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The HOPE Social Media Intervention for Global HIV Prevention: A Cluster Randomized Controlled Trial in Peru

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Abstract

Background—Social media technologies are newly emerging tools that can be used for HIV prevention and testing in low- and middle-income countries, such as Peru. This study examined the efficacy of using the Harnessing Online Peer Education (HOPE) social media intervention to increase HIV testing among men who have sex with men (MSM) in Peru.

Methods—In a cluster randomized controlled trial with concealed allocation, Peruvian MSM from Greater Lima/Callao (N = 556) were randomly assigned to join private intervention or control groups on Facebook for 12 weeks. In the intervention condition, forty-nine Peruvian MSM

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Trial Registration: ClinicalTrials.gov: (NCT01701206)

Conflicts of Interests: We declare that we have no conflicts of interest.

Ethical Approval: UCLA Human Subjects Review Board; Epicentro Human Subjects Board.

Contributors: Sean Young, conceived of and carried out study, wrote manuscript; William Cumberland statistician, participated in study design and sample size calculations, reviewed and revised the manuscript, and was responsible for estimation of effects; Roch Nianogo, participated in study design, analysis, and reviewed and revised the manuscript; Lucho Menacho, helped conceive of study, plan and deliver the intervention, and edit manuscript; Jerome Galea, helped conceive of study and edit manuscript; Thomas Coates, advised on study, reviewed manuscript.

were trained and randomly assigned to be HIV prevention mentors to participants via Facebook groups over 12 weeks. Control participants received an enhanced standard of care, including standard offline HIV prevention available in Peru as well as participation in Facebook groups (without peer leaders) that provided study updates and HIV testing information. After accepting a request to join the groups, continued participation was voluntary. Participants could request a free HIV test at a local community clinic, and completed questionnaires on HIV risk behaviors and social media use at baseline and 12-week follow-up.

Findings—Between March 19, 2012, and June 11, 2012, and Sept 26, 2012, and Dec 19, 2012, 556 participants were randomly assigned to intervention groups (N=278) or control groups (N=278); we analyse data for 252 and 246. 43 participants (17%) in the intervention group and 16 (7%) in the control groups got tested for HIV (adjusted odds ratio 2.61, 95% CI 1.55–4.38). No adverse events were reported. Retention at 12-week follow-up was 90%. Across conditions, 7 (87.5%) of the 8 participants who tested positive were linked to care at a local clinic.

Interpretation—Development of peer-mentored social media communities seemed to be an effective method to increase HIV testing among high-risk populations in Peru.: Results suggest that the HOPE social media HIV intervention may improve HIV testing rates among MSM in Peru.

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Introduction

Over 95 percent of HIV cases occur among people living in low- and middle-income countries (LMIC). (1) Although HIV is one of the top 5 causes of death among people living in LMICs, HIV disproportionately affects particular vulnerable populations, such as men who have sex with men (MSM). (2–4) In Peru, for example, the HIV prevalence among the general population is approximately 0.4%, (5) yet the prevalence among MSM is 12.4%. (6,7) Increasing testing among MSM can heighten awareness of serostatus and decrease HIV transmission. (8) Low-cost, novel HIV interventions are therefore urgently needed to increase HIV testing among MSM in LMIC, such as Peru.

Community peer-led HIV interventions, based on diffusion of innovations theory, are designed to increase HIV prevention and/or testing behaviors by changing social norms and HIV-related stigma. (9,10) Peer-led HIV interventions, which train peer health educators to deliver community-based HIV prevention information, have increased condom use and decreased unprotected anal intercourse, with sustained behavior change up to 3 years later. (11,12) Researchers have proposed using online technologies as tools to rapidly and cost-effectively deliver peer-led HIV prevention among at-risk populations. (13–15) Addressing at-risk populations of Internet and social media users is especially important as Internet sex-seekers may be at increased HIV risk. (16–18) Recently, there has been exponential growth in mobile technology use, especially in Peru, (19) making social media a potentially useful tool for delivering low-cost peer-led HIV prevention interventions in Peru and other resource-limited settings. (20,21) However, this approach has not been systematically tested.

