

# Reconsidering the Internet as an HIV/STD Risk for Men Who Have Sex with Men

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**Abstract** Previous studies linking online sexual partnerships to behavioral risks among men who have sex with men (MSM) may be subject to confounding and imprecise measurement of partnership-specific risks. We examined behavioral risks associated with having only online, only offline, or both online and offline partners in the past year, the confounding effects of multiple partnerships, and partnership-specific risks among a sample of MSM from New York City recruited offline in 2008. Overall, 28% of 479 participants had an online partner in the past year, but most of those (82%) also had an offline partner. Having an online partner was associated with past-year unprotected anal intercourse (UAI) and other risks, but not after controlling for multiple partnerships. There were slightly higher levels of risk within offline partnerships, but differences were largely attributable to MSM who had both offline and online partners. Last sex partners met offline were more likely to be HIV-serodiscordant and engage in concurrent substance use with the participant. This suggests that online partnerships may not be an independent cause of behavioral risks, but a marker for risks occurring independent of Internet use.

**Keywords** HIV · AIDS · MSM · Behavioral risk · Internet · Online

## Introduction

Male-to-male sex continues to be the predominant mode of HIV transmission in the United States, accounting for 51% of adult HIV diagnoses in 2007 [1]. While HIV incidence has stabilized or declined in other risk groups, rates among MSM have increased [2], particularly among younger and non-white MSM [3]. Unprotected anal intercourse (UAI) is the major transmission mechanism in this risk group [4–7], and substantial research has investigated the context and settings in which UAI is most likely to occur, with the goal of targeting prevention activities [8].

The Internet has been one contextual focus, as MSM have increasingly used this medium to meet sexual partners [9, 10]. Estimates of MSM seeking partners online range from 40% (offline studies) to 85% (online studies) and of MSM engaging in sexual activity with partners met online (hereafter, “online partners”) range from 30% (offline studies) to 82% (online studies) [11]. Many studies have documented higher levels of UAI and other behavioral risks among MSM seeking online partners [12, 13], with some suggesting that the anonymity and efficiency of online partnering facilitates especially risky behaviors like concurrent substance use (“party n’ play”) and pre-planned UAI (“barebacking”) [14–16].

But a persistent question of empirical research in this area is whether Internet use contributes to risky sex or merely reflects it. In a 2006 meta-analysis, Liau et al. [11] distinguished these two alternatives as the “accentuation hypothesis” (Internet use itself increases behavioral risks),

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and the “self-selection hypothesis” (already risky MSM tend to use the Internet). They suggested that the two overlap, but that current research did not fully support either. First off, many studies only measure MSM seeking, rather than engaging in sexual activity with, online partners [17, 18]. But others that specifically examine the latter [19] often do not specify whether the measured risks occur in online or offline partnerships. If the self-selection hypothesis holds, then MSM who have online partners are more risky in general and may exhibit those risks with offline partners too.

At least three studies have addressed this by investigating risks within online partnerships themselves. A 2005 study found an increased likelihood of UAI in online versus offline partnerships among HIV-positive MSM recruited in gyms, clinics, and online, but the study was limited to casual partners only and found no difference among HIV-negative or untested MSM [20]. In a 2007 online study, Chiasson et al. [21] found no differences in UAI when comparing MSM whose last sex partner was online and MSM whose partner was offline, but since the last partnership may not represent sexual activity generally, there may be some unmeasured overlap between these two groups. Finally, a 2008 online study of MSM aged 18–24 reported that MSM had more UAI in offline partnerships than in online partnerships, particularly MSM with both online and offline partners [22].

Further exploration of the overlap between online and offline partnerships and the risk behaviors that occur within each are needed to evaluate the Internet as a risk environment. Disease outcomes (HIV and STD infections) and partner-level risk factors in online partnerships also have not been adequately assessed [23, 24]. Additionally, most studies of online partnerships have used online recruitment methods. While certainly relevant here, offline-based data provide a crucial comparison to online-based data since estimates vary considerably by recruitment method [11, 25].

