Efficacy of a Preventive Intervention for Youths Living With HIV

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A B S T R A C T

Objectives. HIV transmission behaviors and health practices of HIV-infected youths were examined over a period of 15 months after they received a preventive intervention.

Methods. HIV-infected youths aged 13 to 24 years (n=310; 27% African American, 37% Latino) were assigned by small cohort to (1) a 2-module ("Stay Healthy" and "Act Safe") intervention totaling 23 sessions or (2) a control condition. Among those in the intervention condition, 73% attended at least 1 session.

Results. Subsequent to the "Stay Healthy" module, number of positive lifestyle changes and active coping styles increased more often among females who attended the intervention condition than among those in the control condition. Social support coping also increased significantly among males and females attending the intervention condition compared with those attending the control condition. Following the "Act Safe" module, youths who attended the intervention condition reported 82% fewer unprotected sexual acts, 45% fewer sexual partners, 50% fewer HIV-negative sexual partners, and 31% less substance use, on a weighted index, than those in the control condition.

Conclusions. Prevention programs can effectively reduce risk acts among HIV-infected youths. Alternative formats need to be identified for delivering interventions (e.g., telephone groups, individual sessions). (*Am J Public Health.* 2001;91:400–405)

Youths represent about 50% of all HIV infections worldwide[1] and 18% of reported HIV cases in the United States.[2] Nationally, there are about 110000 youths living with HIV.[3] On the basis of data from seropositive adults,[4,5] we anticipate that at least one third of these youths may continue their transmission behaviors after learning their serostatus.[6] HIV-infected youths who do not change their sexual risk acts or injection drug use may both infect others and become reinfected with new viral strains.[7] Therefore, it is important to change the health behavior and transmission acts of youths with HIV, both for their self-preservation and for the prevention of transmission to others.

With those considerations in mind, we designed and evaluated an intervention for HIV-infected youths consisting of 2 modules delivered in sequence. Based on the results of an extensive qualitative study of such youths,[8,9] the intervention began with "Stay Healthy," a 12-session module that aims to increase the positive health behaviors of youths with HIV.[10] The intervention was conducted from 1994 to 1996, before the introduction of highly active antiretroviral therapy.[11] Even then, the long-term survival of HIV-infected persons was associated with healthy lifestyles[12] and assertively managing health regimens and relationships with health care providers.[13] Since the introduction of highly active antiretroviral therapy, changes in health behavior are even more important because of the negative consequences of sporadic adherence to these medications,[14] as well as the potential reductions in transmission because of decreased viral loads.

The second module of the intervention, "Act Safe" (11 sessions), aims to enhance altruistic motivations to reduce transmission acts. This module was based on previous successful interventions to reduce sexual and substance-use risk acts with seronegative persons.[15]

The Social Action Model,[16] which was used as the theoretical basis of the intervention, was based on an extensive qualitative study of HIV-infected youths[8] and studies with seropositive adults.[13,17,18] This model takes into account contextual factors as it focuses on improving affective states that influence self-regulation (e.g., coping) and building skills to improve self-regulation (negotiation skills, self-efficacy).[15]

As shown in Figure 1, assessments were conducted before the first module ("Stay Healthy"), between the 2 modules, and after the second module ("Act Safe"). This design allowed us to assess HIV-infected youths' response to the "Stay Healthy" module alone, as well as to assess their response to both modules.

Methods

Participants and Assignment

The study was conducted at 9 adolescent clinical care sites in 4 AIDS epicenters: Los Angeles, New York, San Francisco, and Miami. Over a 21-month period (1994 to 1996), 351 of the 393 HIV-infected youths who received care at the sites were recruited after giving informed consent (25 [6.4%] refused participation; 17 [4.3%] were too ill). Parental consent was obtained for nonemancipated youths younger than 18 years.