The HOPE (Harnessing Online Peer Education) Peru study tested the efficacy of using social media (Facebook) to increase HIV testing among Peruvian MSM. Specifically, this

12-week intervention (with post-intervention and 1-year follow-up assessments) tested whether participants who were invited to Facebook groups to receive peer-mentored HIV prevention and behavior change information (compared to those invited to groups without this information) would be more likely to test for HIV. The HOPE Peru intervention is not a diffusion of innovations study by formal terms (9,10), but is a blended intervention that incorporates components of that theory and social normative theory and interventions (20,22–24). Additional information about the intervention is available (20). This manuscript presents results on the primary intervention outcomes.

Methods

The University of California, Los Angeles (UCLA) and Epicentro (Peru) human subjects review board approved this study. Methods conform to current recommendations on using social media for HIV prevention. (21) Between January 2012 to August 2012, 556 participants were recruited from online banner advertisements on three of the major Peruvian gay websites: gayperu.com, peruesgay.com and perugay.com, and from targeted advertisements (displaying advertisements only to participants who matched targeted criteria) on Facebook. Online advertisements notified participants that UCLA was conducting a study with Epicentro and participants should click on the ad to be screened.

Banner ads directed participants to a form where they provided their email address and phone number. A study staff member replied by phone to interested participants to explain study objectives and send them a link to an online informed consent form. Next, participants were required to connect to a Facebook “fan page” created for the study. The fan page was used to check participant profiles as an attempt to ensure they were associated with unique Facebook accounts, for example, by checking for no duplications in names and checking the number of friends to see whether participants may have created a fake profile for study participation. Participant eligibility was based on the following criteria: 1) male, 2) sex with a man in the past 12 months, 3) 18 years of age or older, 4) living in the Greater Lima Metropolitan area, 5) HIV negative or serostatus unknown, and 6) had a Facebook account or willing to create one (Figure 1).

As the intervention was based on social network participation, all participants needed to complete the baseline survey before the intervention could begin. To avoid a long waiting period, the study was conducted in 2 waves: 1) In wave 1, 300 participants were recruited from January to March 2012 January toooorr, 2) In wave 2, 256 participants were recruited from March to August 2012. Once 300 participants had been recruited and completed a baseline survey in Wave 1, they were randomly assigned to an intervention or control group and we began recruiting participants for Wave 2. All methods below are the same for both Wave 1 and Wave 2.

Peer leader recruitment and training

Based on diffusions of innovations theory recommendations that 15% of a population (or 15 peer leaders for each 100 participants) would be needed for a peer intervention (10), and other research using community organizations to identify peer leaders (22,25), 49 peer leaders were recruited with the help of the staff from the Epicentro Gay Men's Community

Center in Lima, Peru. Center staff gave study fliers to potential peer leaders fitting inclusion criteria: 1) 18 years of age or older, 2) had had sex with a man in the past 12 months, 3) had a Facebook account or willing to set one up, 4) reported by staff as being friendly and well-respected among the MSM community, and 5) interested in educating others about health. Potential peer leaders visited the study website for an online eligibility screening.

Peer leaders who satisfied enrollment criteria were informed about the study design and study goals but were asked to not disclose this information to participants. All peer leaders attended 3training sessions of 3 hours each at Epicentro. Training sessions provided lessons on HIV epidemiology as well as ways of using Facebook for discussing HIV prevention and stigmatizing topics. Peer leaders were given a baseline and final questionnaire to ensure they had gained necessary skills. Fifteen (15) peer leaders did not finish the training, leaving 34 leaders who were trained and qualified to conduct the intervention. Peer leaders were paid $18 US equivalent in electronic gift cards for each of their 12 weeks of study participation.

