The HOPE social media intervention for global HIV prevention in Peru: a cluster randomised controlled trial

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Summary

Background Social media technologies offer new approaches to HIV prevention and promotion of testing. We examined the efficacy of 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 this cluster randomised controlled trial, Peruvian MSM from Greater Lima (including Callao) who had sex with a man in the past 12 months, were 18 years of age or older, were HIV negative or serostatus unknown, and had a Facebook account or were willing to create one (N=556) were randomly assigned (1:1) by concealed allocation to join intervention or control groups on Facebook for 12 weeks. For the intervention, Peruvian MSM were trained and assigned to be HIV prevention mentors (peer-leaders) to participants in Facebook groups. The interventions period lasted 12 weeks. Participants in control groups received an enhanced standard of care, including standard offline HIV prevention available in Peru and 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 also completed questionnaires on HIV risk behaviours and social media use at baseline and 12 week follow-up. The primary outcome was the number of participants who received a free HIV test at a local community clinic. The facebook groups were analysed as clusters to account for intracluster correlations. This trial is registered with ClinicalTrials.gov, number NCT01701206.

Findings Of 49 peer-leaders recruited, 34 completed training and were assigned at random to the intervention Facebook groups. 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.

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

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Introduction

More than 95% of people with HIV live in low-income and middle-income countries (LMICs).[1] HIV is among the top five causes of death, disproportionately affecting 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 about 0·4%,[5] but the prevalence in MSM is 12·4%.[6,7] Increased testing in MSM can improve awareness of serostatus and decrease HIV transmission.[8] Low cost, novel interventions are needed to increase HIV testing among MSM in LMIC.

Community peer-led HIV interventions, based on the theory of diffusion of innovations, are designed to increase HIV prevention and testing behaviours by changing social norms and HIV-related stigma.[9,10] Peer-led HIV interventions that train peer health educators to deliver community-based HIV prevention information, have increased condom use and decreased unprotected anal intercourse, with behaviour change sustained for up to 3 years.[11,12] Online technologies might 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 because internet sex-seekers might be at increased risk of HIV.[16–18] Use of mobile technology has grown exponentially, especially in Peru,[19] making social media a potentially useful instrument to deliver low-cost peer-led HIV prevention interventions in resource-limited settings.[20,21] However, this approach has not been systematically tested.

We tested the efficacy of using the HOPE (Harnessing Online Peer Education) social media intervention for the promotion of HIV testing. 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 other psychologically driven theories and interventions.[20,22–24]

Methods

Study design and participants

The HOPE Peru study was a cluster randomised trial. Based on diffusion 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 organisations 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. Centre staff gave study fliers to potential peer-leaders fitting inclusion criteria:18 years of age or older, had had sex with a man in the past 12 months, had a Facebook account or willing to set one up, reported by staff as being friendly and well respected among the MSM community, and interested in educating others about health. Potential peer-leaders visited the study website for an online eligibility screening.

Participants were recruited by use of 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 doing a study with Epicentro and participants should click on the advertisement to be screened. Banner advertisements directed potential 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 to send potential participants 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 might have created a fake profile for study participation). Eligibility was based on the following criteria: male, sex with a man in the past 12 months, 18 years of age or older, living in the Greater Lima Metropolitan area, HIV negative or serostatus unknown, and had a Facebook account or were willing to create one.

The University of California, Los Angeles (UCLA) and Epicentro (Peru) human subjects review board approved this study. Methods conform to current recommendations on use of social media for HIV prevention.[21]

Randomisation and masking

Facebook was used to create private, 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. Participants were randomly assigned to either an HIV intervention or control condition, and to one of four groups within that condition. Each Facebook group was designed to have roughly 30 participants (and an additional four to six peer leaders in the intervention groups). Randomisation was done by a random number generator, with participants masked to assignment and unable to be placed in a group or condition at their own request. None of the participants or peer leaders were involved in randomisation, and after randomisation participants were unable to change assignment.

