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Acceptability of HIV prevention information delivered through established geosocial networking mobile applications to men who have sex with men

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Abstract

Geosocial networking (GSN) applications could disseminate HIV prevention information to thousands of men who have sex with men (MSM); however, acceptability of the type of information, methods, and frequency of information delivery are unknown. Acceptability of these constructs were assessed through a survey of 224 MSM at the Milwaukee Pridefest. All types of information were found acceptable. A sexual health section and self-seeking information were the most acceptable method and frequency of delivery. Demographics and differences in app usage did not correlate to acceptability. Continued research focusing on the feasibility of incorporating HIV prevention information into GSN applications is needed.

Keywords

men who have sex with men; MSM; geosocial networking apps; HIV prevention; mobile app intervention

INTRODUCTION

Gay, bisexual, and other men who have sex with men (MSM) make up only 2% of the total US population, yet this community accounted for 65% of new HIV infections in 2013 (1). Further disparity exists within MSM subpopulations as African American MSM represented the highest number of newly diagnosed HIV infections in 2014, with nearly 40% of those new diagnoses among those age 13–34 (1).

In 2015, two-thirds of new HIV cases in Wisconsin were diagnosed within minority racial or ethnic groups, despite these groups making up only 17% of the population (2). Half of these

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Informed Consent: Informed consent was waived for this study by the Institutional Review Board, individual participants received an informational letter describing the nature of the survey before initiating participation.

cases were diagnosed in Milwaukee county, with 1 in 2 diagnosed MSM under the age of 30 (2). These findings reflect national trends and reinforce the need to identify appropriate methods for HIV intervention and prevention among age, racial, and ethnic MSM subgroups.

In recent years, mobile phones have helped facilitate HIV disease management and prevention among at-risk populations. Intervention strategies such as short message service reminders have been used successfully to increase antiretroviral adherence, decrease viral load, and promote retesting for HIV and sexually transmitted infections (STIs) (3). However, the increasing popularity of Smartphones and mobile applications (apps) present a new opportunity to reach these high-risk populations.

Black and Hispanic MSM are high-risk populations that may benefit from Smartphone intervention strategies. Smartphone ownership among Black and Hispanic Americans is estimated at 70% compared to only 61% of White Americans (4). Young adults age 18–29 are another group that could benefit, as an estimated 85% of this population are Smartphone owners compared to 79% of those age 30–49, 54% of those age 50–64, and 27% over 65 (4).

As Smartphone use increases, so too does app usage. From 2013 to 2015, mobile app usage increased by 90%, accounting for 77% of the total increased time spent on digital media (5). Current research suggests that MSM may benefit from apps that address HIV and sexual health; however the majority of apps addressing these issues have fewer than 500 downloads, indicating a lack of consumer interest (6). Recently, using established geosocial networking (GSN) apps has emerged as a potential method of overcoming this obstacle. GSN apps help MSM expand their social networks, allowing users to view profiles, send messages and pictures, and use the Smartphone's global positioning system (GPS) to facilitate in-person meet ups with other nearby users (7). Recent research suggests that MSM GSN app users are interested in receiving sexual health information via these established GSN apps (8). One such study found that 70% of a sample of Grindr, the most popular GSN app, users considered GSN-delivered intervention material to be acceptable, compared to 57% who found in-person interventions acceptable (7). However, to the best knowledge of the authors, the type of HIV information MSM find acceptable to receive, methods and frequency of information delivery, and potential differences in this more fine-grained assessment of acceptability by demographics have not be not examined.

We assessed what types of HIV information MSM were willing to receive through established GSN apps, as well as the most acceptable method and frequency of delivery. We also explored whether user demographics (age, race, ethnicity, and frequency of app use) or HIV risk factors (condom use during anal intercourse and HIV testing) influenced information acceptability. Previous research indicates that HIV/STI prevention apps should include information regarding different options in HIV testing and locations and hours of nearby HIV and STI testing facilities (9). Therefore, we hypothesized that this information would be most acceptable. In addition, we hypothesized that younger MSM would endorse higher levels of acceptability. Although we did not define specific hypotheses, further exploratory analyses were conducted to examine differences in acceptability by race, ethnicity, and frequency of app use.