Intervention

Randomization and Masking—Facebook was used to create private and secret groups (unable to be accessed or searched for by non-group members; only an administrator can add new people) for the HIV intervention and control conditions. In each wave, participants were randomly assigned to either an HIV intervention or control condition, and to one of 4 groups within that condition (e.g., Intervention Group #1, Control Group #1… Intervention Group #4, Control Group #4). Participants in the HIV intervention condition were randomly assigned to 2 peer leaders within their group who would attempt to interact with them about the importance of HIV prevention and testing, while those in the control condition received an enhanced (incorporating social media) standard of care. Standard care in Peru is provided by local community clinics and government organizations offering HIV prevention and testing services for public use. Enhanced standard of care was provided by allowing participants to join an online community. Requiring both control and intervention participants to join an online community allowed us to control for intervention effects that might have been due to participation in an online community rather than due to the HOPE intervention. Each Facebook group was designed to have approximately 30 participants (and an additional 4 to 6 peer leaders in the intervention groups). Randomization was performed by a random number generator, with participants blinded to assignment and unable to be placed in a group or condition at their own request. None of the participants nor peer leaders were involved in randomization, and after randomization participants were unable to change assignment.

During each week of the 12-week intervention, peer leaders in the intervention groups attempted to communicate with their assigned participants on Facebook by sending messages, chats, and wall posts. In addition to general “friendly” conversation, peer leaders were instructed to communicate about HIV prevention and testing. As no established best practice existed for health and social media communication, peer leaders talked weekly with the peer leader trainer on how to increase participant engagement. For example, in the first week, peer leaders were instructed to send friendly messages to elicit a basic response from participants and create rapport with them. Peer leaders were given weekly feedback where

they were advised to tailor messages based on participant responses and engagement. Peer leaders were not required to explicitly disclose to participants that they were peer leaders but provided coaching-style messages. Peer leaders were not required (but were allowed) to interact with group participants who they had not been assigned. These methods were conducted in this manner in both phases of the study.

Participants were instructed to use Facebook as they normally did, with no obligation to respond to or engage with peer leaders or other participants, or to remain a member of the Facebook group. Participants could control the amount of personal information that was shared with other group members by adjusting their Facebook settings. Participants were not provided guidance as to whether or not they could interact with each other outside of the study context. To monitor intervention content and fidelity, each week, peer leaders returned "response sheets" indicating whether and which participants responded to their contact attempts, coded by date, contact method, topic of content, and participant engagement.

Every four weeks, participants in both conditions were informed through their Facebook groups and personal email about the importance of testing for HIV and that they could receive a free HIV test at Epicentro, a local HIV community organization accessible and proximal (within 30 minutes) to all study participants. The study coordinator scheduled a test for interested participants at the testing clinic. When the participant arrived at Epicentro, he was instructed to give the clinic his email and ID and the clinic documented that he had tested. Each participant was able to test once during the course of the 12-week intervention. HIV testing was conducted using the Alere DetermineT HIV-1/2 Combo Ag/Ab (ALERE Healthcare, S.L.U) test and confirmed by indirect immunofluorescence assay. All participants who tested received test results. Participants who tested positive were linked to care at a local clinic for confirmatory tests (ELISA and Western Blot for HIV), treatment and care.

At baseline and follow-up (12 weeks after baseline), participants were emailed and asked to complete a 92-item online survey (26) focused on demographics; Internet and social media use (including comfort using the Internet and social media to talk about health and sexual risk behaviors); and sexual health/risk behaviors (including HIV testing and treatment). The survey was able to be completed in multiple sittings, if needed. Demographic, HIV risk, and general health-related items had been validated in previous studies; Internet and social media items were created specifically for this study. Participants were paid 30 soles (~ $10) for completing the baseline and 40 soles (~$14) for completing the post-intervention questionnaire.

Primary intervention endpoints were based on verifiable/observable behavior change during the course of the study: request for an HIV test, visit to receive the HIV test. Study retention was measured based on completion of the post-intervention survey.

