Randomized Controlled Trial of an Intervention to Match Young Black Men and Transwomen Who Have Sex With Men or Transwomen to HIV Testing Options in New York City (All About Me)

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Background: HIV testing is critical to HIV prevention and care. Infrequent HIV testing and late HIV diagnosis have been observed among young Black men who have sex with men and transwomen. Novel interventions to increase HIV testing rates among young Black men who have sex with men and transwomen are needed.

Methods: A randomized controlled trial among 236 young Black men and transwomen who have sex with men or transwomen evaluated the efficacy of an intervention that included completion of a brief survey and receipt of a personalized recommendation of an optimal HIV testing approach. Participants completed a computerized baseline assessment and were randomized to electronically receive either a personalized recommendation or standard HIV testing information. Follow-up surveys were conducted online at 3 and 6 months.

Results: Retention was 92% and 93% at 3-month and 6-month follow-up, respectively. At baseline, 41% of participants reported that they tested for HIV in the past 3 months and another 25% between 4 and 6 months ago. Intent-to-treat analyses found that participants randomized to the experimental arm (personalized recommendation) were not significantly more likely to test for HIV compared with participants in the standard HIV testing information control arm at 3 months (76% vs. 71%; $P = 0.40$) and 6 months (73% vs. 72%; $P = 0.81$), respectively.

Conclusions: This study evaluated an innovative intervention to increase HIV testing by matching individuals to optimal HIV testing approaches. Participants in both arms increased past 3-month HIV testing, suggesting that providing information on options and/or raising risk awareness is sufficient to significantly increase HIV testing.

Trial registration: ClinicalTrial.gov NCT02834572 https://clinicaltrials.gov/ct2/show/NCT02834572.

Key Words: HIV testing, black men who have sex with men, transgender women, mobile technology, HIV prevention

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INTRODUCTION

HIV testing is a critical gateway to HIV treatment, specifically anti-retroviral therapy (ART), and efficacious biomedical prevention, such as Pre-exposure Prophylaxis (PrEP).[1] The Centers for Disease Control and Prevention recommends annual HIV testing or more frequently (every 3–6 months) for individuals at higher risk of infection, including injection drug users, people who exchange sex for money or drugs, sex partners of HIV-positive individuals and gay, bisexual, and other men who have sex with men (MSM) or heterosexual individuals who have had sex with more than one partner since their last HIV test.[2,3] HIV prevalence and incidence are high among young, Black, gay, bisexual, and MSM, as well as among Black transgender women (transwomen) compared with other populations.[4–6] Although HIV testing has increased among Black MSM in recent years,[7,8] further increases in testing are needed to optimize uptake of biomedical prevention strategies and linkage to medical care and uptake of ART early in HIV infection.[6,9,10] However, few HIV testing interventions exist for young Black MSM and transwomen.[11,12]

Several HIV testing approaches are available, including traditional clinic/doctor/community-based testing, self-testing for those unable or unwilling to visit a testing site[13] and

couples HIV testing and counseling (CHTC) for those testing with a sexual partner.[14] These approaches provide the opportunity for an intervention that matches the user to a recommended HIV testing approach. If successful, HIV testing uptake could increase, as has been demonstrated with multiple technologies in the contraceptive field.[15] We describe a randomized controlled trial (RCT) testing the efficacy of a brief, web-based intervention that provided a personalized recommendation for an individual's optimal HIV testing to increase HIV testing uptake among young Black MSM and transwomen. We hypothesized that individuals assigned to the experimental arm, the personalized recommendation, would be more likely to report HIV testing in the past 6 months, compared with those assigned to the control arm.

MATERIALS AND METHODS

Details about trial design and intervention development have been published previously.[16,17] From June 2016 to February 2017, participants were recruited via online advertising, face-to-face outreach, and referrals by study participants. Eligibility included: identifying as male at birth; Black, African American, Caribbean Black, African Black and/or multiethnic Black; ability to read and respond in English; being 16–29 years old; not known to be HIV-infected; reporting anal intercourse with a man or transwoman in the last 12 months; residing in New York City; willing to participate in a 6-month study; having a working email and phone number for follow-up; and providing informed consent. Individuals were ineligible to participate if they reported (1) being enrolled in another research study that included HIV testing, (2) ever participating in an HIV vaccine trial, or (3) were currently taking PrEP. The study was approved by the institutional review boards of the participating institutions.