The objective of our study is to reconsider the impact of online partnerships on HIV/STD risks in an offline-recruited sample of MSM. First, we investigate how many MSM had online partners, the overlap between online and offline partnerships, and the confounding effects of multiple partnerships on the relationship between online partnerships and behavioral risks or disease outcomes. Second, we examine the behavioral risks within online partnerships themselves, stratified by the participant’s partnership history in the past year (only online, only offline, or both online and offline partners). Third, we explore partner-related risk factors to determine whether online partners themselves exhibit more risk than offline partners.

## Methods

### Sampling and Recruitment

This analysis is based on data collected in the National HIV Behavioral Surveillance (NHBS) study among MSM in New York City in 2008. NHBS used venue-based sampling (VBS), a quasi-probability study design that reduces the impact of selection bias, to enumerate and recruit participants [26]. VBS methods for NHBS have been described in detail elsewhere [27]. Briefly, our study team constructed a universal list of all MSM-oriented social venues in NYC by reviewing publications, interviewing key informants, and conducting other ethnographic research. Potential venues were included in this universe if at least 75% of the venue population were adult MSM, as determined through observational and interview-based ethnography. Each venue’s peak hours of operation, in standardized 4-h time blocks, were also determined through this method. Potential venues included commercial establishments like bars and dance clubs, but also parks, public sex strolls, and high-density street intersections. Throughout the study, the universe was updated as new venues opened and known venues closed or changed populations. All information on venues and peak time periods was entered into software, designed by the Centers for Disease Control and Prevention for NHBS, that randomly selected venues and time periods for recruitment events. Selections were sequentially placed on a monthly recruitment calendar. We conducted 12–15 recruitment events a month for 5 months.

At each recruitment event, field staff operating in a mobile van outside the venue enumerated all adult men who entered the venue (or crossed an imaginary line when no venue entrance existed). Enumerated men were sequentially and non-preferentially approached by interviewers to describe the study, and interested men were screened for eligibility. Eligible men provided their informed consent and completed the study, consisting of a quantitative survey administered privately by a trained interviewer and a voluntary HIV test. The eligibility criteria were male gender, adulthood, New York City residence, and English/Spanish comprehension. MSM sexual history was not an eligibility criterion, but for this analysis we removed men with no past-year MSM sexual history and those who self-reported HIV-positive, since awareness of status influences risk behavior [28]. All study procedures were approved by the Institutional Review Boards of the participating organizations.

### Measures

Participants enumerated all their past-year sex partners, categorized them as partners met originally on the Internet

(i.e., online partners) or met through other means (i.e., offline partners), and described risk behaviors (anal intercourse [AI], UAI, concurrent substance use [alcohol/drug use before or during sex], and not discussing HIV before first sex) with partners in each group. Participants who met their last sex partner in the past 3 years (timeframe-limited to improve recall) were asked whether the partner was online or offline, the partner's risk factors (HIV status, >5 years older, ever used crack cocaine, or ever incarcerated), and risk behaviors in the last sexual encounter with that partner (UAI and concurrent substance use).

For this analysis, we report on sociodemographics (race/ethnicity, age, sexual identity, foreign-birth, college graduation, and past-year homelessness and income < \$10,000), and past-year behavioral risks (UAI, UAI with 2 or more partners, UAI with a casual or exchange [traded sex for money or drugs] partner, 5 or more total partners, group sex encounters, female partners, at least weekly binge alcohol use, and any illicit hard drug [non-marijuana] use). For disease outcomes, we asked whether participants ever tested positive for HIV or had any past-year STD diagnoses. HIV serostatus was determined by testing oral fluid on OraQuick platforms (OraSure Technologies, Bethlehem, PA). Reactive OraQuick tests were confirmed with OraSure test kits on a Western Blot platform.

#### Statistical Analysis

Three analytic approaches were used. First, using Pearson  $\chi^2$  tests, we examined the variations in sociodemographics, sexual risks, and disease outcomes between MSM with only offline partners, those with only online partners, and those with both offline and online partners. When testing differences in total partners, we used Wilcoxon rank sum tests for skewed distributions. To test whether having any online partners was independently associated with HIV risk, we constructed logistic regression models with three outcomes (any UAI, UAI with a casual/exchange partner, and STD diagnoses) to determine the crude odds ratio (OR) and 95% confidence intervals (CI) with any past-year online partners as the independent variable. Then we added the logged total partner number variable to each model, since this is the hypothesized primary confounder in the relationship, to determine the adjusted OR (AOR) and 95% CI for each association.