METHODS

Participants and Procedures

Participants were recruited during the 2015 Milwaukee Pridefest. The setting for Milwaukee's Pridefest is a large festival grounds with stages for music and entertainment acts, food vendors, and merchandising booths. Research staff were stationed in the Health and Wellness area of the grounds, an area that consists of booths that specifically provide health information to Pridefest attendees, including agencies that provide HIV testing prevention services, LGBT organizations, and other community based organizations. Research staff had a dedicated booth designated for [authors' institution] where surveys were administered. Researchers approached potential participants to ask if they would be interested in completing a "Men's Health Survey." Eligibility criteria to complete this survey included age of 18 years or older and self-identification as a man. Staff attempted to minimize duplicate surveys by asking whether potential participants had previously completed the survey and not handing out surveys to people they recognized as having already participated. Participants who completed surveys were given a food ticket or novelty item worth $5 in compensation for their time. Food tickets could be redeemed at food vendor booths throughout the Pridefest grounds. All study procedures were approved by [authors' institution]'s Institutional Review Board. To preserve confidentiality, no identifying information about participants was collected, and, given the low-risk nature of the procedures, a waiver of consent was obtained for survey procedures.

Measures

Demographic characteristics included race, sexual orientation, age, gender, and ethnicity (Hispanic/Latino or not).

GSN app usage was assessed by asking participants whether they owned a Smartphone, and if so, whether they also used GSN apps. If participants responded yes to both questions, they were asked to identify the particular GSN apps they used (listed responses included: Grindr, Jack'd, Growlr, Scruff, Hornet, and Other with the ability to write in an app not listed), if and how many times they have used each app in the past year, if they had ever met sexual partners through each app, and how many partners they had met through each app in the past year.

The acceptability scale used was a five point scale ranging from 'acceptable' to 'not acceptable,' with participants identifying how acceptable they found receiving various types of sexual health and HIV/AIDS information through the GSN app they use most often. We assessed three categories of acceptability: types of information, methods of receiving information, and frequency of receiving information, described below.

Types of information variables included subscales of "Locations" (2 items), "Partner discussion" (2 items), and "Risk reduction" (2 items). Individual items within subscales were averaged. For "Locations," participants indicated acceptability of receiving: "Location and hours of nearby HIV testing facilities," and "Locations providing free condoms." For "Partner discussion," participants indicated acceptability of receiving information regarding "Negotiating condom use with potential partners," and "Discussing HIV status with

potential partners." For "Risk reduction," participants indicated acceptability of receiving "General info on HIV," and "Reducing your risk of contracting HIV." Additional individual items assessed acceptability of "Support groups for persons diagnosed and living with HIV," "Drug and alcohol use in association with the risk of HIV infection," "Home testing services for HIV," "Pre-exposure prophylaxis (PrEP)," and "Online health care chat with a physician." PrEP was defined for participants as a preventative measure protecting against HIV transmission.

Methods of receiving HIV information variables included the individual items of: "Sexual health section within the app that you must open to receive information," "Advertisement banner that runs along the bottom or top of the screen," and "An alert or notification on the homescreen of your Smartphone."

Frequency of receiving information variables included the individual items of: "Once per week (alert)," "Once per day (alert)," "Every time the app is opened," "Before starting a conversation with a new person," and "Only when you actively seek the information."

Sexual risk variables included condom use and HIV testing. Condom use was assessed through averaging scores of the individual items: "I use condoms when I have anal sex" and "I use condoms even if I have been drinking." Responses were measured on 5 point scales from 'never' to 'always.' Participants were also asked "How important is knowing your HIV status?" on a five point scale ranging from 'not important' to 'very important,' whether they have ever had an HIV test, how many times they have been tested for HIV in the last 3 years, how long ago their most recent HIV test was, and what the results of that test were.

Data Analysis

Because we were interested in how acceptable MSM would find HIV prevention information delivered through GSN apps, we restricted our sample to participants who self-identified as a male or other, did not identify as heterosexual, and had used a GSN app within the past year. One survey participant identified as a transgender woman. Analysis was conducted with and without the transgender woman included and results did not change; therefore results presented do not include this participant. Our sample consisted of 224 participants (50% of the full sample of 447). We compared individuals included in our sample with those excluded on age, ethnicity, race, and sexual risk assessed by condom use and whether they have ever been tested for HIV. Age and condom use between groups were assessed using independent samples t-test, while ethnicity, race, and whether they have ever been tested for HIV between groups were assessed using Pearson's chi-square test.

