adjusting for baseline responses as well as age, sex, community and descent, significant differences were observed between groups at post (immediately following intervention) in overall knowledge (adjOR = 8.40, 95% CI = 6.45, 10.94), reported attitudes (adjOR = 9.58, 95% CI = 6.92, 13.27) and communication (adjOR = 3.31, 95% CI = 2.44, 4.50) (Table 2 and Figure 2). The strongest specific effects were observed on knowledge of the sexual transmission of *Sida* (adjOR = 116.4, 95% CI = 15.3, 886.2), knowledge of condoms as a prevention method (adjOR = 59.4, 95% CI = 13.0, 270.8) and self-efficacy to avoid *Sida* (adjOR = 54.0, 95% CI = 9.73, 299.4). The Intervention group scored higher than the Control group on all 15 indicators, with significant differences being observed for 12 of the indicators, even after the Bonferroni adjustment ($p < 0.003$). One attitudinal indicator showed a borderline effect ($p = 0.004$) that did not fall below the Bonferroni-adjusted critical *p*-value. The least difference was observed in reported communication with a friend about *Sida* (adjOR = 1.96, 95% CI = 0.81–4.76) and reported comfort in talking about *Sida* (adjOR = 2.28, 95% CI = 0.73, 7.13) (Table 2).

Adjusting for age, sex, community, descent and baseline responses had a large effect on the magnitude of effect for some specific indicators. Most notably, for knowledge of the sexual transmission of HIV, adjustment increased the odds ratio from 20.48 to 116.43. Adjustment effected significance for two indicators – reported communication with a family member and being able to name three people with whom the participant could speak about *sida* – which had unadjusted *p* values of 0.017 and 0.027, respectively. Whereas the adjusted effect for these indicators met the Bonferroni significance criteria ($p < 0.003$),

Table 2. Differences in knowledge, reported attitudes, and reported communication immediately post-intervention.

| | % 'Correct' responses (*n*/*N*) | | | |
| --- | --- | --- | --- | --- |
| | Intervention (*n* = 99) | Control (*n* = 41) | Unadjusted OR (95% CI) | Adjusted OR (95% CI)[a] |
| Knowledge (correct response) | | | | |
| How is *sida* transmitted? (sex) | 97% (96/99) | 61% (25/41) | 20.5 (5.53–75.8)** | 116.4 (15.3–886.2)** |
| Is *sida* transmitted by sharing a drinking glass? (No) | 97% (89/92) | 61% (25/41) | 19.0 (5.12–70.4)** | 51.6 (10.3–258.5)** |
| How can a person protect themselves from *sida?* (faithfulness/partner reduction) | 34% (34/99) | 5% (2/41) | 10.2 (2.32–44.8)** | 24.6 (3.13–194.0)** |
| How can a person protect themselves from *sida?* (using condoms) | 96% (95/99) | 54% (22/41) | 20.5 (6.34–66.3)** | 59.4 (13.0–270.8)** |
| Are HIV and AIDS the same thing? (No) | 89% (88/99) | 46% (19/41) | 9.26 (3.86–22.3)** | 12.2 (4.67–32.0)** |
| Can sida be cured? (No) | 92% (91/99) | 61% (25/41) | 7.28 (2.80–19.0)** | 13.7 (4.34–43.4)** |
| Overall knowledge | 83% (486/587) | 48% (118/246) | 5.69 (4.08–7.94)** | 13.02 (8.26–20.52)** |
| Reported attitudes ('correct' response) | | | | |
| Can you protect yourself from *sida?* (Yes) | 97% (96/99) | 61% (25/41) | 20.5 (5.53–75.8)** | 54.0 (9.73–299.4)** |
| Is contracting *sida* a question of bad luck? (No) | 76% (75/99) | 29% (12/41) | 7.55 (3.34–17.1)** | 26.9 (7.39–98.1)** |
| Can someone control whether or not they get *sida?* (Yes) | 78% (77/99) | 56% (23/41) | 2.74 (1.26–5.96)* | 3.65 (1.51–8.80)* |
| Can a person with *sida* live a normal life? (Yes) | 81% (80/99) | 46% (19/41) | 4.88 (2.21–10.76)** | 7.80 (3.03–20.1)** |
| What would you do if you found out your friend had *sida?* (support/help them) | 91% (75/82) | 22% (9/40) | 36.9 (12.6–107.9)** | 51.7 (13.8–193.7)** |
| Overall attitudes | 84% (403/478) | 43% (88/204) | 7.08 (4.89–10.3)** | 12.01 (7.61–18.94)** |
| Reported communication ('correct' response) | | | | |
| Are you comfortable talking about *sida?* (Yes) | 86% (85/99) | 78% (32/41) | 1.71 (0.67–4.33) | 2.28 (0.73–7.13) |
| With whom have you talked about *sida?* (mentioned at least one family member) | 54% (45/84) | 30% (11/37) | 2.73 (1.20–6.22)* | 5.70 (1.69–19.2)** |
| With whom have you talked about *sida?* (mentioned at least one friend) | 56% (56/99) | 51% (21/41) | 1.24 (0.60–2.57) | 1.96 (0.81–4.76) |
| Can you name 3 people with whom you can speak about *sida?* (Yes) | 87% (86/99) | 71% (29/41) | 2.74 (1.12–6.66)* | 6.21 (1.96–19.6)** |
| Overall communication | 71% (272/381) | 58% (93/160) | 1.80 (1.22–2.64)** | 3.13 (1.91–5.12)** |