Baseline Visit and Follow-up Surveys

After informed consent, participants were randomized in a 1:1 ratio into the unblinded intervention or control arm with assigned staff opening sequentially numbered, opaque, sealed envelopes. Randomly ordered block sizes of 4 and 6 stratified by age (16–23, 24–29 years) were generated by the study data analyst using Sealed Envelope Ltd. 2015 [available from: https://www.sealedenvelope.com/simple-randomiser/v1/lists (Accessed 4 Mar 2016)]. Participants completed an in-person baseline assessment on the All About Me platform, which included information about each HIV testing method (clinic-based, self-test, CHTC); upon completion, all participants had access to information on a range of HIV testing, treatment, and prevention options, including a health department card on PrEP and referrals to services, as needed. All participants received 3- and 6-month follow-up surveys by email. Participants received compensation for completing the baseline visit and for the 3- and 6-month follow-ups. If a participant reported testing HIV-positive on a follow-up survey, the participant remained in the study and was linked to care, as needed.

Measures

The baseline assessment collected data on demographics, HIV testing history, sexual risk behaviors, and substance use in the previous 3 months. Sexual behavior questions included number of anal/vaginal sex partners, insertive/receptive anal sex, and condom use. Substance use questions included stimulants (powder cocaine, crack cocaine, and methamphetamine) and club drugs (eg, ecstasy, gamma hydroxybutyrate, ketamine, etc.), and alcohol or drug use with sex.[16] The follow-up surveys included the same questions as the baseline survey. The primary outcome, assessed at 3 and 6 months, was self-reported HIV testing during the follow-up period. Secondary outcomes included HIV self-testing and CHTC; for intervention participants, we assessed their reported testing method(s) compared with the algorithm-recommended method.

Intervention and Control Conditions

The intervention was modeled after a successful computer-based intervention using an algorithm that matches the user to a contraceptive method among women at urban publicly funded family planning centers.[18] As described previously, the algorithm was both theory-based (ie, social cognitive,[19,20] theory of planned behavior,[21] stigma theory,[22] social identity theory,[23] and social norms theory[20]) and empirically validated.[16,17] Intervention arm participants answered questions on educational level, health insurance, incarceration history, primary partner, stigma or fear as a reason not to test, HIV testing self-efficacy, comfort testing with a friend or partner at home, and social support. The answers yielded data for the algorithm and subsequent "match" to either clinic-based, self-test, or CHTC.[16] Intervention arm participants then received results of the algorithm, presented as their "personalized HIV testing approach." Intervention arm participants recommended to clinic-based testing or CHTC were provided resources to find an HIV testing site or CHTC site. Those recommended to the self-testing approach could receive a free self-test kit. Control arm participants received electronic information about each testing method, but without completing the questions for the algorithm and subsequently receiving a recommended approach. When an intervention participant received a recommendation of HIV self-testing and was offered a free kit, the next control participant in the same age strata was also offered a free self-test kit to reduce bias toward future HIV testing and associated with the cost of HIV self-test kits.

Statistical Analysis

Analyses were conducted on an intent-to-treat basis. Those who reported testing HIV-positive on the 3-month survey were excluded from analyses. Dropouts were compared with completers by baseline behavior and other characteristics to assess whether differential dropout occurred. For 2-group comparisons of continuous measures, Wilcoxon rank sum tests were implemented. We used the Cochran–Armitage test for trend for ordinal measures. McNemar test assessed reported changes from baseline to 3-month and to 6-month follow-up. The primary outcome, self-reported occurrence of HIV testing during 6 months of

