A Novel Approach to Prevention for At-Risk HIV-Negative Men Who Have Sex With Men: Creating a Teachable Moment to Promote Informed Sexual Decision-Making

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Objectives. As a result of the impact of HIV among men who have sex with men (MSM), multiple strategies for reducing HIV risks have emerged from within the gay community. One common HIV risk reduction strategy limits unprotected sex partners to those who are of the same HIV status (serosorting). We tested a novel, brief, one-on-one intervention, based on informed decision-making and delivered by peer counselors, designed to address the limitations of serosorting (e.g., risk for HIV transmission).

Methods. In 2009, we recruited a group of 149 at-risk men living in Atlanta, Georgia, and randomly assigned them to an intervention condition addressing serosorting or a standard-of-care control condition.

Results. Men in the serosorting intervention reported fewer sexual partners (Wald $\chi^2=8.79$, $P<.01$) at the study follow-ups. Behavioral results were also consistent with changes in psychosocial variables, including condom use self-efficacy and perceptions of risk for HIV transmission.

Conclusions. With the current intervention, service providers can offer risk reduction for men arguably at the highest risk for HIV infection in the United States. Addressing risks associated with serosorting in a feasible, low-cost intervention has the potential to significantly affect the HIV epidemic. (*Am J Public Health.* 2011;101:539–545. doi:10.2105/AJPH.2010.191791)

In the United States alone, 56 000 new HIV infections occur each year, the majority among men who have sex with men (MSM).[1] The stable number of MSM becoming infected with HIV testifies to the need for new and innovative approaches to HIV prevention in this high priority population. Community-based prevention programs targeting MSM have dwindled over the past decade, and only 3 evidence-based interventions designed specifically for MSM are disseminated by the Centers for Disease Control and Prevention, none of which are individual-level or brief interventions (for details, see http://effectiveinterventions.org).

The limited attention to MSM in HIV prevention services has left men to create their own strategies for HIV risk reduction; one such strategy is serosorting—limiting partners to those who are of the same HIV status.[2–5] Serosorting provides an alternative to condom use and thus addresses another factor, safer sex fatigue (general weariness toward prevention messages), that has stymied HIV prevention. As such, engaging in serosorting practices has allowed MSM to feel safe from HIV when having unprotected sex, yet ultimately these men are exposing themselves to HIV via flaws in serosorting. Although MSM may use serosorting as a means of prevention, information regarding serosorting must highlight its limitations and stress the importance of condom use.

Similar to other partner selection strategies, serosorting relies on assumptions and beliefs that, when unmet, diminish its theoretical benefits.[4,6,7] New HIV infections are prevented when HIV-positive individuals restrict unprotected sexual practices to partners who are also HIV positive, but this practice can increase the risk for other health-compromising sexually transmitted infections (STIs). More concerning are the failings of serosorting among those who believe they are HIV negative. People cannot engage in continued risk behavior and then be certain that they are HIV negative. Even if individuals routinely test for HIV before changing sexual partners, serosorting is not sufficient to prevent infections owing to the possibility of a negative HIV test result during the acute infection phase.[8]

As many as half of all individuals diagnosed with HIV deny engaging in risk behaviors with any partners who are HIV positive or whose HIV status is unknown.[9] In a retrospective study of MSM with recent HIV infections who reported unprotected anal intercourse, 20% were certain that their sex partner, who was the source of their HIV infection, was HIV negative.[10] Longitudinal studies have also shown an increased risk of HIV infection associated with engaging in sex with HIV-negative partners.[11] Misrepresenting one's HIV status may be an important factor as well in explaining these findings.[3] One study showed that 33% of men who had recently seroconverted had serosorted.[12]

Finally, Butler and Smith[13] demonstrated through modeling that sex with a high-risk HIV-negative partner confers a greater likelihood for HIV infection than does sex with an HIV-positive partner. This paradoxical finding is explained by the possibility of the HIV-negative partner having an acute HIV infection and the HIV-positive partner being treated with antiretrovirals and, therefore, being less infectious. Thus, we see an urgent need for realistic, feasible, and effective interventions to address the risks associated with serosorting among MSM.