[a]Adjusted for age, sex, community, descent, and baseline responses.
*$p < 0.03$, not below Bonferroni-adjusted critical value.
**$p < 0.003$, below Bonferonni-adjusted critical value.

the unadjusted effect did not. Adjustment had no effect on significance for composite indicators or for other specific indicators.

At follow-up (four months), significant differences between groups were again observed in overall knowledge (adjOR = 3.81, 95% CI = 2.26, 6.42), reported attitudes (adjOR = 6.31, 95% CI = 3.51, 11.3), and reported communication (adjOR = 2.67, 95%CI = 1.37, 5.10) (Table 2). Adjustment again affected the estimated magnitude of effect, though it only influenced significance in overall reported communication (unadj OR = 2.11, 95% CI = 1.23, 3.62, $p = 0.006$). Overall knowledge declined for the Intervention group (from 83% immediately post-

intervention to 78% four months after) but increased for the Control group (from 48% to 56%), resulting in a diminished effect, as compared with the post analysis. Declines in effect on attitudes and communication were less notable (see Figure 2). In terms of individual indicators, the Intervention group again scored higher than the Control group on all 15 indicators. After the Bonferroni adjustment, significant differences between groups on specific indicators were only observed on one knowledge indicator and two attitude indicators. Loss-to-follow-up had resulted in wider confidence intervals. Two knowledge indicators and one attitude indicator had results of
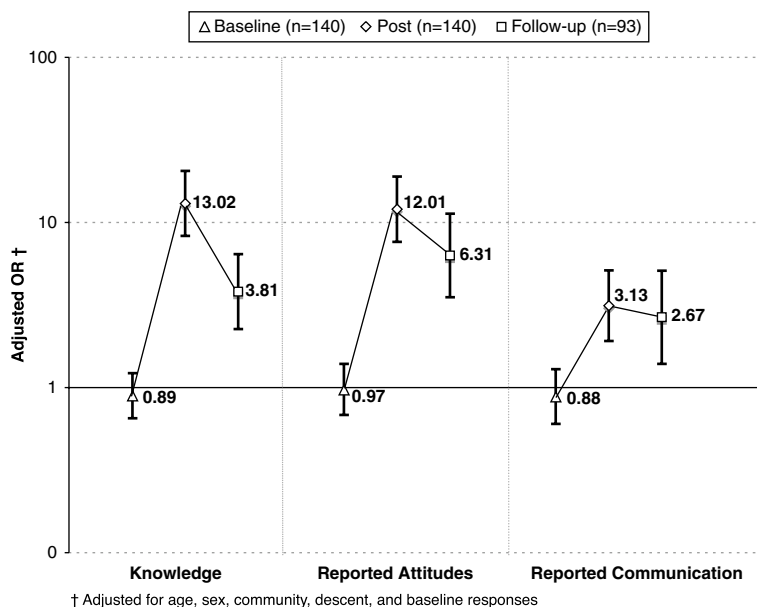
Figure 2. Differences in knowledge, reported attitudes, and reported communication between groups at post and follow-up.

borderline significance ($0.01 < p < 0.05$) that did not pass the Bonferroni-adjusted critical *p*-value (see Table 3).