Role of the funding source—The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Data analysis

The primary aim of this study was to assess the efficacy of the intervention on HIV testing behavior among participants during the 12-week intervention. The primary outcomes of the study were requesting a test by the end of follow-up, a dichotomous variable, and getting tested (reported by clinic staff), a dichotomous variable. The following potential confounders were included in the analyses: age, income, education, race, marital status, sexual orientation, computer ownership, time spent daily online, time spent communicating with prospective sexual partners in the past three months, recently tested in the last three months, unprotected (vaginal, receptive anal, insertive anal) sex.

To account for intraclass correlation since this study was a cluster-randomized trial, data were analyzed using a random effects model with the xtlogit procedure of STATA, which uses random effects logistic models for dichotomous outcomes. To compare the differences in requesting a test or getting tested between groups at follow-up we conducted a random effect multivariate adjusted logistic regression of the main outcomes on study arm while adjusting for potential confounders.

Each study arm's demographic characteristics measured at baseline were compared using *chi-squared tests* for categorical variables and *t-tests* for continuous outcomes. *Fisher's exact test* was used for categorical variables with sparse margins.

All the analyses were performed in the statistical software Stata version 12.1 (StataCorp, College Station, Texas)

Results

Between September 2010 and June 2011, 556 participants were randomly assigned to an intervention or control group (278 HIV intervention participants, 278 control participants; Figure 1). Three hundred eligible participants were recruited during the first wave and randomized to either the intervention group (n=150) or the control group (n=150). Each study arm had four clusters or peer-led Facebook groups with 37 to 38 participants each. Similarly, 256 participants were recruited in the second wave and randomized either to the intervention (n=128) or the control group (n=128). Each study arm had four clusters or peer-led groups with 32 participants. In the intervention group, 252/278 (90.7%) participants were retained in the study at 12-week follow-up. In the control group, 246/278 (88.5%) participants were retained in the study at 12-week follow-up. Together, study retention was 90% (Figure 2).

Table 1 displays the baseline characteristics of study participants. There were no significant differences found in baseline characteristics between groups. Participants' mean age was 28.9 years with a standard deviation of about 8 years. Almost 40% (210/556) reported a vocational curriculum, 28% (155/556) some college; 22% (155/556) of participants reported having a bachelor's degree and 5% (27/556) reported having gone to graduate school. About 30% (148/556) of participants reported a monthly income of less than $US 286 and 36% (183/556) reported an income between US $286 and US $573. Approximately 80% (443/556) of study participants were single and never married. Almost 90% (486/556) of

participants had a computer at home and about half of the participants (306/556) spent more than 3 hours online per day. Slightly less than one participant out of three (186/556) had tested in the last three months.(Table 1).

Table 2 displays the random effect multivariate logistic adjusted regression of the main outcomes by study arms. A greater proportion of intervention participants requested an HIV test (77 of 252) vs. 36 out of 246 in the control group. Similarly, 43 out of 252 participants in the intervention group got tested vs. 16 out of 246 participants in the control group (Figure 2).

The odds of requesting a test among participants in the intervention arm was 2.79 times those in the control group after adjusting for baseline covariates (95% Confidence Interval [1.42, 5.72]). Likewise, the odds of getting tested among participants in the intervention arm were 2.61 times those of participants in the control group after adjusting for baseline covariates (95% Confidence Interval [1.55, 4.38]). Across conditions, 7 (87.5%) of the 8 participants who tested positive were linked to care at a local clinic.

The mean change score of self-reported engagement in receptive anal sex from baseline to follow-up seemed to be lower among participants in the intervention group compared to those in the control group; however, after adjusting for baseline covariates, this difference was no longer significant (*aβ*: -0.20; 95% Confidence Interval [-0.44, 0.05,]). We found no differences in other reported sexual risk behaviors between groups from baseline to follow-up.

Discussion

Among Peruvian MSM, the HOPE Peru social media intervention led to an almost 3-fold increase in odds of HIV testing compared to a control group (Panel 1). This study is important because it 1) is the first social media-based randomized controlled trial assessing HIV testing; 2) suggests the efficacy of using the HOPE social media approach as a low cost HIV intervention in Peru and potentially other similar settings; 3) includes both self-report measures and a verifiable behavioral outcome of HIV testing; and 4) has 12-week retention rates of over 90%, suggesting that the HOPE intervention may lead to high study retention rates in Peru. Results are additionally encouraging as communities of HIV at-risk participants remained highly engaged in group discussions, improving likelihood that these communities can increase linkage to care among those who test positive. In fact, 7 (87.5%) of the 8 participants who tested positive were linked to care at a local clinic, demonstrating the initial feasibility of using social media communities for linkage to care.