Second, differences in risk characteristics (number of partners, AI, UAI, concurrent substance use, and discussing HIV before first sex) occurring within online partnerships and offline partnerships were explored. We summarized variations simultaneously across partnership categories (online versus offline) and stratified by participants' partnership history within those categories (e.g., offline partnerships among participants with only offline partners

versus offline partnerships among participants with both offline and online partners). Because the analytic unit was the partnership and participants fell into multiple units, no tests of statistical significance were conducted.

Third, we examined the partner-related risks in an event-specific analysis of last sexual encounter, comparing MSM whose last partner was online with MSM whose partner was offline. Here again, Pearson  $\chi^2$  tests were used to determine significant differences in risk between these two groups.

#### Results

Among 781 men approached to participate in the study, 568 completed the survey (response rate = 73%). Of these 568 men, 18 (3%) were removed from this analysis because they had no recent MSM sexual history and 71 (13%) because they self-reported as HIV-positive. Of the remaining 479 MSM, 395 (82%) agreed to an HIV test. Most MSM were recruited from bars (59%); others were recruited from parks (8%), dance clubs (8%), public sex environments (7%), gay pride events (7%), community-based organizations (6%), and house ball events (6%). Two-thirds of MSM (67%) attended social venues where they met other MSM at least weekly.

The racial/ethnic composition of the sample was 26% black, 35% Hispanic, 32% white, and 7% other (Table 1). Most participants were young: 46% were 18–29 years old, 28% were 30–39, 16% were 40–49, and 10% were 50 or older. Most (80%) identified as homosexual/gay, 18% were foreign-born, 9% were recently homeless, 41% had graduated college, and 19% had an annual income of less than \$10,000. Past-year behavioral risks were common: 50% had UAI, 19% had UAI with 2 or more partners, 21% had UAI with a casual/exchange partner, 44% had 5 or more total partners (mean = 8.0, median = 3), 18% had engaged in group sex, 17% had female partners, 25% had engaged in frequent binge drinking, and 33% used hard drugs. Eighteen percent were infected with HIV and 10% reported an STD diagnosis in the past year.

Overall, 136 (28%) had any online partners in the past year, and the remaining 343 (72%) had only offline partners. Of the 136 with online partners, 24 (18%) had only online partners and 112 (82%) had both offline and online partners. Compared to MSM with only offline or only online partners, MSM with both offline/online partners were significantly more likely to identify as homosexual ( $P = 0.02$ ) and exhibit several behavioral risks: UAI ( $P < 0.01$ ), UAI with 2 or more partners ( $P < 0.01$ ), UAI with a casual/exchange partner ( $P < 0.01$ ), 5 or more total partners ( $P < 0.01$ ), and group sex ( $P < 0.01$ ). College graduates were most likely to have only online partners

**Table 1** Sociodemographics, behavioral risks, and disease outcomes and associations with past-year sex partners met only offline, only online, and both online and offline, among New York City men who have sex with men, 2008,  $n = 479$ 