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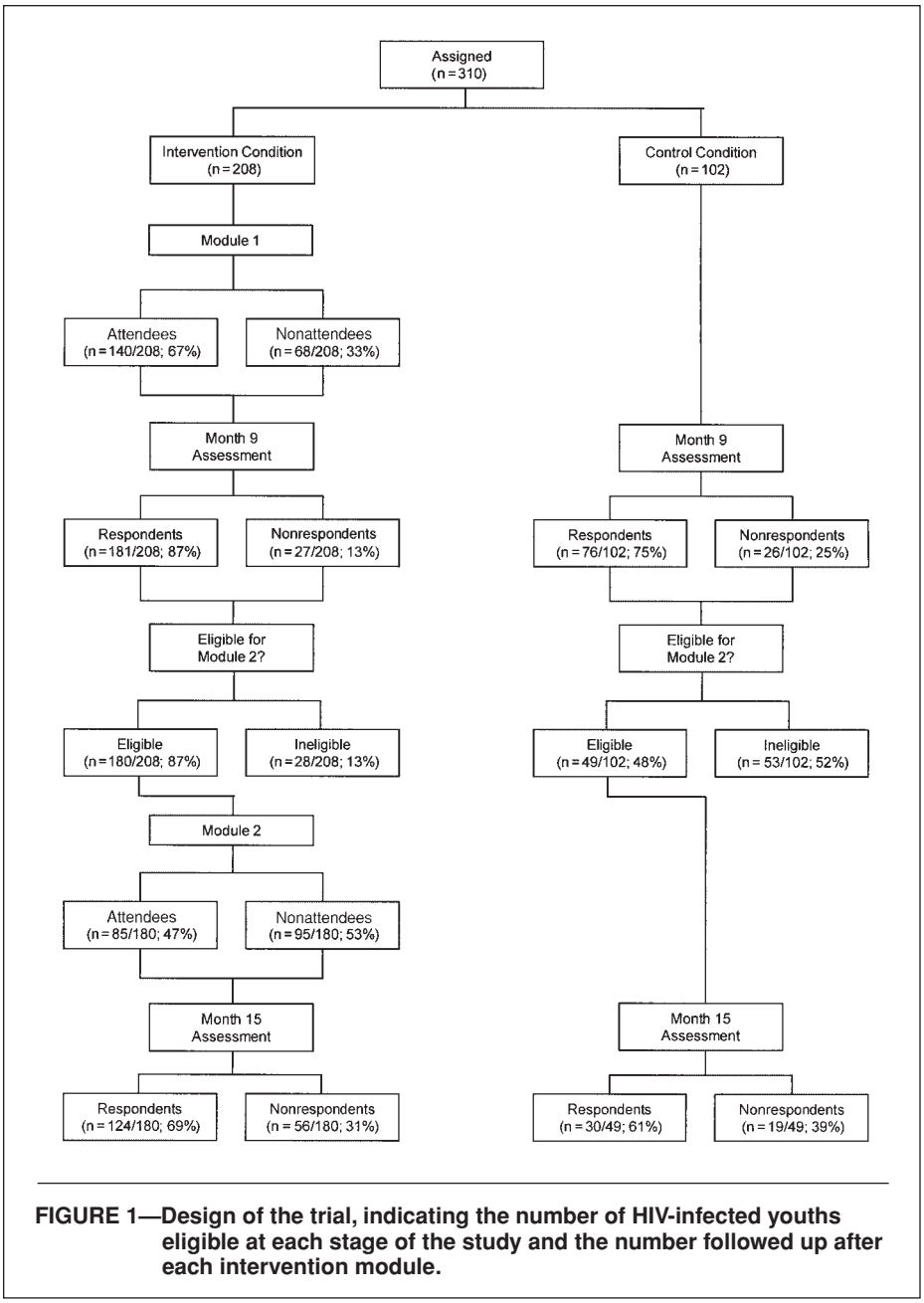

FIGURE 1—Design of the trial, indicating the number of HIV-infected youths eligible at each stage of the study and the number followed up after each intervention module.

Two baseline assessments were conducted at a 3-month interval to establish the stability of risk behaviors, with an incentive of $20 to $25 per assessment. Five HIV-infected youths were too sick to participate, and 36 were lost to follow-up before the second baseline. The remaining 310 youths participated in the study: 126 from Los Angeles, 91 from New York, 49 from San Francisco, and 44 from Miami.