## Discussion

These study results provide strong evidence of the FPV program's effect on HIV-related knowledge, reported attitudes, and reported communication (KAC). Though the Control group had slight advantages in KAC at baseline, the Intervention Group had surpassed them on every indicator by post-intervention and retained these advantages at four-month follow-up. Similar to other studies on HIV prevention interventions, the findings point to a diminishing effect on knowledge over time.

From post-intervention to follow-up, the Intervention group notably declined in knowledge of partner reduction/mutual faithfulness as a prevention method (from 34% to 17%), knowledge of condoms as a prevention method (from 96% to 89%), and in knowledge of *Sida* being incurable (from 92% to 84%). The effect on attitudes diminished as well, though not as markedly.

That knowledge of condoms as a prevention method greatly exceeded that of partner reduction/ faithfulness is important for tailoring prevention efforts in *bateyes*. The discrepancy likely results because past HIV prevention efforts have largely revolved around social marketing and condom promotion, including free condom distribution, posters, and a television drama. The use of an open-ended question to measure knowledge of prevention methods

likely resulted in lower levels of knowledge (particularly around partner reduction) than would be found in a prompted health survey. However, since all participants had the opportunity to provide multiple answers, the unprompted question allowed investigation of adolescents' prioritization of HIV prevention strategies. In this case, both before and after the intervention, participants overwhelmingly emphasized condom use. That participants did not retain knowledge of partner reduction/faithfulness as a prevention method as well over the follow-up period as knowledge of condoms or HIV transmission highlights a key area for improvement in FPV. Indeed, this is an area in which many HIV prevention interventions have fallen short (Shelton et al., 2004). Activities in the FPV curriculum should be modified or supplemented to increase emphasis on partner reduction/faithfulness as a prevention method without detracting from education about abstinence and condoms.

This study had important limitations. Self-selection into groups might have introduced selection bias. For example, those choosing to participate in FPV might, by their nature, have been more likely to improve in knowledge, attitudes and communication. The lack of differences between groups at baseline suggests that the groups did not differ with respect to previous exposure to HIV-related information or interventions. Furthermore, since differences in age, sex, community, and ethnicity were adjusted for in the analysis, it is improbable that the major differences after exposure to the interventions resulted from differences in the make-up of the two groups. Nevertheless, in future evaluations of these interventions,

Table 3. Differences in knowledge, reported attitudes, and reported communication at four-month follow-up.