	Total		Past-year sex partners			<i>P</i>
	<i>n</i>	%	Only offline <i>n</i> = 343 %	Only online <i>n</i> = 24 %	Both online/ offline <i>n</i> = 112 %	
Race/ethnicity						0.16
Black	125	26.1	26.2	29.2	25.0	
Hispanic	167	34.9	37.6	29.2	27.7	
White	152	31.7	29.5	25.0	40.2	
Other	35	7.3	6.7	16.7	7.1	
Age						0.87
18–29	219	45.7	43.7	45.8	51.8	
30–39	134	28.0	28.9	29.2	25.0	
40–49	76	15.9	16.6	12.5	14.3	
50+	50	10.4	10.8	12.5	8.9	
Sexual identity						0.02
Homosexual	383	80.0	77.3	75.0	89.3	
Bisexual/heterosexual	96	20.0	22.7	25.0	12.5	
Sociodemographics						
Foreign-born	85	17.8	17.5	25.0	17.0	0.55
Homeless <sup>a</sup>	44	9.2	10.2	4.2	7.1	0.43
College graduate	196	40.9	37.0	70.8	46.4	<0.01
Income < 10 k <sup>a</sup>	86	18.7	20.1	13.0	15.9	0.49
Behavioral risks <sup>a</sup>						
Unprotected anal intercourse	239	49.9	46.7	37.5	62.5	<0.01
UAI with $\geq 2$ partners	89	18.6	14.0	12.5	33.9	<0.01
UAI with casual/exchange partner	102	21.3	16.0	16.7	38.4	<0.01
Mean (median) total partners	8.0 (3)	–	4.7 (2)	8.3 (3)	18.1 (7)	<0.01
$\geq 5$ total partners	210	43.8	34.4	41.7	73.2	<0.01
Group sex encounters	85	17.8	12.5	12.5	34.8	<0.01
Any female partners	79	16.5	18.1	16.7	11.6	0.28
Weekly binge drinking	120	25.1	24.8	20.8	26.8	0.81
Hard drug use	159	33.2	31.2	25.0	41.1	0.11
Disease outcomes						
HIV seroinfection <sup>b</sup>	69	17.5	18.0	15.8	16.1	0.90
STD diagnosis <sup>a</sup>	48	10.0	7.9	12.5	16.1	0.04

<sup>a</sup> In the past 12 months<sup>b</sup>  $n = 395$ 

( $P < 0.01$ ). There were no significant differences in HIV infection by online partnerships, but STD diagnoses were significantly higher ( $P = 0.04$ ) in MSM with both online/offline partners (16%) compared to those with only online partners (13%) or only offline partners (8%).

In bivariate analyses (data not shown), MSM with any online partners ( $n = 136$ ) were more likely to have UAI (OR = 1.58, 95% CI = 1.06–2.37), UAI with a casual/exchange partner (OR = 2.77, 95% CI = 1.75–4.36), and STD diagnoses (OR = 2.14, 95% CI = 1.16–3.93). MSM with both online/offline partners had a higher average number of past-year partners ( $P < 0.01$ ), and in multivariate analysis controlling for the logged partner number, all

three associations lost significance and the adjusted coefficient changed by greater than 20%: any UAI (AOR = 1.19, 95% CI = 0.77–1.85), UAI with casual or exchange partner (AOR = 1.46, 95% CI = 0.87–2.43), and STD diagnoses (AOR = 1.55, 95% CI = 0.79–3.04).

As Table 2 shows, MSM in offline partnerships ( $n = 455$ ) had the same median number of offline partners as MSM in online partnerships ( $n = 136$ ) had online partners (3 for both), but the subgroup of MSM with both offline/online partners had more offline partners than MSM with only offline partners (medians = 4 vs. 2). Overall, 84% of MSM in offline partnerships had AI in those partnerships, similar to the 83% of MSM in online

**Table 2** Comparison of risk characteristics of offline partnerships versus online partnerships among New York City men who have sex with men, 2008,  $n = 479$ 

	Offline partnerships			Online partnerships		
	Only offline partners $n = 343$	Offline/online partners $n = 112$	Both $n = 455$	Only online partners $n = 24$	Offline/online partners $n = 112$	Both $n = 136$
No. partners, mean (median)	4.7 (2)	9.4 (4)	5.8 (3)	8.3 (3)	8.7 (3)	8.6 (3)
Any anal intercourse	84.0%	83.0%	83.7%	79.2%	83.9%	83.1%
No. AI partners, mean (median)	2.7 (1)	4.8 (2)	3.2 (2)	7.1 (2)	5.4 (2)	5.7 (2)
Any unprotected anal intercourse	44.9%	42.0%	44.2%	33.3%	38.4%	37.5%
No. UAI partners, mean (median)	0.8 (0)	1.4 (0)	0.9 (0)	0.6 (0)	2.1 (0)	1.9 (0)
Concurrent substance use	55.9%	61.6%	58.2%	58.3%	52.7%	53.7%
Discussed HIV before sex (any partners)	65.4%	65.2%	65.4%	75.0%	62.5%	64.7%
Discussed HIV before sex (all partners)	47.6%	48.2%	47.8%	70.8%	44.6%	49.3%