Overall acceptability of types of information, methods, and frequency of receiving information were assessed through first calculating general estimates of central tendency for the acceptability of each subscale or item (mean, median, mode, and standard deviation). We considered mean acceptability scores significantly greater than 3, the neutral midpoint of the scale, as generally acceptable to participants. Therefore, one-sample t-tests compared mean acceptability scores to 3. Mean levels of acceptability of types of information, methods of information delivery, and frequencies of delivery varied, and we were interested if these differences were significant on average. In other words, we wanted to know the types,

methods, and frequencies that were the most and least acceptable. All participants rated acceptability on all items; therefore, within-participants pairwise t-tests compared differences among the types, methods, and frequencies ranked lowest to highest on average.

To explore whether some racial groups endorsed higher acceptability on our subscales, we conducted one-way ANOVAs, comparing participants who identified as White, Black/African American/Caribbean, and 'Other' (Asian, Native Hawaiian, Pacific Islander, Native American, and more than one race). Significant ANOVA tests were followed by Fisher's least significant difference test to assess post-hoc pairwise comparisons. To assess differences by ethnicity, we conducted independent samples t-tests on all acceptability subscales, comparing those who identified their ethnicity as Hispanic or Latino and those who did not.

We also explored relationships of all acceptability subscales with age, frequency of app use, and HIV risk variables using Pearson's product-moment correlation coefficient calculations. Frequency of GSN app use per week and the number of sexual partners met through GSN apps were log transformed to correct for skew. Missing data were excluded listwise from individual statistical tests.

RESULTS

Participant Demographics

Participants included in data analysis were between the ages of 18 and 65 with a mean age of 31.49 (SD=9.97), with 68.2% identifying as White (N=150), 15.9% as Black, African American, or Caribbean (N=35), 1.4% as Asian (N=3), 1.4% as Native American (N=3), 9.5% as more than one race (N=21), and 3.6% as Other (open-ended responses included Arab, Cuban, Guatemalan, Hispanic, Latino, Puerto Rican, Spanish, and Dutch) (N=8). Nearly 18% of participants identified as Hispanic or Latino (N=40). Nearly all (N=220, 98.2%) participants reported their gender as male or a man, while 4 (1.8%) identified as other (open-ended responses included bi-gender, gender curious, agender, and demiboy). Within our sample, 209 (93.3%) identified as homosexual, 11 (4.9%) identified as bisexual, and 4 (1.8%) identified as other (open-ended responses included Queer, Pansexual, and Pup).

Grindr was used by 81.7% of participants, followed by Scruff (41.1%), Jack'd (30.4%), Growlr (25.9%), Hornet (11.6%), and other (open-ended responses included A4A, Radar, Meetme, Recon, BCG, Tinder, Manhunt, NKP, OK Cupid, Craig's List, and Facebook) (12.9%). Two-hundred and twelve (94.6%) participants indicated that they have had an HIV test in their lifetime, with 199 (88.8%) having been tested within the last 3 years. Additionally, 18 (8%) participants indicated they were HIV positive.

Participants who were included within our data analysis sample were found to be younger [M=31.49, SD=9.97; $t(416)=-3.85$, $p<0.01$] than those excluded from this study (M=36.02, SD=13.78), were more likely to use condoms during anal sex [M=3.67, SD=1.25; $t(424)=2.31$, $p<0.01$] and to use condoms even they had been drinking [M=3.74, SD=1.30; $t(425)=2.59$, $p<0.01$] than those excluded (M=3.34, SD=1.63 and M=3.37, SD=1.63,

respectively). In addition, only 5.4% of those included in this study reported never having had an HIV test compared to 19.9% of those excluded [χ^2 (1, N=440)=21.29, p<0.001]. Finally, participants included were no more likely to be Hispanic or Latino [χ^2 (1, N=444)=1.59, *ns*] or identify as another race [χ^2 (6, N=441)=6.50, *ns*] than those excluded.