Procedures

Because the intervention was based on social network participation, all participants had to complete the baseline survey before the intervention could begin. To avoid a long waiting period, the study was done in two waves: in wave 1, 300 participants were recruited in wave 2, 256 participants were recruited. 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 waves.

Peer-leaders who satisfied enrolment criteria were informed about the study design and study goals but were asked not to disclose this information to participants. All peer leaders attended three training sessions of 3 h each at Epicentro. Training sessions provided lessons on HIV epidemiology and ways to use Facebook for discussing HIV prevention and stigma. Peer leaders were given a baseline and final questionnaire to ensure they had gained necessary skills. 15 peer leaders did not finish the training, leaving 34 leaders who were trained and qualified to do the intervention. Peer-leaders were paid for each of their 12 weeks, paid in Peruvian Sol, a US equivalent of $14 per week in electronic gift cards.

Within each intervention group, peer leaders would attempt to interact with participants about the importance of HIV prevention and testing. Participants in control groups received enhanced (incorporating social media) standard of care. Standard care in Peru is provided by local community clinics and government organisations 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 result from participation in an online community rather than because of the HOPE peer-leader intervention.

During each week of the 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 conversation, peer leaders were instructed to communicate about HIV prevention and testing. Because no established best practice existed for health and social media communication, peer leaders talked weekly with the peer-leader trainer on how to increase participants' engagement. For example, in the first week, peer leaders were instructed to send friendly messages to elicit a basic response from participants and to create rapport with them. Peer leaders were given weekly feedback where they were advised to tailor messages on the basis of responses from and engagement of the

participants. Peer leaders were not required explicitly to 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.

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 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 4 weeks, participants in both intervention and control groups 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 organisation accessible and nearby (within 30 min by public transport) for all study participants. The study coordinators scheduled a test for interested participants at the testing clinic. When participants arrived at Epicentro, they were instructed to give the clinic their email address and identification codes and the clinic documented that they had tested. Every participant was able to test once during the course of the 12 week intervention. HIV testing was done with the Alere DetermineT HIV-1/2 Combo Ag/Ab (ALERE Healthcare, SLU) 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; use of internet and social media (including comfort using the internet and social media to talk about health and sexual risk behaviours); and sexual health or risk behaviours (including HIV testing and treatment). The survey could be completed in multiple sittings. Demographics, risk of HIV, and general health-related items had been validated in previous studies;[27] internet and social media items were created specifically for this study. Participants were paid 30 soles (~$10) for completing the baseline questionnaire and 40 soles (~$14) for completing the postintervention questionnaire.

Outcomes

The primary outcome was the number of participants who received a free HIV test at a local community clinic. Study retention and requests for HIV testing were secondary outcomes. Study retention was measured by completion of the postintervention survey.

Statistical analysis

HIV testing and requests for HIV testing were dichotomous variables. The following potential confounders were included in the analyses: age, income, education, ethnic origin, marital status, sexual orientation, computer ownership, time spent daily online, time spent communicating with prospective sexual partners in the past 3 months, recently tested in the past 3 months, and unprotected (vaginal, receptive anal, insertive anal) sex.

To account for intraclass correlation because this study was a cluster-randomised trial, data were analysed 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 did a random-effect multivariate adjusted logistic regression of the main outcomes on study condition with adjustment for potential confounders.