partnerships. The median number of AI partners was the same for offline and online partnerships (2 for both), with little variation within partnership categories. Overall, 44% of MSM in offline partnerships had UAI with those partners while 38% of MSM in online partnerships had UAI with those partners. Among MSM with both offline/online partners, more had UAI in offline partnerships than online partnerships (42% vs. 38%). Among MSM in offline partnerships, 58% engaged in concurrent substance use, while 54% of MSM in online partnerships did. Among MSM with both offline/online partners, a higher percent engaged in concurrent substance use in offline partnerships than in online partnerships (62% vs. 53%). Finally, there were minor variations in discussing HIV before sex with any or all offline partners (65% and 48%, respectively) and any or all online partners (65% and 49%, respectively), but MSM with only online partners had the highest rates of discussing HIV in any or all of those online partnerships (75% and 71%, respectively).

Table 3 compares the risk characteristics of the last male sexual encounter by online versus offline initiation of that partnership. There were no significant differences in partner type or UAI at last sex by partnership category. However, 48% of MSM reported concurrent substance use, and any substance use ( $P = 0.04$ ), alcohol use specifically ( $P = 0.01$ ), and cocaine use specifically ( $P = 0.06$ ) were all more likely in offline partnerships. Overall, 55% reported their partner was HIV-negative, 4% HIV-positive, and 40% unknown. MSM with online partners were more likely to report an HIV-negative partner, while those with offline partners were more likely to report a HIV-positive or unknown-status partner ( $P = 0.02$ ). Likewise, participants with offline partners were more likely to report a serodiscordant or unknown-status partner ( $P = 0.02$ ). However, there were no differences in the prevalence of UAI with a serodiscordant/unknown partner. There were

**Table 3** Risk characteristics of last sexual partnership and comparisons between partners met offline versus online, among New York City men who have sex with men, 2008,  $n = 413^a$ 

	Totals		Last partner		<i>P</i>
	<i>n</i>	%	Offline %	Online %	
Partner type					0.65
Main	167	40.4	41.0	38.2	
Casual	229	55.5	54.6	59.2	
Exchange	17	4.1	4.5	2.6	
Unprotected anal intercourse					
Any UAI	104	25.2	25.5	23.7	0.74
Receptive UAI	50	12.1	12.5	10.5	0.64
Insertive UAI	88	21.3	21.1	19.3	0.80
Concurrent substance use					
Any alcohol/drugs	197	47.7	50.2	36.8	0.04
Alcohol	178	43.1	46.0	30.3	0.01
Cocaine	24	5.8	6.8	1.3	0.06
Partner HIV status/discordance					
Partner status					0.02
HIV−	229	55.5	52.2	69.7	
Unknown	167	40.4	43.3	27.6	
HIV+	17	4.1	4.5	2.6	
Serodiscordant/unknown	175	42.4	45.1	30.3	0.02
UAI with Serodis./Unk. partner	43	10.4	10.7	9.2	0.70
Partner risk factors					
Partner > 5 years older	98	23.7	22.9	27.6	0.38
Partner ever used crack	30	7.3	8.3	2.6	0.09
Partner ever incarcerated	34	8.2	8.9	5.3	0.30

<sup>a</sup> Limited to MSM who met their last partner in the past 3 years

also no differences in two partner risk factors (older age and incarceration history), and only marginally higher rates of crack use for offline partners ( $P = 0.09$ ).

## Discussion

In our study of offline-recruited MSM from New York City, we found that most MSM who met partners online also met them offline. Several behavioral risks and STDs were higher among MSM with both offline/online partners, but this association was largely explained by the confounding effects of multiple partnerships. Within partnerships, we found slightly higher levels of risk in offline partnerships, but again, more risk by MSM with both offline/online partners compared to MSM with only offline or only online partners. There were no major differences in partner-level risk factors or rates of UAI, but there were higher levels of concurrent substance use and serodiscordance in offline partnerships.

### Online Partners and Risk Behavior

Online studies have generally found that 80–90% had online partners [29, 30], while offline studies have found 20–30% did [19, 31], consistent with our finding of 28%. Timeframe measurements for these partnerships vary across studies. The differences are clearly impacted by the recruitment method [11], and studies of online-recruited MSM have been found to overestimate risks generally [25, 32]. Regardless, few studies have examined the overlap between offline and online partnerships. One recent online study of young MSM found 37% had only online partners, 15% had only offline partners, and the remaining 48% had both online and offline partners in the prior 3 months [22], whereas our findings were 5%, 72%, and 23% in these respective categories. In addition to recruitment method, other factors that may account for these differences may be our longer period for measuring partnerships, older study population [33], and exclusion of self-reported HIV-positive participants [28, 34].