Successful HIV interventions with youths have generally been delivered in a small-group format[15,19]; following this design, we delivered our intervention in small groups (cohorts). Cohorts of about 15 HIV-infected youths each were assigned sequentially to the intervention and control conditions. It took several months to assemble a sufficient number of youths to form a cohort; in 7 of 9 sites, the last cohort was assigned to the intervention condition. Therefore, across the 9 sites, there were 16 cohorts in the intervention condition (n = 208) and 9 cohorts in the control condition (n = 102).

Given the sequential nature of the assignment, there is a concern about imbalance between the intervention and control conditions. We conducted regressions to assess the potential bias that might emerge over time during participant recruitment, regressing each risk behavior reported at the baseline interview on the order of entry into the study. No significant time trends were found.

The second baseline interview was conducted before assignment to the intervention condition. As shown in Figure 1, the first module of the intervention, "Stay Healthy," was then delivered to the youths assigned to the intervention condition over a period of 3 months. Youths in both conditions were reassessed at month 9. Among the 310 youths initially assigned, 257 (83%) were reassessed successfully at this time, 181 in the intervention condition and 76 in the control condition (Figure 1).

Module 2 ("Act Safe") of the intervention was then delivered over a period of 3 months, and youths were reassessed at month 15. Because the duration of the study was limited, 77 youths were recruited too late to participate in module 2, and 4 were ineligible owing to illness or death. The remaining 229 youths (180 in 14 intervention cohorts and 49 in 5 control cohorts) were eligible to participate in module 2. Among these, 154 (67%; 124 in the intervention and 30 in the control condition) completed the month 15 assessment after module 2.

Intervention

Module 1 focused on coping with learning one's serostatus, implementing new daily routines to stay healthy, issues of disclosure, and participating in health care decisions. Module 2 aimed to reduce substance use and unprotected sexual acts by having youths identify their risk behavior triggers and modify their patterns of substance use as well as increase self-efficacy of condom use and negotiation skills.

A detailed manual (available online at http://chipts.ucla.edu) guided the 2 intervention modules, which comprised 23 sessions of 2 hours each.[10] Each participant received $10 for the first session attended in each module and $2 increases in incentives for subsequent sessions.

The intervention was usually delivered by 2 facilitators, 1 male and 1 female. The cohorts were mixed according to sex. The facilitators received intensive training of 3 days for each module from teams of experienced cognitive-behavioral intervention researchers. They also received ongoing supervision. The training included review of the study's theoretical orientation, the intervention manual, and videotapes of model sessions, as well as practice in conducting the intervention.

Quality assurance ratings were conducted from randomly selected videotapes of sessions; ratings for more than 80% of the sessions exceeded criteria for content and process measures of fidelity. On assessments conducted at sessions 5 and 11 of each module, youths in the intervention reported liking their sessions (mean = 4.2 on a scale of 1–5); they also rated their facilitators as highly trustworthy (mean = 4.2 on a scale of 1–5).

Across both modules, 151 of 208 youths (73%) assigned to the intervention condition

attended at least 1 session (71 attended module 1 only, 22 attended module 2 only, and 58 attended both). Intervention attendees were those assigned to the intervention condition who attended at least 1 session; intervention nonattendees were those assigned to the intervention condition but who never attended a session. Among those who attended at least 1 session in module 1, the mean number of module 1 sessions attended was 7.7 (SD=3.55); 70% attended 6 or more sessions (median=9) out of a total of 12. Among those who attended at least 1 session in module 1 (n=80), the mean number of module 2 sessions attended was 7.6 (SD=3.2); 73% attended 5 or more sessions (median=8) out of a total of 11. Youths in the control condition received standard care at the adolescent clinical care sites and received the intervention at the study's conclusion.

Assessments

Data were collected by an ethnically diverse team of trained interviewers who used computer-assisted interviewing. Quality assurance ratings were conducted from randomly selected audiotapes; 91% met criteria on ratings of completeness, positive tone, and crisis referrals. For all assessment domains, activities reported for the previous 3 months are defined as "recent" behaviors.