We tested a primary prevention intervention aimed at promoting informed decision-making that would be feasible for implementation in public health settings. The intervention was therefore delivered in a brief, single session and administered one-on-one by peer counselors who incorporated an innovative approach grounded in the conflict theory of decision-making.[14] Conflict theory focuses on weighing the risks and benefits of possible behavioral

options as a means of making the most effective decision.

In this case, we used conflict theory to deliver information about the risks associated with choosing partners believed to pose reduced risk for HIV (i.e., serosorting). The use of conflict theory allowed 2 critical components to be addressed during the intervention: informed personal decision-making around partner selection, a strategy that not only encourages risk reduction but prepares individuals to make safer decisions when they are in risky situations, and creation of a teachable moment, a time period and emotional state in which people are more receptive to alternative behavioral choices.[15] During a teachable moment, individuals are more open to change, creating an important window of opportunity for intervention.

Finally, the intervention was delivered in part through the use of a graphic novel, which allowed for counselors to provide information about serosorting in an interactive, informative, and nonintimidating manner. We hypothesized that this intervention would result in significantly greater risk reduction than would a time-matched, standard-of-care control intervention.

METHODS

This 2-condition, randomized efficacy trial was conducted at a community-based research site in the downtown area of Atlanta, Georgia, from March 2009 to October 2009. Both intervention and control counseling sessions were approximately 40 minutes in duration. Participants were asked to visit the study site 3 times: for the baseline intervention session and 2 follow-up assessments occurring 1 month and 3 months after the intervention.

Participants

We recruited men through flyers, advertisements, and in-field recruitment methods to capture a diverse sample. Flyers were placed at HIV testing sites, treatment centers, and gay-identified venues such as bars, bathhouses, and clubs. Advertisements were placed in local gay newspapers and on an Internet classifieds Web site. To be eligible for the study, individuals were required to be male or transgendered, to be aged 18 years or older, to not be HIV positive, and to report having had 2 or more male unprotected anal sex partners in the preceding 6 months. Eligible participants were immediately given appointment times and further information about the study location. Men were paid up to $120 for their participation in the study (baseline, $35; 1-month follow-up, $40; 3-month follow-up, $45).

Measures

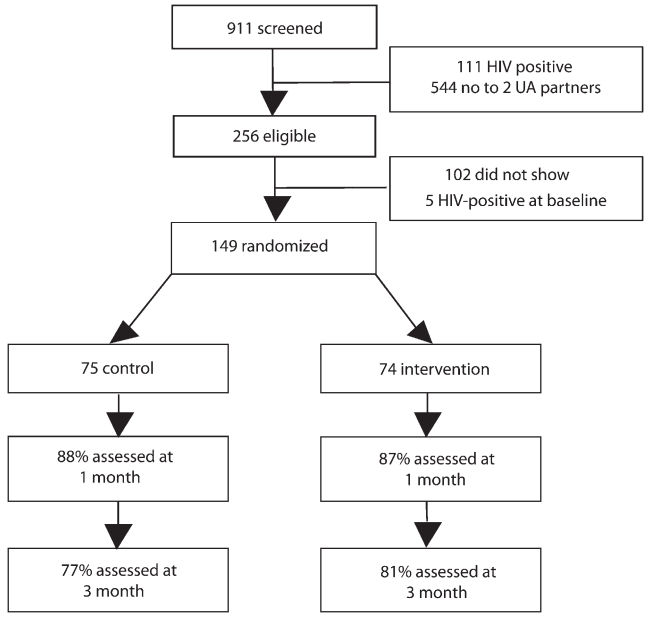
Demographic characteristics. We gathered data on participants' age, years of education, income, ethnicity, employment status, sexual orientation, the extent to which they had disclosed their sexual orientation, and relationship status.

HIV status testing and STI history. Participants were asked to report the results of their most recent HIV test and how often they were tested for HIV. They also reported on whether they had ever had an STI.