Each study group's demographic characteristics measured at baseline were compared with χ^2 tests for

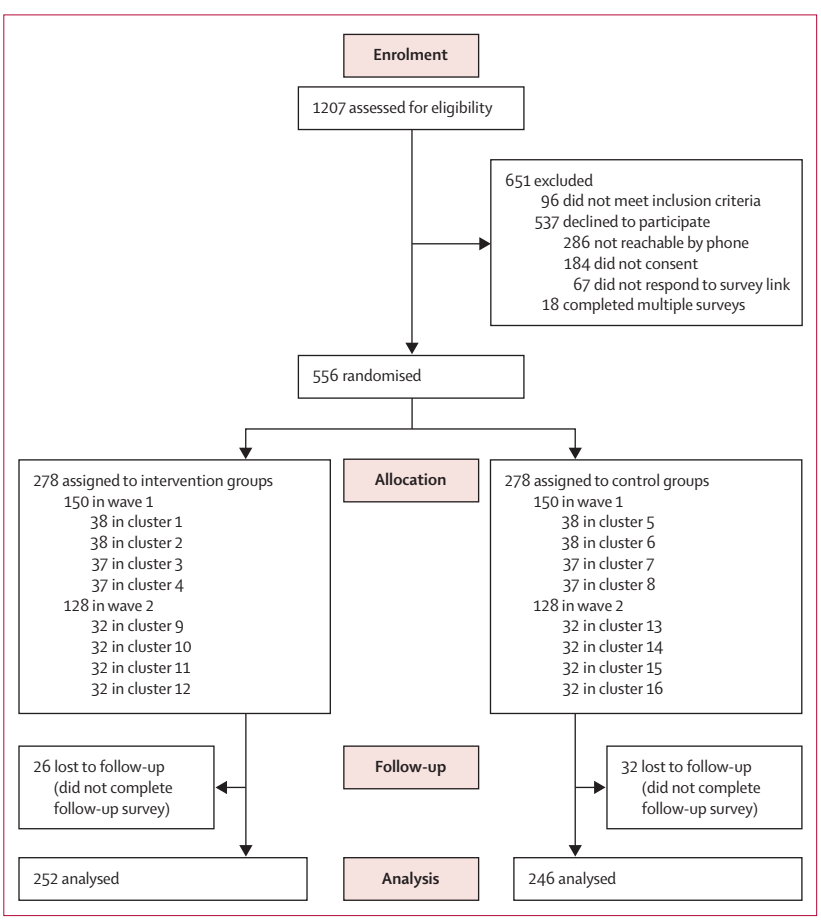

***Figure*: Trial profile**

categorical variables and *t* tests for continuous outcomes. Fisher's exact test was used for categorical variables with sparse margins.

All analyses were done with Stata (version 12.1; StataCorp, College Station, TX, USA)

	Control (n=278)	Intervention (n=278)	Total (n=556)
Age, years	29·2 (8·1)	28·5 (7·78)	28·9 (7·98)
Highest education			
High school or less	19 (7%)	23 (8%)	42 (8%)
Vocational school	101 (36%)	109 (39%)	210 (38%)
Some college	86 (31%)	69 (25%)	155 (28%)
Bachelor degree	62 (22%)	60 (30%)	122 (22%)
Graduate school	10 (4%)	17 (6%)	27 (5%)
Monthly Income			
No income	23 (9%)	24 (9%)	47 (9%)
<US$286	75 (30%)	73 (28%)	148 (27%)
US$286–573	79 (31%)	104 (40%)	183 (33%)
US$573–1145	50 (20%)	36 (14%)	86 (17%)
US$1145–1908	20 (8%)	15 (6%)	35 (7%)
>US$1980	7 (3%)	6 (2%)	13 (3%)
Self-described sexual orientation			
Homosexual	214 (77%)	210 (76%)	424 (76%)
Bisexual	51 (18%)	55 (20%)	106 (19%)
Other	13 (5%)	13 (5%)	26 (5%)
Marital status			
Single (never married)	225 (81%)	218 (78%)	443 (80%)
Married or domestic partner	27 (10%)	26 (9%)	53 (10%)
Separated or divorced	2 (<1%)	4 (1%)	6 (1%)
Other	24 (9%)	30 (11%)	54 (10%)
Ethnic origin			
White	49 (18%)	55 (21%)	104 (20%)
Black	6 (2%)	6 (2%)	12 (2%)
Mixed	187 (70%)	183 (70%)	370 (70%)
Other	24 (9%)	20 (8%)	44 (8%)
Computer ownership	236 (86%)	250 (90%)	486 (88%)
Have been tested for HIV in the last 3 months	86 (31%)	96 (35%)	182 (33%)
Time spent communicating online with prospective sexual partners in the past 3 months			
Never	84 (30%)	92 (33%)	176 (32%)
0–1 h	64 (23%)	54 (19%)	118 (21%)
1–2 h	56 (20%)	63 (23%)	119 (21%)
2–3 h	30 (11%)	28 (10%)	58 (10%)
3–5 h	21 (8%)	15 (5%)	36 (6%)
≥5 h	23 (8%)	26 (9%)	49 (9%)
Time spent daily online			
Never	0	1 (<1%)	1 (<1%)
0–1 h	11 (4%)	17 (6%)	28 (5%)
1–2 h	70 (25%)	69 (25%)	139 (25%)
2–3 h	62 (22%)	52 (30%)	121 (22%)
3–5 h	49 (18%)	67 (24%)	153 (28%)
≥5 h	86 (31%)	67 (24%)	153 (28%)