We derived 3 indices of health behavior: (a) a weighted index of medical care contacts (the weighted sum of the number of nights [n] for a hospital stay [weight of 5], the number of clinic, office, or emergency room visits [n] [weight of 4], the number of home health care visits [n] [weight of 3], the number of personal support for everyday tasks [n] [weight of 2], and the number of phone consultations [n] [weight of 1] [α=.62]); (b) the number of medical appointments missed; and (c) the number of positive lifestyle changes (α=.71) (n=12 potential behaviors; e.g., balanced diet, exercise, vitamins, adequate sleep).

We also examined 3 health status measures: (a) T-cell count; (b) physical health symptoms, a summary count of 23 physical symptoms (α=.88, r=0.70 with chart review of 31 HIV-infected youths)[20]; and (c) physical health distress score, calculated as a mean of the intensity (range=0–5) of each symptom (α=.90).

We assessed coping style with a modified version of the Dealing with Illness Inventory,[21] with 37 items rated on a 1-to-5 Likert scale and factor analyzed into 7 factors: positive action (10 items; α=.88), social support (5 items; α=.77), spiritual hope (4 items; α=.74), passive problem solving (5 items; α=.75), self-destructive escape (5 items; α=.81), depression/withdrawal (4 items; α=.66), and nondisclosure/problem avoidance (4 items; α=.66).

On the basis of extensive sexual history data, we derived the following 4 indices: (a) no recent sexual risk (abstinence [no vaginal or anal intercourse] or 100% condom use over the last 3 months), (b) the number of sexual partners—total count and separate counts by serostatus, (c) the percentage of vaginal and anal sex acts unprotected by condoms with HIV-negative partners, and (d) the percentage of partners to whom disclosure of serostatus was made before intercourse.

On the basis of extensive substance-use data, we derived the following 6 indices: (a) use of alcohol and marijuana only, (b) use of hard drugs, (c) a weighted index of drug use (derived as the sum of the frequency of the use of each drug category, weighted as follows: marijuana=1, amphetamine/stimulants=2, steroids=3, crack/cocaine=4, heroin=5),[22,23] (d) symptoms of abuse and dependency, (e) entry into and completion of substance-use treatment, and (f) a sum of the number of different drugs used.

Emotional distress was assessed with the Brief Symptom Inventory,[24] a 53-item, reliable index of mental health symptoms (α=.97).

Data Analysis

We conducted as-treated analyses[25,26] comparing intervention attendees vs control subjects and intervention attendees vs intervention nonattendees. (Results of intent-to-treat analyses are similar on all outcomes, except for the weighted substance use index for module 2, and are available from the authors.) We used mixed-effects analyses of covariance models to compare continuous postintervention scores across the cohorts, controlling for baseline scores (the second baseline), city, sex, and ethnicity as covariates and treating the cohort as a random effect. We report the adjusted mean outcomes for each condition (intervention attendees, control subjects, intervention nonattendees), adjusted for baseline scores, city, sex, and ethnicity. Similarly, we used mixed-effects logistic regression models to compare categorical postintervention outcomes, controlling for baseline status, city, sex, and ethnicity and treating the cohort as a random effect. We interpreted the intervention effect by using the relative effect size, defined as the intervention effect (the difference between the score of youths in the intervention condition and in the control condition) divided by the score of youths in the control condition, converted into a percentage.

We examined the association between each outcome and the number of intervention sessions attended among intervention attendees to assess the dose–response relationship. No significant associations were found, most likely because of the relatively high attendance among intervention attendees.

Results

Table 1 describes the HIV-infected youths at the baseline assessment (n=310); the subgroup of youths available for the module 1 analysis is very similar to the group of those assigned at baseline (n=257). At baseline, most participants (72%) were male; 88% of these males were gay or bisexual. The youths ranged in age from 13 to 24 years (mean=20.7; SD=2.1); females were younger than males by about 1.5 years (P<.001). Most youths (64%) belonged to ethnic minority groups, 55% had graduated from high school, 31% were currently enrolled in school (mean=11th grade; SD=2.31), and 84% had been employed. On average, youths had tested seropositive for HIV more than 2 years before recruitment (mean=2.1; SD=2.0; median=1.4 years).