Substance use. Participants were asked about their use of alcohol, marijuana, nitrite inhalants (poppers), powder or crack cocaine, methamphetamine, erectile dysfunction medications (Viagra, Cialis, Levitra) without a prescription, intravenous drugs, or other drugs in the preceding 3 months. In addition, the Drug Abuse Screening Test (DAST)[16] and the Alcohol Use Disorders Identification Test[17] (AUDIT) were administered to assess drug and alcohol abuse, respectively. We defined a score of 3 or greater on the DAST as indicating drug abuse problems and a score of 7 or greater on the AUDIT as indicating alcohol-related problems.

Condom use self-efficacy. We used 6 items adapted from Brafford and Beck[18] to assess participants' condom use self-efficacy during sexual negotiations with a partner (e.g., "I feel confident in my ability to discuss condom usage with any partner I might have" and "I feel confident in my ability to put a condom on myself or my partner"). Responses ranged from 1 (strongly disagree) to 6 (strongly agree). This scale demonstrated internal consistency (Cronbach $\alpha=0.84$).

Risk perceptions. We asked participants how much HIV risk they perceived for different scenarios. Questions included "How risky is anal sex without a condom as the bottom partner with a man you just met who tells you his HIV status is negative?" and "How risky is anal sex without a condom as the bottom partner with a man you just met who tells you his HIV status is negative and that he just recently tested negative?"[2] Responses ranged from 0 (no or low risk) to 10 (very high risk).



Note. UA = unprotected anal sex.

FIGURE 1—Participant recruitment and enrollment flowchart: Atlanta, GA, March-October 2009.

Responses to the 2 items were highly correlated, and thus we averaged them together and treated them as a single variable.

Sexual behavior outcomes. Participants were asked about their sexual partners and specific sexual acts. Participants reported their total number of sexual partners in the preceding month, as well as their number of HIV-negative partners, HIV-positive partners, and partners whose status was unknown. They were then asked about the number of unprotected anal sex acts they had engaged in with HIV-negative partners, HIV-positive partners, and partners whose status was unknown in the preceding month. HIV-negative partners were assessed separately to reflect serosorting behaviors.

Procedures and Randomization

After providing informed consent, participants were randomly assigned to 1 of 2 arms: a single-session, counselor-delivered partner selection intervention or a time-matched, HIV risk reduction, standard-of-care control intervention.

Serosorting risk reduction intervention. The main focus of the intervention was to highlight misbeliefs about selecting sexual partners, shape accurate beliefs and perceptions of risk about the effectiveness of serosorting, and determine a practical, skills-based strategy tailored for each participant.

We created a graphic novel to convey messages about serosorting. The novel depicted a fictitious (but evidence-based) story of a man who tests HIV negative, uses serosorting as an HIV prevention strategy, and then tests HIV positive at the end of the story. This activity led to a discussion about how the main character could have become infected (e.g., acute HIV infection, nonexplicit disclosure of HIV status, misrepresentation of HIV status, infrequent HIV testing) or infected his partners. Guided by conflict theory, the counselor and participant worked together to identify and discuss these varying scenarios with a focus on what the main character could have done to reduce his risk for HIV.

Next, participants were shown a visual diagram depicting the main character's sexual partners and acts. The character's sexual network diagram was provided to help facilitate discussions related to ways in which the character exposed himself to HIV. Then participants

TABLE 1—Demographic Characteristics of Intervention and Control Condition Participants: Men Residing in Atlanta, GA, 2009