TABLE 1. Baseline Characteristics, All About Me, 2016–2017

Characteristic	Total (n = 236) N	%	Intervention (n = 118) N	%	Control (n = 118) N	%
Demographics						
Age						
16–19	33	14.0	15	12.7	18	15.3
20–24	120	50.9	65	55.1	55	46.6
25–29	83	35.2	38	32.2	45	38.1
Gender						
Male	192	81.4	95	80.5	97	82.2
Transwoman/female	39	16.5	19	16.1	20	17.0
Gender queer/other	5	2.1	4	3.4	1	0.9
Sexual identity (n = 231)						
Gay/same gender loving	158	68.4	78	68.4	80	68.4
Bisexual	50	21.7	25	21.9	25	21.4
Hetero/unsure/other	23	10.0	11	9.7	12	10.3
Employment (n = 226)						
Working (full/part/off books/other)	128	56.6	64	57.1	64	56.1
Not working	98	43.4	48	42.9	50	43.9
Education (n = 230)						
HS grad/GED/Tech or less	113	49.1	53	46.5	60	51.7
Some college or assoc degree	76	33.0	40	35.1	36	31.0
Bachelor's degree or more	41	17.8	21	18.4	20	17.2
Income (n = 201)						
Less than $10,000	100	49.8	56	57.1	44	42.7
$10,000 to $39,999	58	28.9	21	21.4	37	35.9
$40,000 +	43	21.4	21	21.4	22	21.4
Financial insecurity (n = 223)						
Never	74	31.4	37	33.0	37	33.3
Once in a while	54	22.9	25	22.3	29	26.1
Fairly often (3–5 times)	42	17.8	20	17.9	22	19.8
Very often	53	22.5	30	26.8	23	20.7
Sexual behavior and alcohol use (P3M)						
No. Partners						
0–1	68	28.8	30	25.4	38	32.2
1						
2–3	81	34.3	39	33.1	42	35.6
4+	87	36.9	49	41.5	38	32.2
Serodiscordant insertive anal intercourse (N = 219)						
Yes	82	34.8	47	39.8	35	29.7
No	137	58.0	70	59.3	67	56.8
Serodiscordant receptive anal intercourse (N = 236)						
Yes	82	34.8	45	38.1	37	31.4
No	154	65.2	73	61.9	81	68.6
Exchange sex for money						
Yes	58	25.7	32	29.1	26	23.9
No	161	71.2	78	70.9	83	76.1
STI diagnosed						
Yes	30	12.7	14	12.2	12	10.3
No	206	87.3	101	87.8	105	89.7

TABLE 1. (*Continued*) Baseline Characteristics, All About Me, 2016–2017

Characteristic	Total (n = 236) N	%	Intervention (n = 118) N	%	Control (n = 118) N	%
Alcohol or drugs with sex (excluding marijuana)						
Yes	94	39.8	48	40.7	46	39.0
No	142	60.2	70	59.3	72	61.0
HIV testing behavior						
Ever HIV tested (lifetime)						
Yes	219	92.8	109	92.4	110	93.2
No	17	7.2	9	7.6	8	6.8
Most recent test (n = 218)						
Past 3 mo	90	41.3	53	49.1	37	33.6
Between 4 and 6 mo	55	25.2	25	23.2	30	27.3
In past yr, but not P6M	42	19.3	19	17.6	23	20.9
1+ yr ago/unsure, but 1+ yr ago	31	14.2	11	10.2	20	18.2
Place of last test (n = 218)						
Clinic	109	50.0	56	51.9	53	48.2
Mobile van	40	18.4	20	18.5	20	18.2
Private doctor's office	20	9.2	9	8.3	11	10.0
Hospital or emergency room	14	6.4	6	5.6	8	7.3
Used an HIV self-test	13	6.0	7	6.5	6	5.5
All other places/other place/don't remember	22	10.1	10	9.3	12	10.9
Ever self-test (n = 217)						
Yes	39	17.8	23	21.3	16	14.7
No	178	81.3	85	78.7	93	85.3
Ever CHTC (n = 218)						
Yes	36	16.4	18	16.7	18	16.4
No	182	83.1	90	83.3	92	83.6

CHTC, couples HIV testing and counseling.
GED, general education diploma

follow-up, was compared between intervention and control arms while controlling for baseline testing history using logistic regression.