We conducted extensive analyses to assess the presence of selection bias, comparing subgroups by assignment, attrition, and participation at each module (results available from the authors). Although the intervention assignment procedure was not randomized, it was successful in producing subgroups that were comparable throughout the study. Only 3 differences were found: (1) the intervention and control conditions were not balanced by site (χ^2_6=29.1; P<.001), because 7 of 9 sites ended with an intervention cohort; (2) because Miami had more female HIV-infected youths, and youths from Miami were not eligible for module 2, more males attended only module 1 (χ^2_2=11.3; P<.05) compared with other groups; and (3) intervention attendees were more likely to use social support as a coping strategy (an outcome measure) at baseline. City, sex, ethnicity, and baseline status were controlled for in all analyses; therefore, those differences do not confound our findings.

Table 2 summarizes the as-treated analyses comparing intervention attendees, intervention nonattendees, and control subjects.

Module 1: "Stay Healthy"

On average, youths had missed 1 medical appointment (SD=1.2) in the previous 3 months. The most commonly cited reason for missing appointments was ease of rescheduling. When physical health status was controlled for, there were no differences in missed appointments across conditions. T-cell counts, the number of physical health symptoms, and distress associated with physical health symptoms were similar across conditions.

TABLE 1—Baseline Characteristics and Risk Behaviors of Study Participants in a Preventive Intervention for Youth Living With HIV

	Intervention Attendees (n=140)	Controls (n=102)	Intervention Nonattendees (n=68)	Overall (n=310)
Mean age, y (SD)	20.7 (2.1)	20.6 (2.2)	21.0 (1.9)	20.7 (2.1)
12–17, % (n)	7 (10)	10 (10)	4 (3)	7 (23)
18–20, % (n)	34 (47)	31 (32)	31 (21)	32 (100)
21–24,[a] % (n)	59 (83)	59 (60)	65 (44)	60 (187)
Male, % (n)	71 (100)	75 (77)	69 (47)	72 (224)
Gay/bisexual (male only), % (n)	88 (87)	95 (72)	78 (36)	88 (195)
Ethnicity,** % (n)				
African American	33 (46)	22 (22)	22 (15)	27 (83)
Latino	32 (45)	46 (47)	34 (23)	37 (115)
White	18 (25)	12 (12)	32 (22)	19 (59)
Other	17 (24)	21 (21)	12 (8)	17 (53)
City,** % (n)				
Los Angeles	36 (50)	49 (50)	38 (26)	41 (126)
New York	37 (52)	13 (13)	38 (26)	29 (91)
San Francisco	12 (17)	21 (21)	16 (11)	16 (49)
Miami	15 (21)	18 (18)	7 (5)	14 (44)
Diagnostic status, % (n)				
Asymptomatic	57 (77)	61 (60)	62 (41)	59 (178)
Symptomatic	35 (47)	29 (28)	29 (19)	31 (94)
AIDS	9 (12)	10 (10)	9 (6)	9 (28)
T-cell count	499.0	468.1	474.9	483.4
Health-related issues				
No. of medical care contacts	21.1	19.0	21.8	20.5
No. of appointments missed	1.1	0.8	1.4	1.1
No. of positive lifestyle changes	4.8	5.0	4.9	4.9
No. of physical health symptoms	9.8	10.0	8.8	9.6
Mean physical health distress score	1.0	1.0	0.9	1.0
Coping				
Social support*	2.7	2.4	2.3	2.6
Positive action	3.4	3.4	3.3	3.3
Sexual behavior				
No sexual-risk pattern, % (n)	73 (102)	67 (68)	74 (50)	71 (220)
No. of sexual partners	3.1	2.6	2.6	2.8
No. of HIV-negative partners	4.9	2.2	2.2	3.4
No. of HIV-positive partners	0.4	0.5	0.4	0.4
Disclosed serostatus to sexual partners, %	53.5	54.0	54.3	53.8
Unprotected sex acts, %	11.3	12.6	7.2	10.8
Brief Symptom Inventory score	0.9	0.9	0.9	0.9
Substance use				
Abstains from alcohol and drugs, % (n)	24 (34)	22 (22)	19 (13)	22 (69)
Alcohol abstinent, % (n)	37 (52)	30 (31)	29 (20)	33 (103)
Drug abstinent, % (n)	44 (61)	48 (49)	41 (28)	45 (138)
Alcohol/marijuana use, % (n)	72 (101)	75 (77)	79 (54)	75 (232)
Marijuana use only, % (n)	46 (65)	43 (44)	50 (34)	46 (143)
Hard drug use, % (n)	35 (49)	30 (31)	32 (22)	33 (102)
Weighted index	69.6	36.8	33.5	50.9
No. of drugs used	1.1	0.9	1.1	1.0
Injection drug use,* % (n)	12 (17)	4 (4)	4 (3)	8 (24)