	Intervention Group	Control Group
Age, y, mean (SD)	28.3 (10.4)	30.0 (9.6)
Education, y, mean (SD)	14.0 (2.0)	13.8 (2.0)
Income, $, no. (%)		
0–10 999	27 (37.5)	29 (38.7)
11 000–20 999	14 (19.4)	15 (20.0)
21 000–30 999	10 (13.9)	7 (9.3)
31 000–40 999	8 (11.1)	7 (9.3)
41 000–50 999	5 (6.9)	8 (10.7)
51 000–60 999	3 (4.2)	4 (5.3)
≥61 000	5 (6.9)	5 (6.7)
Sexual orientation, no. (%)		
Gay	55 (75.3)	54 (72.0)
Bisexual	16 (21.9)	20 (26.7)
Heterosexual	2 (2.7)	1 (1.3)
Extent of disclosure of sexual orientation, no. (%)		
Not out	6 (8.1)	5 (6.9)
Out sometimes	30 (40.5)	37 (50.0)
Out always	38 (51.4)	32 (43.2)
Relationship status, no. (%)		
Not having sex	11 (14.9)	8 (10.7)
Having sex but no exclusive partner	46 (62.2)	51 (68.0)
Have main partner and outside partners	10 (13.5)	9 (12.0)
Have exclusive partner	7 (9.5)	7 (9.3)
DAST score, mean (SD)	2.5 (2.1)	2.5 (2.5)
DAST score of 3 or higher, %	44.6	37.3
AUDIT score, mean (SD)	6.9 (6.4)	7.7 (8.2)
AUDIT score of 7 or higher, %	39.2	44.0
Ethnicity, no. (%)		
White	18 (24.0)	14 (17.9)
Black	50 (69.3)	55 (73.1)
Hispanic	2 (2.7)	3 (3.8)
Asian	0 (0)	0 (0)
Other	3 (4.0)	3 (5.1)
Employed, no. (%)		
Yes	34 (45.9)	33 (44.0)
No	40 (54.1)	42 (56.0)
Drug use, no. %)		
Alcohol	66 (89.2)	64 (85.3)
Marijuana	42 (56.8)	38 (50.7)
Cocaine	16 (21.6)	15 (20.3)
Nitrate inhalants	9 (12.2)	12 (16.0)
Methamphetamine	4 (5.4)	6 (8.0)
Viagra/Cialis/Levitra	7 (9.5)	10 (13.3)
Intravenous drugs	1 (1.4)	2 (2.7)
Other	12 (16.2)	13 (17.3)

Continued

TABLE 1—*Continued*

HIV status, no. (%)		
Negative	70 (93.3)	67 (91.8)
Unknown	5 (6.7)	6 (8.2)
Frequency of HIV testing, no. (%)		
Less than yearly	15 (21.1)	16 (22.5)
Yearly	15 (21.1)	17 (23.9)
Every 6 mo	31 (43.7)	23 (32.4)
Every 3 mo	10 (14.1)	13 (18.3)
Monthly	0 (0)	2 (2.8)
History of sexually transmitted disease, no. (%)		
Yes	36 (48.0)	35 (47.3)
No	39 (52.0)	39 (52.7)

Note. AUDIT = Alcohol Use Disorders Identification Test; DAST = Drug Abuse Screening Test. Relationship status was recoded to represent a continuous variable progressing from no sexual contact to sex with an exclusive partner and sex with casual partners.

were asked to create their own sexual network diagram by providing information about their sexual partners and acts during the preceding 6 months. Participant diagrams were compared with the character's diagram, thereby allowing the participants to observe how their behaviors related to those of an evidence-based character who tests HIV positive. Through this activity, participants readily reflected on instances in which they potentially exposed themselves to HIV, thus creating a teachable moment.

Participants used their own sexual network diagram as a guide to forming a plan they could carry out to reduce their HIV risk. Specifically, they reviewed the occasions in which they had unwittingly put themselves at risk for HIV in the past and discussed what they could do differently in the future to reduce their risk. In keeping with informed decision-making, we guided participants toward a risk reduction plan that they considered reasonable. Plans included increases in condom use, reductions in sexual partners and acts, alternatives to unprotected anal intercourse, and greater inquiry into a sexual partner's HIV status and testing history. Thus, the participant along with the counselor generated a menu of harm reduction options by weighing the relative costs and benefits of each and deciding on the optimal choice.