RESULTS

Among 3121 persons screened for eligibility, 236 attended the baseline visit and were randomized, with 118 in both the intervention and control arms. The mean age was 23 (SD = 3.3). Most identified as gay or same gender loving (68.4%); most identified as male (81.4%), although 16.5% identified as a transwoman or female. Over half (56.6%) were employed and nearly half (49.1%) had a high school degree, general education diploma or a lower level of education. Half (49.8%) earned less than $10,000 and 40.3% experienced financial insecurity often. In the 3 months before baseline, just over a third (36.9%) reported 4 or more sexual partners and about a third (34.8%) reported condomless anal insertive or receptive sex. Slightly over a quarter (25.7%) reported

exchange sex and 12.7% reported an sexually transmitted infection diagnosis, in the past 3 months. Almost 40% reported alcohol or drug use during sex. No differences were found between intervention and control arm participants on key demographic or behavioral outcomes.

At baseline, most participants reported lifetime HIV testing. About two-fifths reported HIV testing in the past 3 months, with 25.2% testing in the past 4–6 months, 19.3% testing in the past year, and 14.2% more than a year ago. Almost two-thirds reported HIV testing, using any method, in the previous 6 months. Relatively small proportions reported ever HIV self-testing or CHTC (Table 1).

Among intervention participants, 43.2% received a recommendation to clinic-based testing, 42.4% to self-testing, and 7.6% to CHTC. A few participants received recommendations to test by one of 2 methods: 2.5% by clinic-based testing or CHTC, 2.5% by self-testing or CHTC, and 1.7% by self-testing or clinic-based testing.

Three-month surveys were completed by over 90% of both study arms and 6-month surveys were completed by 83% of intervention and 87% of control participants. Those not completing 6-month follow-up were more likely to be younger ($P = 0.042$), a transwoman ($P = 0.002$), financially insecure ($P = < 0.001$), unemployed ($P = 0.004$), and to have lower incomes ($P = 0.014$). There were no differences in testing in the previous 6 months at baseline or use of HIV self-test or CHTC by retention at 6 months.

Self-reported HIV testing during 6 months of follow-up significantly increased in both arms from baseline to 84.6% ($P < 0.001$), but this did not differ by study arm (intervention: 67.9% at baseline to 85.3% at follow-up; control: 57.1% at baseline to 83.9% at follow-up) ($P = 0.85$). In Table 2, HIV self-testing did not differ by study arm at either the 3- or 6-month follow-up time points (3-month: intervention: 12.0%; control: 12.7%; 6-month: intervention: 8.6%; control: 4.9%). Use of CHTC also did not differ by study arm at either the 3- or 6-month follow-up time points (3-month: intervention: 10.2%; control: 8.2%; 6-month: intervention: 10.8%; control: 5.9%). Low proportions of intervention participants reported using their recommended testing method at 3 months (28%) and 6 months (20%) (Table 2).

A total of 11 participants reported testing HIV-positive during follow-up. Of the 6 who reported testing positive at the 3-month follow-up survey, 2 reported at baseline that they had never tested for HIV in their lifetime; 4 reported at baseline that they had tested for HIV in the 6 months before baseline. Of the 5 who reported testing positive at the 6-month survey, 2 reported that they had tested negative on the 3-month survey and another 3 reported that they had not tested at the 3-month visit, but had tested in the 6 months before baseline.

DISCUSSION

Increasing consistent HIV testing is a critical component of the national prevention strategy in the US, where ART and PrEP are available.[1] In this HIV testing RCT, the experimental approach used online technology to reach young Black MSM and transwomen[24] with tailored information about optimal HIV testing options. Testing increased in both study arms among this sample, suggesting that minimal-effort interventions to inform potential testers of their options may affect consistent testing (ie, every 6 months), as recommended by the Centers for Disease Control and Prevention for higher-risk groups.[2] The control arm in this RCT provided a rigorous test of the intervention, as it provided participants with information about ways to test using each testing approach, but without a recommended "best fit" approach. Had a wait-list or less informative control condition been offered, for example redirection to a health department website, we may have detected an effect of the intervention.