This intervention appears to have increased participants likelihood of testing and changing their testing behavior by a factor of about three. This is a moderate to large effect which underlines the power of the intervention in its potential for curbing the epidemic in this era of social media and new technologies. The 90% retention rates (compared to the typical retention rates in online studies of less than 70%) (17) suggest that this intervention is an acceptable and engaging approach that can be used for HIV prevention among at-risk populations in Peru. Rapidly growing and typically freely available, social media-based

interventions, such as HOPE, might be effective low cost HIV solutions in settings similar to Peru as these technologies can achieve broader reach than traditional public health interventions while reducing travel and time costs. In fact, nearly 25% of people in the world use social media, with an 18% increase in the past year. (27) This is especially evident in LMICs: the Middle East and Africa have the most engaged Twitter users in the world, and Latin America (55%) has only 4 percentage points fewer Facebook users than the United States (59%). Although social media use varies by age and education, rapid growth in smart phone use suggests that this digital divide will soon diminish as it has in the United States, (28) providing an opportunity for social media to be a low-cost tool with broad potential HIV intervention reach. Further, outside of a "study" environment, the HOPE social media intervention would be less expensive and easier to implement, making it potentially feasible for Peru and other countries with similar culture and Internet penetration.

Findings are limited based on study location and population. Because the study was conducted among MSM in Greater Lima, Peru, it is unknown whether effects would generalize to other populations and settings. However, because of growing international popularity of social media, we believe that similar effects would be found in other populations and regions with similar cultural and technological behaviors. Further, because a disproportionate number of HIV cases occur among MSM, we believe it is still important even if these effects did not generalize outside of MSM. Future research can explore these issues. Because testing sites are limited in Peru, we believe that most participants in Lima offered a free test at Epicentro would test at Epicentro rather than other locations. However, we were unable to know whether participants might have tested at other sites. Self-report items also limited study findings. Participants were recruited based on their self-reported response to inclusion criteria and it is possible that participants may have learned the inclusion criteria and tailored their responses to be included in the study. Further, we are unable to determine why differences were found on the observable/verifiable endpoint of HIV testing, but not on the self-report items related to sexual risk behaviors. The lack of differences found between groups on self-report items might be due to recall bias or other issues related to self-report items. Future research can help to determine the most appropriate methods for measuring HIV testing and prevention behaviors in global settings as well as to determine the best approaches for how peer leaders can deliver HIV testing information on social media.

Studies on the HIV care continuum have illustrated the need for expanding HIV prevention and testing to new sexual networks to increase testing and linkage to care. (29,30) HOPE, and other social media interventions that are designed to promote social network interaction and communication have the potential to address this need to be used for rapid, global HIV prevention, testing, and treatment. Data underscore the need for evaluating these innovative low-cost technologies for HIV prevention and treatment in global settings.

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Panel 1: Research in context

Systematic review

We searched PubMed for full articles, systematic reviews, and meta-analyses published up to October 2, 2014, in any language with the search terms “social media HIV testing intervention” or “social networking HIV testing intervention”. Our search identified 15 results. Only one other RCT (a cluster randomised trial) was identified. This was a study conducted on whether the HOPE social media intervention (Young et al., 2013; Annals of Internal Medicine) could be used to increase requests for HIV testing in the United States. No controlled trials had been conducted outside of the United States.

Interpretation

Social media has been proposed as a tool for delivering HIV testing interventions in global settings. However, no randomised controlled trial using social media has shown efficacy in increasing HIV testing. The HOPE Peru social media intervention increased the odds of HIV testing by a factor of almost 3 compared to the control condition. Findings suggest that the HOPE intervention can have substantial effects on HIV testing among MSM in Peru.