Data are n (%) or mean (SD).

Table 1: **Baseline demographic characteristics**

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.

Results

Between March 19, 2012, and June 11, 2012, and Sept 26, 2012, and Dec 19, 2012, 556 participants were randomly assigned to an HIV intervention group (n=278) or control group (n=278; figure). 300 eligible participants were recruited during the first wave and randomly assigned to either intervention groups (n=150) or control groups (n=150). Each study arm had four clusters or peer-led Facebook groups with 37 or 38 participants each. Similarly, 256 participants were recruited in the second wave and randomised 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 (91%) participants were retained in the study at 12 week follow-up. In the control group, 246 (88%) participants were retained in the study at 12 week follow-up. Together, study retention was 90%. No adverse events were reported.

We did not note any significant differences in demographics between participants in the control and intervention study conditions (table 1). A greater proportion of intervention participants than control participants requested an HIV test; table 2). Similarly, 43 (17%) of 252 participants in the intervention group got tested for HIV compared with 16 (7%) of 246 participants in the control group.

The odds of requesting a test among participants in the intervention group was 2·79 times (95% CI 1·42–5·72) those in the control group after adjustment for baseline covariates. Likewise, the odds of getting tested among participants in the intervention group was 2·61 times (95% CI 1·55–4·38) those of participants in the control group after adjustment for baseline covariates. Across conditions, seven of eight participants who tested positive were linked to care at a local clinic: all participants who tested positive were connected to a HIV clinic near Epicentro to receive HIV care.

The mean change score of self-reported engagement in receptive anal sex from baseline to follow-up seemed to be lower in the intervention group than in the control group (data not shown); however, after adjustment for baseline covariates, this difference was not significant ($a\beta$ –0·20; 95% CI –0·44 to 0·05). We found no differences in other reported sexual risk behaviours between groups from baseline to follow-up (data not shown).

Discussion

In this cluster randomised trial of Peruvian MSM, the HOPE Peru social media intervention led to an almost three-fold increase in the odds of getting an HIV test

	Intervention	Control	Unadjusted model 1		Adjusted			
			OR (95% CI)	p value	Model 2		Model 3	
					aOR (95% CI)	p value	aOR (95% CI)	p value
Requested HIV test	31% (77/252)	15% (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% (43/252)	7% (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

OR=crude odds ratio. aOR=adjusted odds ratio. Model 1=crude analysis with only study condition as a covariate. Model 2=the potential confounders adjusted in this model included age, income, education, ethnic origin, 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.