Control intervention. Participants in the control arm received standard, HIV risk reduction counseling consistent with the guidelines of the Centers for Disease Control and Prevention.[19] The counselor addressed general problems that posed barriers to HIV risk reduction. Client-centered counseling techniques (e.g., open-ended questions, attentive listening, and a nonjudgmental and supportive approach) were used to discuss participants' personal HIV risks and the strategies they could use to reduce their risks.

Data Analyses

We used the combined modified design proposed by Jurs and Glass[20] to test the integrity of our randomization and potential differential attrition among participants at follow-up. We conducted a series of 2×2 analyses of variance in which condition (intervention or control) served as one factor and attrition (presence or nonpresence at follow-up) served as a second factor; we also assessed the interaction of these variables. Attrition was based on the final follow-up time point. We tested key demographic variables and sexual behaviors to determine whether or not randomization or attrition varied according to these factors. We used χ^2 and t tests to examine differences in additional variables at baseline. We used χ^2 and t tests to examine differences in additional variables at baseline.

We used generalized estimating equations with an unstructured working correlation matrix and a Poisson distribution with a log-link function (for count data) or a normal distribution (for scaled data) to analyze the main outcomes. We treated baseline behavioral data as covariates, and we entered condition, time, and their interaction as model effects. Planned pairwise contrasts with least significant difference adjustments were used to test for simple effects.

RESULTS

We screened 911 men during the recruitment process to determine their eligibility (Figure 1). Because the intervention arm focused on serosorting specifically for partners who were believed to be HIV negative, we screened out all men who reported being HIV positive (n=111) and referred these men to alternate study opportunities at the research site. Of the remaining 800 men screened, 64% were Black, 17% were White, 3% were Latino, 1% were Asian, and 5% were of other racial/ethnic backgrounds.

We eliminated an additional 544 men because they did not report at least 2 unprotected anal sex partners in the preceding 6 months. In total, 149 (58%) of the 256 men screened into the study enrolled. Retention rates at the 1-month follow-up were 88% in the control group and 87% in the intervention group; corresponding retention rates at the 3-month follow-up were 77% and 81% (these differences were nonsignificant).

We assessed the following variables to test for randomization and attrition differences: age, education, income, sexual orientation, extent of sexual orientation disclosure, relationship status, DAST and AUDIT scores, and total number of male sexual partners. We found no between-condition differences on any of these variables, indicating that we achieved a balance in our randomization of participants. Men were more likely to drop out of the study if they were open about their sexual orientation. No other differences were observed for any of the variables (Table 1). As such, no major differences emerged between men who dropped out of the study and those who did not.

Men in the intervention and control groups were similar in terms of their HIV testing histories, with a majority having been tested every 6 months or less frequently (i.e., yearly or less than yearly). Almost half of the men in the study reported a history of STIs (Table 1).

Men in the intervention and control groups had similar rates of substance use (Table 1). Overall, drug and alcohol use were

high, with well over a third of the men having DAST or AUDIT scores consistent with an abuse problem.

Men in the intervention condition reported greater self-efficacy when negotiating condom use with sexual partners than men in the control condition after baseline condom use self-efficacy had been taken into account. Risk perceptions were correlated with ethnicity, with Black participants reporting greater perceived risk than did White participants. As such, we controlled ethnicity and baseline risk perceptions in these analyses. In comparison with participants in the control condition, participants in the intervention condition reported a marginally greater perception of risk for HIV during sex with HIV-negative partners in the follow-up assessments. Time and the interaction between condition and time were not significant (Table 2).

After control for baseline number of sexual partners, men in the intervention group had significantly fewer partners than did men in the control group. Planned comparisons showed that intervention participants reported fewer sexual partners at both follow-ups. Although men in the 2 groups had a similar number of HIV-negative partners, there was a marginally significant difference at the 1-month follow-up, with intervention participants reporting fewer negative partners than did control participants. Relative to men in the comparison condition, men in the intervention condition reported fewer partners who were HIV positive or whose status was unknown after control for baseline number of such partners.