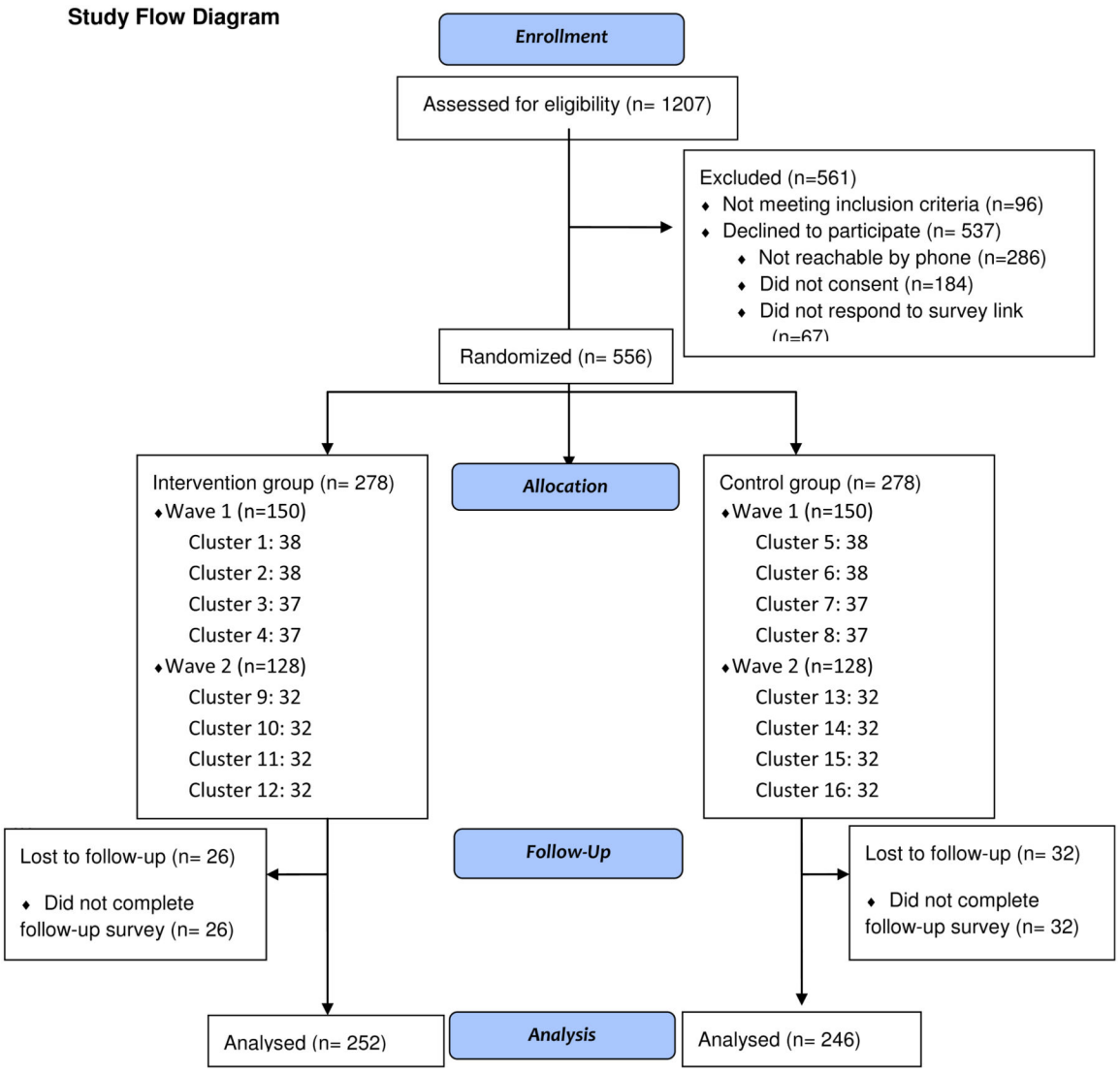

Figure 1. Participant condition assignment flow diagram using the CONSORT 2010, Lima, Peru, 2012

In this cluster-randomized design, eligible participants were randomly assigned to the HOPE intervention or control online community group.