Table 2: **Effect of the HOPE social media intervention on requesting a test and getting tested among Peruvian men who have sex with men (n=498), Peru, 2012**

compared with a control group (panel). This study is important because it is the first social media-based randomised controlled trial assessing HIV testing; it suggests the efficacy of use of the HOPE social media approach as a low cost HIV intervention in Peru and potentially other similar settings; it includes both self-reported measurements and a verifiable behavioural outcome of HIV testing; and it has a 12 week retention rate of greater than 90%, suggesting that the HOPE intervention could lead to high study retention rates in Peru. Results are also encouraging because 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, seven of eight participants who tested positive were linked to care at a local clinic, showing the initial feasibility of use of social media communities for linkage to care.

This intervention appears to increase the odds of HIV testing by a factor of almost three, and as a result, changes HIV testing behaviour. This is a moderate to large effect, which shows potential of the intervention in this era of social media and new technologies. The 90% retention rates (compared with the typical retention rates in online studies of less than 70%)[17] suggest that this intervention is acceptable and engaging and 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 because 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.[28] Although use of social media varies by age and education, rapid growth in use of smart phones suggests that this digital divide will soon diminish as it has in the USA,[29] providing an opportunity for social media to be a low-cost instrument with broad potential for HIV interventions 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.

Our findings are restricted because of the study location and population. The study was conducted among MSM in Greater Lima, Peru, and effects may not be generalisable to other populations and settings. However, with growing international popularity of social media, we believe that similar effects would be identified in other populations and regions with similar cultural and technological behaviours. Further, because a disproportionate number of HIV cases occur among MSM, we believe it is still important even if these effects are not generalisable outside of MSM. Future research can explore these issues. Because testing sites are restricted 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 do not know whether participants tested at other sites. Self-reported items also restrict study findings. Participants were

Panel: **Research in context**

Systematic review

We searched PubMed for full articles, systematic reviews, and meta-analyses published up to Oct 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. No other experimental social media-based HIV testing studies other than our own US-based study had been done. But some other studies included investigations of HIV drug networks, an online longitudinal cohort assessment of HIV testing self-report in England, a review of social marketing HIV interventions, and several of our own secondary analysis of social media-based HIV interventions in Los Angeles. These studies are not comparable because they were not experimentally testing the use of social media to increase HIV testing. Only one other randomised controlled trial (a cluster randomised trial) was identified, which assessed whether the HOPE social media intervention could be used to increase requests for HIV testing in the USA.[22] No controlled trials have been done outside of the USA.

Interpretation

Social media has been proposed as an instrument to deliver HIV testing interventions in global settings. However, no randomised controlled trials of social media have shown efficacy in increasing HIV testing. The HOPE Peru social media intervention increased the odds of HIV testing by a factor of almost three compared with the control condition. Based on these results, researchers are encouraged to test the effectiveness of application of HOPE social media interventions not only in Peru, but also in other HIV-affected settings and populations.

recruited based on their self-reported response to inclusion criteria and it is possible that participants might have learned the inclusion criteria and tailored their responses for inclusion. The absence of differences between groups on self-reported items might be the result of low power of the study to detect such behaviour changes in this short period of time or that these behavioural changes might take longer to be occur. Future research can help to determine the most appropriate methods for measurement of HIV testing and prevention behaviours in global settings and to determine the best approaches for how peer leaders can deliver HIV testing information about social media.

Studies of the HIV care continuum have shown the need to expand HIV prevention and testing to new sexual networks to increase testing and linkage to care.[30,31] 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. Our data emphasise the need to assess these innovative low-cost technologies for HIV prevention and treatment in global settings.

Contributors

SDY designed the HOPE intervention, oversaw the implementation of the intervention throughout the study, and wrote the report. WGC did the statistical analysis, participated in study design and sample size calculations, reviewed and revised the report, and was responsible for estimation of effects. RN participated in study design, data analysis, and reviewed and revised the report. LAM helped conceive the study, planned and delivered the intervention, and edited the report. JTG helped conceive the study and edited the report. TC advised on study and reviewed the report.

Declaration of interests

We declare no competing interests.

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