Acceptability of types of information, methods, and frequency of information delivery

We considered mean acceptability scores significantly greater than 3 (the neutral midpoint of the scale) to be generally acceptable to participants. All types of information were found to be, on average, generally acceptable [M=3.62–4.03, SD=1.09–1.42; *t*(220–223)=6.72–13.73, *p*<0.001] (Table I). Paired t-tests performed sequentially between items with the highest and next highest average acceptability indicated that information regarding the subscale "Locations" (M=4.03, SD=1.21) was significantly more acceptable to receive than "Home testing services for HIV" [M=3.88, SD=1. 37; *t*(223)=2.16, *p*<0.05], which was more acceptable than "Online health care chat with a physician" [M= 3.64, SD=1.42; *t*(221)=3.15, *p*<0.01].

All methods of information delivery were found to be, on average, generally acceptable [M= 3.54–3.86, SD=1.29–1.42; *t*(222)=5.65–9.98, *p*<0.001], with the exception of "An alert or notification on the homescreen of your Smartphone" (M=2.92, SD=1.48), which did not significantly differ from neutral (Table I). "Sexual health section within the app that you must open to receive information" (M=3.86, SD=1.29) was found to be more acceptable than an "Advertisement banner across the bottom or top of the screen" [M=3.54, SD=1.42; *t*(222)=3.53, *p*<0.01].

Regarding frequency of receiving information, "Only when you actively seek the information" [M=3.79, SD=1.37; *t*(220)=8.56, *p*<0.001], and receiving information "Once per week (alert)" [M=3.74, SD=1.38; *t*(222)=7.93, *p*<0.001] were both significantly more acceptable than neutral. Receiving information "Every time the app is opened" [M=2.67, SD=1.48; *t* (220)= −3.37, *p*<0.01], "Before starting a conversation with a new person" [M=2.53, SD=1.41; *t*(219)= −4.94, *p*<0.001], and "Once per day (alert)" [M=2.43, SD=1.35; *t*(220) =−6.22, *p*<0.001] were all significantly less acceptable than neutral (Table I).

Race, Ethnicity, and Acceptability

One-way ANOVAs were used to test for race differences on all acceptability measures. Significant differences were found regarding the perceived acceptability of receiving health information "Once per day (alert)" [*F*(2, 214)=5.27, *p*<0.01], "Before starting a conversation with a new person" [*F*(2, 213)=6.04, *p*<0.0], and "Every time the app is opened" [*F*(2, 214)=4.59, *p*<0.05]. Post-hoc pairwise comparisons found those that identified as Black [M=2.91, SD=1.36; *t*(180)=2.70, *p*<0.01] and Other [M=2.83, SD=1.44; *t*(181)=2.36, *p*<0.05] found it significantly more acceptable to receive information "Once per day (alert)" than those who identified as White (M=2.24, SD=1.29). Participants identifying as Other (M=3.17, SD=1.47) found it more acceptable to receive information "Before starting a conversation with a new person" than those who identified as White [M=2.33, SD=1.34; *t*(180)=3.26, *p*<0.01]. Those who identified as Other (M=3.34, SD=1.45) also found it more

acceptable to receive information “Every time the app is opened” than those who identified as White [M=2.51, SD=1.45; $t(181)=3.03$, $p<0.0$]).

No significant differences were found between Hispanic or Latino ethnicity on the acceptability of the type of information, method, or frequency of information delivery [results not shown, all $ts(217–220)<1.75$].

Associations between acceptability, age, app usage, and HIV risk variables

Several correlations were found between reported condom use during anal intercourse and acceptability. As reported use of condoms increased, the acceptability of receiving information regarding “Locations” [$r(222)=0.17$, $p<0.05$), “PrEP” [$r(222)=0.14$, $p<0.05$], and “Support groups for persons diagnosed and living with HIV” [$r(222)=0.18$, $p<0.01$] increased, as well as the acceptability of having information delivered as “An alert or notification on the homscreen of your Smartphone” [$r(222)=0.15$, $p<0.05$] and “Once per week (alert)” [$r(222)=0.15$, $p<0.05$].

There were few correlations between age and acceptability measures. However, younger participants found it more acceptable to receive information as an “Advertisement banner across the bottom or top of the screen” [$r(210)=-0.18$, $p<0.05$], or “An alert or notification on the homescreen of the Smartphone” [$r(210)=-0.15$, $p<0.05$], and to receive information “Once per week (alert)” [$r(210)=-0.21$, $p<0.01$], “Once per day (alert)” [$r(208)=-0.23$, $p<0.01$], “Every time the app is opened” [$r(208)=-0.21$, $p<0.01$], or “Before starting a conversation with a new person” [$r(207)=-0.17$, $p<0.05$].