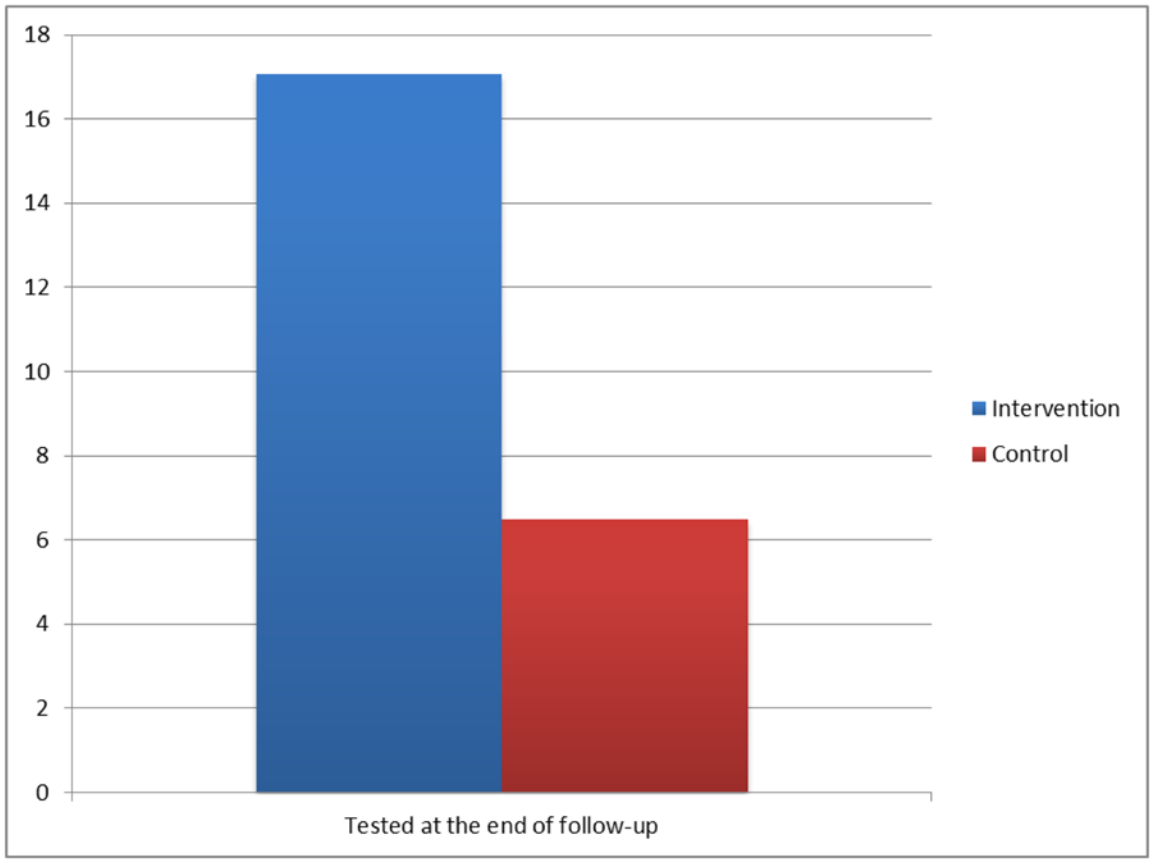

Figure 2. Group differences (% out of overall sample) in HIV testing among Peruvian MSM, 2012

Table 1

Baseline Demographic Characteristics by Intervention Status of men who have sex with men (MSM) participants (N=556), Peru, 2012