The numbers of unprotected acts engaged in with HIV-negative partners, HIV-positive partners, and partners whose status was unknown were similar in the 2 groups with 1 exception: men in the intervention group reported significantly fewer unprotected acts with HIV-positive partners and partners whose status was unknown at the 1-month follow-up. Time and the condition by time interaction were not significant in any of the analyses (Table 2). In additional analyses, we treated baseline number of partners as a dependent variable (rather than a covariate) so that we could assess all possible relevant contrasts between groups and time points. In these analyses, pairwise contrasts of estimated marginal means showed a significant drop in the number of male partners among intervention participants between baseline and the 1-month follow-up that remained significant at the 3-month follow-up (Figure 2).

TABLE 2—Results of Generalized Estimating Equation Analyses of Psychosocial Measures, Sexual Partners, and Unprotected Sexual Acts: Men Residing in Atlanta, GA, 2009

	Intervention Group, Mean (SE)	Control Group, Mean (SE)	Wald χ^2	*P*
Condom use self-efficacy			5.12	<.05
1 mo	5.49 (0.08)	5.28 (0.12)		
3 mo	5.62 (0.08)	5.25[a] (0.11)		
Risk perceptions			3.56	.07
1 mo	9.15 (0.17)	8.57[a] (0.21)		
3 mo	9.18 (0.22)	8.89 (0.23)		
Total no. of male sexual partners			8.79	<.01
1 mo	1.42 (0.18)	2.67[a] (0.47)		
3 mo	1.31 (0.20)	2.44[a] (0.47)		
No. of HIV-negative partners			2.28	.13
1 mo	0.91 (0.16)	1.44[b] (0.28)		
3 mo	0.81 (0.17)	0.99 (0.16)		
No. of HIV-positive/unknown status partners			6.93	<.01
1 mo	0.47 (0.12)	1.22 (0.43)		
3 mo	0.49 (0.15)	1.47[b] (0.47)		
No. of unprotected anal sex acts with HIV-negative partners			0.50	.48
1 mo	2.12 (0.67)	1.08 (0.35)		
3 mo	1.03 (0.39)	1.14 (0.47)		
No. of unprotected anal sex acts with HIV-positive/unknown status partners			2.61	.11
1 mo	0.26 (0.10)	0.79[a] (0.20)		
3 mo	0.30 (0.14)	0.44 (0.15)		

Note. Adjusted means are presented.
[a]Pairwise contrast revealed significant ($P < .05$) difference at time point.
[b]Pairwise contrast revealed marginally significant ($P = .07$) difference at time point.

DISCUSSION

Our findings demonstrate that a brief, single-session, theory-based intervention framed by informed decision-making and focused on partner selection can be effective in reducing numbers of sexual partners reported at short-term follow-ups. Importantly, a decrease in number of sexual partners can result in a net reduction in risk for HIV infection. Although the relationship between number of partners and likelihood of HIV infection is nonlinear, having multiple partners is related to HIV infection.[21] As such, even though long-term, mutually monogamous relationships are most effective for HIV risk reduction, reducing number of sexual partners can also lower the likelihood of HIV infection.

Number of sexual partners is particularly important when partnerships overlap in time, which has clear implications with respect to HIV transmitting rapidly through existing networks.[22] Such overlap appears to be particularly relevant in sexual networks of Black MSM, with recent data supporting the possibility that these men are at higher risk for HIV transmission than are non-Black MSM as a result of not only their sexual behaviors but, in part, the higher HIV prevalence in their sexual networks.[23,24]

Our psychosocial variable measures were also consistent with the behavioral findings at the short-term follow-up. The increase in condom use self-efficacy may have resulted from men's heightened awareness of risk or their increased motivation to protect themselves