| | % 'Correct' responses (n/N) | | | |
| --- | --- | --- | --- | --- |
| | Intervention (n = 75) | Control (n = 18) | Unadjusted OR (95% CI) | Adjusted OR (95% CI)[a] |
| Knowledge (correct response) | | | | |
| How is *sida* transmitted? (sex) | 95% (71/75) | 78% (14/18) | 5.07 (1.13–22.7)* | 7.19 (1.28–40.4)* |
| Is *sida* transmitted by sharing a drinking glass? (No) | 96% (72/75) | 78% (14/18) | 6.86 (1.38–34.0)* | 12.3 (1.65–92.2)* |
| How can a person protect themselves from *sida?* (faithfulness/partner reduction) | 17% (13/75) | 6% (1/18) | 3.56 (0.43–29.2) | 4.23 (0.47–37.8) |
| How can a person protect themselves from *sida?* (using condoms) | 89% (67/75) | 72% (13/18) | 3.22 (0.91–11.4) | 3.46 (0.94–12.7) |
| Are HIV and AIDS the same thing? (No) | 85% (64/75) | 28% (5/18) | 15.1 (4.49–50.9)** | 18.8 (4.99–70.8)** |
| Can *sida* be cured? (No) | 84% (63/75) | 78% (14/18) | 1.50 (0.42–5.35) | 2.10 (0.52–8.37) |
| Overall knowledge | 78% (350/450) | 56% (61/108) | 2.70 (1.74–4.19)** | 3.81 (2.26–6.42)** |
| Attitudes ('correct' response) | | | | |
| Can you protect yourself from *sida?* (Yes) | 96% (72/75) | 83% (15/18) | 4.80 (0.88–26.1) | 5.69 (0.91–35.5) |
| Is contracting *sida* a question of bad luck? (No) | 76% (57/75) | 33% (6/18) | 6.33 (2.08–19.3)** | 18.0 (3.59–90.1)** |
| Can someone control whether or not they get *sida?* (Yes) | 79% (59/75) | 61% (11/18) | 2.35 (0.78–7.03) | 2.18 (0.70–6.79) |
| Can a person with *sida* live a normal life? (Yes) | 81% (61/75) | 56% (10/18) | 3.49 (1.16–10.43)* | 4.30 (1.29–14.3)* |
| What would you do if you found out your friend had *sida?* (support/help them) | 87% (58/67) | 28% (5/18) | 16.8 (4.81–58.4)** | 21.6 (5.42–86.3)** |
| Overall attitudes | 84% (307/367) | 52% (47/90) | 4.68 (2.85–7.70)** | 6.31 (3.51–11.3)** |
| Communication ('correct' response) | | | | |
| Are you comfortable talking about *sida?* (Yes) | 91% (68/75) | 78% (14/18) | 2.78 (0.71–10.8) | 4.85 (0.77–30.4) |
| With whom have you talked about *sida?* (mentioned at least one family member) | 58% (37/64) | 33% (6/18) | 2.74 (0.91–8.22) | 3.04 (0.94–9.86) |
| With whom have you talked about *sida?* (mentioned at least one friend) | 61% (46/75) | 44% (8/18) | 1.98 (0.70–5.61) | 1.92 (0.62–5.98) |
| Can you name 3 people with whom you can speak about *sida?* (Yes) | 87% (65/75) | 78% (14/18) | 1.86 (0.51–6.78)^ | 1.99 (0.51–7.70) |
| Overall communication | 75% (216/289) | 58% (42/72) | 2.11 (1.23–3.62)* | 2.67 (1.39–5.10)** |

[a]Adjusted for age, sex, community, descent, and baseline responses.
*$p < 0.05$, not below Bonferroni-adjusted critical value.
**$p < 0.003$, below Bonferonni-adjusted critical value.

participants or (clusters of participants) should be randomly allocated to Intervention and Control groups.

The study's small sample size limited our ability to analyze effects across sub-groups. Furthermore, loss-to-follow-up rates in these transitory migrant communities were higher than anticipated. Among the Intervention group, this may have biased follow-up data. It is possible that those participants lost to follow-up would have scored lower than those interviewed at follow-up, resulting in larger overall declines in KAC between post-intervention and follow-up. Likewise, high loss-to-follow-up rates among the Control group limited the statistical power in follow-up analyses and made it difficult to determine to what extent information may have diffused from FPV participants to non-participants in the same community. Previous evaluation of the Grassroot Soccer model has suggested that diffusion may take place when interventions are delivered in a school setting (Clark et al., 2006). The extent and characteristics of this diffusion should be investigated in future studies.

Notably, the study did not include measures of reported sexual risk behavior or biological endpoints. This limits what can be inferred about the intervention's effect in preventing HIV transmission. The intervention's and study's short-term nature may have led to substantial desirability bias if we had assessed self-reported behavioral outcomes, particularly those related to sexual behavior. Numerous studies have confirmed that such measurements – while important in measuring effectiveness – are subject to desirability bias, even within long-term follow-up periods (Plummer et al., 2004). Our study's small size, limited funding, and short-term scope did not allow for an assessment of biological outcomes.

Indeed, youth-targeted HIV prevention interventions that have found short- and long-term effects on knowledge and attitudes have so far failed to demonstrate long-term impacts on HIV incidence (Cowan et al., 2010; Jewkes et al., 2008; Ross et al., 2007). Nevertheless, our findings further support the potential effectiveness of sports-based HIV prevention and demonstrate that a sports-based intervention found successful in improving knowledge and attitudes in sub-Saharan Africa can retain its effect on knowledge, attitudes and communication when adapted to a Caribbean context. Ideally, such interventions should be tested for their effectiveness in reducing HIV and other sexually transmitted infections, pregnancies, and reported sexual risk behaviors.

## Acknowledgements

## Note

1. The barrios had similar living conditions to *bateyes*, with extreme poverty, informal housing, and lack of social services.

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