There were also few correlations between log-transformed number of sexual partners met through a GSN apps and acceptability measures, although as GSN app usage increased, the acceptability of receiving information “Once per week (alert)” [$r(223)=-0.13$, $p<0.05$] and “Before beginning a conversation with a new person” [$r(219)=-0.15$, $p<0.05$] decreased.

Knowing one’s HIV status was associated with lower acceptability of receiving information “Only when you actively seek the information” [$r(220)=-0.13$, $p<0.05$]. There were no other significant correlations between the importance of knowing one’s HIV status, frequency of HIV testing in the last three years, or how many times per week participants used GSN apps and any other acceptability measure [results not shown, all $rs(201–223)=-0.12–0.47$].

DISCUSSION

The survey administered at the 2015 Milwaukee Pridefest was the first survey, to the best knowledge of the authors, to address acceptability of receiving specific types of HIV prevention information, methods of delivery, and frequency of receiving HIV information through established GSN apps. We also explored associations between acceptability and age, ethnicity, race, GSN app use, and HIV risk factors. All listed types of HIV information were found to be acceptable, consistent with previous research suggesting high overall acceptability of GSN-delivered interventions (7, 8). Acceptable information delivery methods included a sexual health section within the app and an advertisement banner.

Acceptable frequencies of receiving information included actively seeking the information and an alert once per week. Age, ethnicity, race, frequency of app use, the number of partners met through GSN apps, and the importance of knowing your HIV status were not associated with the majority of acceptability measures.

The research presented here builds upon previous research by establishing the specific types of information MSM find most acceptable to receive and how MSM would like to receive this information through GSN apps. While a previous study found that it was feasible to incorporate health educator profiles within GSN apps to answer health questions posed by users who initiated chats, only 35% of users who viewed the health educator profile initiated a conversation (8). Of this 35%, two-thirds were user-initiated greetings, one-quarter were informational chats, and the remainder were direct referrals to testing centers (8). Around 25% of the informational chats ended in referrals to local HIV and STI testing locations (8). While feasible, chatting features may add an additional, unnecessary step in the delivery of information such as locations of local HIV and STI testing centers.

The only correlations identified between acceptability, age, app usage, and HIV risk were in information delivery through the GSN app. All information categories were found acceptable, despite demographic differences. In addition, those with reported greater use of condoms during anal intercourse found it more acceptable to receive information regarding “Locations,” “PrEP,” and “Support groups for persons diagnosed and living with HIV.” This differs somewhat from prior studies where those who identified as Non-White, were unaware of their HIV status, and reported low HIV testing self-efficacy found receiving sexual health information through GSN apps more acceptable (8). Overall, the information presented here may indicate that GSN app users are more mindful about their sexual health and that, overall, GSN app users would be receptive to HIV interventions delivered via GSN apps.

A notable finding within this study was that “PrEP” was among the most acceptable types of information to receive through a GSN app. PrEP is a relatively new biomedical intervention for those at high risk of acquiring HIV, with the ability to lower HIV infection up to 92% in those who take it consistently (10). However, despite its efficacy, PrEP uptake has been low outside of large cities. In Milwaukee, it is estimated that in 2016, nearly 8 thousand MSM age 15–59 had indications for the use of PrEP; however only around 350 people are currently using PrEP (11, Dr. A. Petroll, personal communication, October 27, 2016). One reason for this lack of uptake may be due to a deficiency of PrEP knowledge among those at risk of HIV infection. Increasing PrEP knowledge among potential PrEP users through platforms such as GSN apps may be a way to disseminate accurate information to at-risk individuals.