It is important to note that identifying the "best fit" for an individual depends on 3 conditions. First, choices must be equally accessible to all participants. Second, testing barriers must be correctly identified. Third, the test to which a participant is matched must address barriers to testing for them specifically and effectively enough to result in testing. In relation to the first condition, in the New York City (NYC) area, there were relatively few options for CHTC, which were

TABLE 2. HIV Testing Outcomes by Study Arm, All About Me, 2016–2017

	Baseline		3-mo			6-mo*		
	Intervention	**Control**	**Intervention**	**Control**		**Intervention**	**Control**	
Outcome	**N (%)**	**N (%)**	**N (%)**	**N (%)**	***P***	**N (%)**	**N (%)**	***P***
Test (P3M)								
Yes	50 (50)	35 (33.3)	82 (75.9)	78 (70.9)	0.402	68 (73.1)	73 (71.6)	0.809
No	50 (50)	70 (66.7)	26 (24.1)	32 (29.1)		25 (26.9)	29 (28.4)	
Test (P6M)								
Yes	74 (67.9)	64 (57.1)	93 (85.3)	94 (83.9)	0.774			
No	35 (32.1)	48 (42.9)	16 (14.7)	18 (16.1)				
Method used vs. method recommended								
Concordant			23 (21.3)			19 (20.4)		
Not concordant			85 (78.7)			74 (79.6)		

*Excluded self-report HIV-positive at 3M.
P3M = past 3 mo.
P6M = past 6 mo.

not geographically distributed to afford easy access for all participants. Thus, it is possible that CHTC was a less viable option for some individuals. However, the randomization study design feature addressed this concern; furthermore, because few experimental arm individuals were matched to CHTC (~7%), we do not believe this was a major concern in our study.

Regarding the second condition, although we used a theory-based, empirical approach, based on self-reported intention to use a specific test method in the next 3 months, to develop the matching algorithm,[17] it is possible that it was not specific or robust enough to increase the likelihood of use of the specific test method. This could have occurred if the algorithm was based on a mis- or under-specified model. We found that about 20% of experimental arm participants used the method to which they were matched at their next HIV test. Regarding the third condition, it is possible that the barriers that each testing method were designed to overcome were not sufficiently addressed by the method. For example, about half of the experimental arm participants were matched to HIV self-testing. It may be that while HIV self-testing facilitates privacy, reducing concerns around being publicly identified as in need of HIV testing, this alone may not be sufficient to overcome the anticipated stigma that is an important barrier to testing,[25] as one would still need to obtain a confirmatory test following a reactive self-test. As well, desire for privacy may not outweigh the fear of a positive result that may be associated with self-reported intention to use the HIV self-test.[16]

We found that testing increased from baseline levels among participants in both arms, suggesting that raising awareness of various options, even in the absence of a "match," increases HIV testing. Thus, it may be that the intervention identified here is not through a match, but rather through increasing awareness of risk and testing options, via the prerandomization survey, which is in itself an intervention. Increasing risk awareness and engaging in self-monitoring are well-established precursors to increases in HIV prevention behaviors.[26] A final potential explanation for the near-equal increases in testing across arms is the emphasis on increasing testing in NYC during the period that the study took place. Since 2008, the NYC Department of Health and Mental Hygiene has been running campaigns to increase HIV testing in specific boroughs and citywide. During the campaign period (2010–2015), the Department of Health and Mental Hygiene estimates that undiagnosed HIV has decreased from 14% to 5.6%.[27] Finally, it is important to note a key limitation to our study, which is that our outcomes were self-reported, which means that HIV testing increases in both arms may reflect socially desirable responding across arms.

CONCLUSIONS

Although we did not detect an intervention effect of the algorithm to match individuals to an optimal testing method, a key success of the study was identifying individuals living with HIV and linking them to care using minimal effort approaches. In an era of undetectable = untransmittable, there is a need for continued development of approaches that address barriers to HIV testing to identify new cases of HIV, link individuals to care and increase uptake of ART. In the context of PrEP, a powerful biomedical prevention approach, there is a need for strategies that both encourage frequent testing and facilitate consideration of PrEP among eligible HIV testers. As advances in technology and eHealth interventions continue, HIV testing matching strategies should be revisited to increase consistent testing in the future.

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