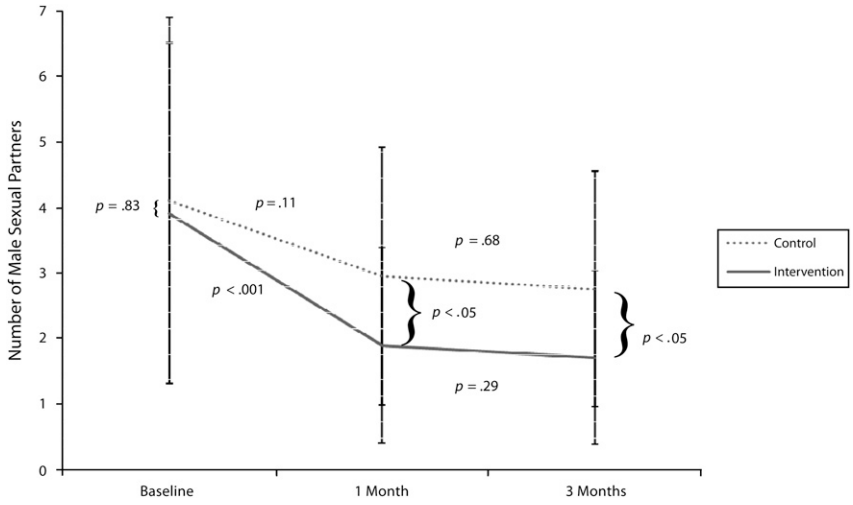


FIGURE 2—Contrasts for number of male sexual partners at baseline and at the 1-month and 3-month follow-ups: men residing in Atlanta, GA, 2009.

when making sexual decisions. Evidence of a trend toward increased perception of risk for HIV among serosorting intervention participants is also consistent with condom use self-efficacy and behavioral outcomes. Changes in these psychosocial variables further support the behavioral risk reduction observed.

A critical component of our intervention was the ability to recruit individuals from the population arguably at greatest risk of HIV infection in the United States, namely, Black MSM living in cities with high HIV prevalence rates. HIV surveillance reports in Georgia indicate that although Black men and women make up only 30% of the state's overall population, they account for 78% of HIV infections. Furthermore, infection rate data among MSM in Georgia have shown that young Black MSM account for 24% of overall incident infections, whereas their White counterparts account for only 3%.[25] Clearly grave health disparities exist, and addressing the needs of Black MSM must be a public health priority.

Limitations

Our results should be considered in light of the limitations of this study. The serosorting intervention assessed here requires further testing in a larger scale trial. Also, our data analysis was limited to a 3-month time point, restricting the long-term conclusions that can be made. Intervention effects may be prone to dissipating over time as well, and our data do not allow us to address this concern. However, data from the time points used do warrant further research with a larger sample and an extended follow-up period. Future trials should also include biological outcomes to assess STIs over study follow-ups. Because they can indicate sexual risk taking and remove biases stemming from self-reported STI data, assessments of biological outcomes are a critical component of evaluations of intervention effectiveness.

Another limitation is that, in general, our participants reported low incomes and had high rates of unemployment; these factors should be considered when interpreting our findings. Men's socioeconomic status may have implications for risk reduction, and the current intervention should be tested with MSM from varying socioeconomic groups to more fully understand its effects. Finally, our findings cannot be generalized to men who did not meet the study entry criteria.

Conclusions

A demand exists for prevention to address more than simple messages of always using condoms or remaining abstinent. A one-size-fits-all strategy is not effective; men's individual needs must be addressed. Also, the safer sex fatigue experienced by many of the men at greatest risk for HIV infection, including MSM, must be addressed. To that end, informed decision-making, particularly in the area of serosorting and other partner risk reduction strategies, should be incorporated into HIV prevention packages.

Serosorting interventions driven by informed decision-making will empower men to make educated choices about their sexual behaviors and provide the tools they need to effectively manage the scenarios in which HIV transmission is most likely to occur. Given the potential reach of a single-session partner selection intervention, coupled with its minimal impact on limited resources, further study of the efficacy and effectiveness of this type of intervention is a prudent investment. ■

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Contributors

L. A. Eaton conceptualized and designed the study, conducted the analyses, and wrote the article. C. Cherry, D. Cain, and H. Pope conceptualized and implemented the study.

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Human Participant Protection

This study was approved by the University of Connecticut institutional review board. Participants provided written informed consent.

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