[a]There was 1 24-year-old youth living with HIV.
*$P<.05$; **$P<.01$.

Among females, the number of positive lifestyle changes was significantly higher among intervention attendees than among control subjects (relative effect size [RES]=45.9%; $P=.003$) and intervention nonattendees (RES=35.4%; $P=.016$).

The positive action coping subscale score was significantly higher for females who were intervention attendees than for females in the control condition (RES=17.6%; $P=.029$). For both sexes, the social support coping score was significantly higher among intervention attendees than among control subjects (RES=10.8%; $P=.04$) and intervention nonattendees (RES=16.8%; $P=.006$).

Module 2: "Act Safe"

Overall, only about 30% of HIV-infected youths reported having any sexual partners at the 15-month assessment. Compared with nonattendees, intervention attendees reported significantly fewer sexual partners (RES=51.5%; $P=.033$) and fewer HIV-negative sexual partners (RES=54.3%; $P=.035$). Intervention attendees had a lower percentage of unprotected sexual risk acts than control subjects (RES=82.1%; $P=.013$) and intervention nonattendees (RES=74.0%; $P=.075$). There was no significant difference in disclosure of serostatus to sexual partners.

Comparing intervention attendees and nonattendees, there were significant reductions in the weighted substance use index (RES=49.7%; $P=.024$), the prevalence of alcohol or marijuana use (RES=25.7%; $P=.045$), and the

TABLE 2—Intervention Effects Based on Comparisons Among Intervention Attendees, Controls, and Intervention Nonattendees

	Intervention Attendees	Controls	Intervention Nonattendees	RES, Attendees vs Controls
	Module 1 ("Stay Healthy")			
	(n = 129)	(n = 76)	(n = 52)	
Index of no. of medical care contacts	22.1	24.1	23.9	−8.2
No. of appointments missed	1.1	0.5	1.4	101.9
T-cell count	416.5	408.1	509.1[b**]	2.1
Positive lifestyle changes (females)	6.0	4.1[a***]	4.5[b**]	45.9
No. of physical health symptoms	8.4	8.7	9.1	−3.1
Mean physical health distress score	0.8	0.9	0.9	−7.7
Brief Symptom Inventory score	0.7	0.7	0.8	2.8
Positive action (females)	3.4	2.9[a***]	3.5	17.6
Social support (males and females)	2.6	2.3[a***]	2.2[b***]	10.8
	Module 2 ("Act Safe")			
	(n = 80)	(n = 30)	(n = 44)	
Sexual behavior				
No sexual-risk pattern, %	80	67[a**]	75	19.4
No. of sexual partners	1.7	3.0	3.4[b**]	−45.0
No. of HIV-negative partners	1.4	2.9	3.1[b**]	−50.0
No. of HIV-positive partners	0.2	0.2	0.2	15.0
Disclosed serostatus to sexual partners, %	64.2	55.6	54.8	15.4
Unprotected sex acts, %	2.8	15.5 [a**]	10.6[b*]	82.1
Substance use				
Alcohol/marijuana, %	63	67	84[b**]	−6.0
Hard drugs, %	21	27	39[b*]	−22.2
Weighted index	20.2	29.2	40.2[b**]	−30.8
No. of drugs	1.3	1.4	1.6	−6.3
Brief Symptom Inventory score	0.8	0.8	0.9	−1.2

Note. RES = relative effect size, defined as 100% × [(attendee's outcome − control outcome) / control outcome]. Adjusted means are different owing to different analytic modules.
[a]Intervention vs control.
[b]Intervention attendees vs intervention nonattendees.
*P < .10; **P < .05; ***P < .01.

use of hard drugs (RES = 45.0%; P = .097). There were no significant differences between conditions in the number of drugs used or in emotional distress. Fewer than 5% of YLH reported contact with substance abuse treatment facilities across intervention conditions at any assessment; no changes were expected or observed on these measures because of the low base rates.