Characteristics	Control (*n*=278)		Intervention (*n*=278)		Total (*n*=556)		*p-value*
	n	*%*	*n*	*%*	*n*	*%*	
Age (*mean, SD*)	29.2	8.1	28.5	7.7	28.9	7.9	0.3361
Highest Education							
High school or less	19	6.8	23	8.3	42	7.6	
Vocational school	101	36.3	109	39.2	210	37.8	
Some college	86	30.9	69	24.8	155	27.9	0.355
Bachelor	62	22.3	60	21.9	122	21.9	
Graduate school	10	3.6	17	6.1	27	4.9	
Monthly Income							
No income	23	9.1	24	9.3	47	9.2	
Less than US $286	75	29.5	73	28.3	148	28.9	
US$ 286-573	79	31.1	104	40.3	183	35.7	0.260
US$ 573-1145	50	19.7	36	14	86	16.8	
US$ 1145-1908	20	7.9	15	5.8	35	6.8	
More than US $1980	7	2.8	6	2.3	13	2.5	
Self-described sexual orientation							
Homosexual	214	77	210	75.5	424	76.3	
Bisexual	51	18.35	55	19.8	106	19.1	0.910
Other	13	4.7	13	4.7	26	4.7	
Marital status							
Single (Never Married)	225	80.9	218	78.4	443	79.7	
Married/Domestic partner	27	9.7	26	9.4	53	9.53	0.695
Separated or Divorced	2	0.7	4	1.4	6	1.1	
Other	24	8.6	30	10.8	54	9.7	
Race							
White	49	18.4	55	20.8	104	19.6	
Black	6	2.3	6	2.3	12	2.3	0.862
Mixed	187	70.3	183	69.8	370	69.8	

Characteristics	Control (*n*=278)		Intervention (*n*=278)		Total (*n*=556)		*p-value*
	n	***%***	***n***	***%***	***n***	***%***	
Other	24	9	20	7.6	44	8.3	
Computer ownership	236	85.5	250	90.3	486	87.9	0.087
Have been tested in the last three months	86	31.1	96	34.5	182	32.8	0.382
Time spent communicating with prospective sexual partners in the past three months							
Never	84	30.2	92	33.1	176	31.7	
0-1 Hours	64	23	54	19.4	118	21.2	
1-2 Hours	56	20.1	63	22.7	119	21.4	0.719
2-3 Hours	30	10.8	28	10.1	58	10.4	
3-5 Hours	21	7.6	15	5.4	36	6.47	
5 + Hours	23	8.3	26	9.4	49	8.8	
Time spent daily online							
Never	0	0	1	0.4	1	0.2	
0-1 Hours	11	4	17	6.1	28	5	
1-2 Hours	70	25.2	69	24.8	139	25	0.064
2-3 Hours	62	22.3	52	25.9	121	21.8	
3-5 Hours	49	17.6	67	24.1	153	27.5	
5 + Hours	86	30.9	67	24.1	153	27.5	

Table 2

Effect of the HOPE social media intervention on requesting a test and getting tested among Peruvian MSM (n=498), Peru, 2012

	Intervention	Control	Unadjusted Model 1			Adjusted Model 2			Adjusted Model 3		
			cOR	95%CI	*p-value*	*aOR*	95%CI	*p-value*	*aOR*	95%CI	*p-value*
Requested HIV test	30.6% (77/252)	14.6% (36/246)	2.96	1.62, 5.41	0.0003	2.69	1.42, 5.08	0.001	2.79	1.42, 5.72	0.003
Tested for HIV	17.1% (43/252)	6.5% (16/246)	2.61	1.58, 4.30	<0.0001	2.83	1.72, 4.64	<0.0001	2.61	1.55, 4.38	0.003

cOR: Cude Odds ratio; *aOR*: Adjusted Odds ratio; CI: Confidence interval.

Model 1: crude analysis using only study condition as a covariate

Model 2: The potential confounders adjusted in this model included age, income, education, race, marital status, sexual orientation, computer ownership, time spent daily online and time spent communicating with prospective sexual partners in the past three months.

Model 3: The potential confounders adjusted for in this model included those included in model 2 and the following covariates: “recently tested in the last three months” and “unprotected vaginal sex” “unprotected receptive anal sex” and “unprotected insertive anal sex” at baseline.

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