There are several limitations to this research. First, as with all self-report surveys, the data collected is subject to self-report bias. Second, the use of convenience sampling during a Pridefest event and exclusion of individuals who identified as heterosexual means that our sample may not be representative of the entirety of the MSM population or MSM who do not identify as gay or bisexual. It is possible that MSM who are less gay-identified may appreciate the privacy of receiving information through GSN apps more, or would not be

using these types of GSN apps at all. However, the participants included in this study are similar to other GSN app users in regard to HIV testing tendencies. Ninety-five percent of participants included in this survey had been tested for HIV at least once in their lives, which is similar to rates reported by Grindr users in Atlanta (12). This, in combination with the general acceptability reported here, may speak to an increased awareness of sexual risks and a desire to maintain sexual health among app users that can be further facilitated through having HIV information available through GSN apps. Third, although the results presented here indicate that there is no difference in acceptability between races, the power of these tests were limited by the small sample sizes of minority races. Culturally tailored information may be needed to address specific disparities between White and Black MSM, as STI rates, undiagnosed HIV seropositivity, access to care and treatment, and use of highly active antiretroviral treatment have all been identified as factors that contribute to the disproportionate HIV infection rate among African American MSM (1). In addition, transgender women are an important population to include as this population is disproportionately affected by HIV (1); however, we were unable to asses acceptability within this population as only one transgender woman completed this survey. Another limitation is using a cutoff of HIV testing of 3 years, as the CDC recommends annual screening for those at high risk of HIV infection. No conclusions can be drawn as to whether the participants who reported having an HIV test in the last 3 years are following the recommended guidelines (1). Finally, no causal conclusions can be drawn from our cross-sectional analysis. Despite these limitations, the data collected from this research adds valuable knowledge to the acceptability of using established GSN apps to inform users of HIV prevention and care information.

Some MSM apps, such as Grindr and Scruff, feature limited information on sexual health and HIV with links to outside resources both online and within the apps. App owners could partner with researchers and sexual health experts to maximize the impact of sexual health information within apps. Following development of HIV prevention features within GSN apps, these features will need to undergo usability testing regarding type of information, language used, and length of entries to establish an interface that provides users with desired information in an easy to access manner. Frequency of delivery will also need to be calibrated to maximize impact, with preference given for either lower frequency or only when information is sought out as indicated in this sample.

CONCLUSION

Given the continued popularity and widespread use of GSN apps within the MSM community, incorporating HIV prevention and care information into established apps may allow for increased information dissemination to high-risk groups. The data collected here indicate that most types of HIV information, in particular information regarding HIV and STI testing centers, PrEP, and discussing sexual health and HIV status with potential partners, are acceptable to receive through established GSN apps, regardless of race, ethnicity, and age.

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Table I

Mean acceptability and comparative acceptability of subscales measuring the type of information, methods, and frequency of receiving information

	Mean (SD)	Mean acceptability of subscales[a]	Significant differences in acceptability between subscales[b]
Type of Information			
Locations	4.03 (1.21)	12.64***	NA
PrEP	4.00 (1.27)	11.76***	*ns*
Partner discussion	4.00 (1.09)	13.73***	*ns*
HIV home testing	3.88 (1.37)	9.65***	2.16*
HIV support groups	3.82 (1.36)	9.12***	*ns*
Risk reduction	3.82 (1.22)	10.07***	*ns*
Online physician chat	3.64 (1.42)	6.83***	3.15**
Drug and alcohol use in association with HIV risk	3.62 (1.38)	6.72***	*ns*
Method of Delivery			
Sexual health section within app	3.86 (1.29)	9.98***	NA
Advertisement banner	3.54 (1.42)	5.65***	3.53**
Alert	2.92 (1.48)	*ns*	6.45***
Frequency of Delivery			
Only when actively seek information	3.79 (1.37)	8.56***	NA
Alert once per week	3.74 (1.38)	7.93***	*ns*
Every time the app is opened	2.67 (1.48)	−3.37**	8.59***
Before starting a new conversation	2.53 (1.41)	−4.94***	*ns*
Alert once per day	2.43 (1.35)	−6.22***	2.46*

*$p < .05$,

**$p < .01$,

***$p < .001$

[a]Compared to 3, the “neutral” response option; dfs 219–223

[b]Groupings of acceptability were determined by testing for significant differences between the highest acceptability variable in each category and each subsequent variable until significance was reached. For example, “Locations” was compared to “PrEP,” then “Partner discussion,” then “HIV home testing,” with a significance difference emerging between “Locations” and “HIV home testing.” “HIV home testing” was then compared to “HIV support groups,” “Risk reduction,” and “Online physician chat,” with significance emerging with “Online physician chat.” dfs 219–223