Discussion

Continued risk among HIV-positive persons has been well documented[5,27,28]; this is one of the first studies of a prevention program with HIV-infected youths. The efficacy of this program appears to be similar to that of preventive interventions for seronegative persons.[29] At a cost of $513 per youth, the "Act Safe" module resulted in a 50% reduction in the number of HIV-negative partners, an 82% decrease in the number of unprotected sex acts, and a 31% reduction in a weighted index of drug use. The "Stay Healthy" module (delivery cost of $467 per youth) focused on changing health behavior; however, fewer benefits were demonstrated. At baseline, 58% of HIV-infected youths were highly satisfied with their physician's competence and 68% reported high levels of assertiveness, providing little opportunity for improvement.[30] Females in the "Stay Healthy" module changed health habits and increased their active coping styles. Both males and females increased their social support coping styles. Improvements in health behaviors have become increasingly important since the introduction of highly active antiretroviral therapy.[11,14] Therefore, any future health promotion interventions must also focus on issues of medication adherence, as well as enhancing healthy lifestyles and assertiveness with care providers.

It is important to note that the behavioral changes were specific to the content of the intervention sessions in each module; for example, the "Stay Healthy" module did not affect sexual risk, even though health behaviors did change. The "Act Safe" module changed substance use and sexual risk, but no further changes occurred in health acts. We also did not find a dose effect, which is not surprising, given the high attendance rate among intervention attendees.

The sample recruited for the study was relatively large, was recruited from 9 sites in 4 AIDS epicenters, matched the sociodemographic profile of HIV-infected youths in the Centers for Disease Control and Prevention's national AIDS and HIV case data,[2] and demonstrated expected developmental patterns (e.g., risk acts increased with age; test–retest correlations on each measure increased with age). Although biological markers would have been desirable to confirm youths' self-reports, these measures were not available at the time this study was initiated. Substantial evidence confirms the reliability and validity of self-reports of HIV-related risk acts.[31]

Over time, most HIV-infected youths engaged in exemplary health behaviors and low rates of transmission behavior. While their lifetime patterns were very risky (51% had had more than 20 sexual partners, 27% had bartered sex, 87% had used hard drugs, and 16% had injected drugs), only 22% of youths reported

engaging in unprotected sex in the 3 months before the baseline assessment, most disclosed their serostatus to all sexual partners, and only about half used drugs (mainly marijuana).[30] Receiving ongoing health care may account for relatively low levels of risk. Yet, a recent meta-analysis of the effect of HIV testing[32] suggests that early detection alone may be a substantial preventive intervention. Not all HIV-infected youths need preventive interventions; HIV providers may need to screen for ongoing risk before delivering preventive interventions.

However, the mode of delivering preventive interventions to HIV-infected youths must be reexamined, as 27% did not attend even 1 intervention session. The youths reported liking and trusting the small-group format. Yet, scheduling difficulties, fears of stigmatization in a group setting, and slow accrual of HIV-infected youths led to fewer attending the intervention. Small groups also are not feasible in rural communities or for youths selected according to sex or language use; recruitment would be too slow. Alternative intervention strategies need to be evaluated (e.g., individual sessions, Internet-based or telephone groups). □

Contributors

M. J. Rotheram-Borus was the principal investigator on the project; she designed the study and wrote the first draft of the manuscript. M. B. Lee provided data analysis and wrote the Methods section of the manuscript. D. A. Murphy designed the assessment tools and edited subsequent drafts of the manuscript. D. Futterman worked on study design and implementation. N. Duan provided data support, methodologic review, and help with the writing and structure of the manuscript. J. M. Birnbaum and M. Lightfoot worked on the project and were involved in implementation of the intervention, data collection, and manuscript development. The Teens Linked to Care Consortium was involved in data collection and project implementation.

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