Consistent with previous research, we found that online partnerships were associated with UAI and other behavioral risk factors [12]. While there was no significant association between online partnerships and HIV infection, we were not able to limit HIV diagnoses to those recently infected [35]. As for other STDs, one recent study found no association between online partnerships and STDs among MSM [24], but our results were consistent with others that have [10, 36]. Yet upon further examination, the largest differences in the likelihood of these behavioral and biological risk factors were not between MSM who had online partners and MSM who did not, but between MSM with both online and offline partners and MSM with only online or only offline partners. Since MSM with online and offline partners must, by definition, have at least 2 partners in the measured timeframe while the other two groups must have only 1 partner, we investigated the impact of partner

number on the relationship between online partnering and three key outcomes (UAI, UAI with a casual/exchange partner, and STDs). Multivariate modeling showed that online partnering was substantially confounded by partner number. This provides some further evidence of the “self-selection hypothesis” that MSM with online partners are riskier than those with only offline partners, independent of Internet use [11].

### Partnerships Versus Partners

Most studies on this topic, as noted, measure risks among MSM who have online partners, whereas only examining the risks within online partnerships would provide evidence of the “accentuation hypothesis” that the Internet contributes to risk behavior. Evidence on this is still mixed: one study found more risk in online partnerships while another found no association [20, 21]. Horvath et al. [22] approached the issue differently, by comparing UAI across partnership categories (online versus offline) and MSM within those categories (MSM with only online or only offline partners versus MSM with both types of partners), finding higher levels of UAI in offline partnerships and by the subgroup of MSM with both offline and online partners.

We expanded on that approach by including MSM of all age groups since most HIV infections still occur among older MSM [2], examining the participant’s and the partners’ substance use since this plays a major role in HIV transmission [6, 15], and investigating pre-sex HIV discussions since some have suggested that the Internet aids frank discussions about HIV status [37, 38]. In the end, we found only small differences in behavioral risks between online and offline partnerships and between MSM with exclusively online or offline partners and those with both types of partners. Higher rates of UAI and concurrent substance abuse in offline partnerships compared to online partnerships overall and specifically for MSM with both online/offline partners support a refocusing of prevention efforts on bars and other offline venues where MSM meet [39].

### Partner-Specific Risks

Several studies have suggested that network and partner-related risk factors help explain the growth and disparities in HIV infection [40–42], and the Internet has the potential to bridge many social networks that would otherwise remain unconnected. But few have investigated partner-related risk factors among MSM with online partnerships. We hypothesized that offline partners would be riskier because the Internet allows MSM to “preview” partners, and thus preferentially avoid riskier ones. Our findings suggest there are few differences in partner-related risks:

offline partners were no more likely to be casual/exchange partners, older, or have a history of incarceration, and only marginally more likely to have used crack. But importantly, there were differences in partner serostatus: online partners were less likely to be HIV-positive than offline partners. Similarly, a recent study of STD clinic patients found that heterosexuals with recent online partners were less likely to test positive for gonorrhea or Chlamydia [24]. This may again reflect the intrinsic communication properties of the Internet, as it helps MSM find seroconcordant partners [43]. Concurrent substance use was also less likely in online partnerships, which may reflect common alcohol and drug use in offline venues.

### Limitations

The primary limitation to this study is its offline recruitment method, since estimates of online partnerships substantially vary by method [11]. Others have found that online surveys may overestimate HIV risks [18, 44], but the venue-based sampling method used in our study is not necessarily representative of all MSM or even MSM who attend social venues. Population-based surveys have found lower rates of HIV risk and prevalence [45], but a strength of our sampling method is that these MSM are potentially reachable for prevention messaging at social venues. Our main estimates of online partnerships were also consistent with previous offline studies and the venue-based sampling design is a rigorous method for reducing common recruitment biases. Another limitation is that all data except HIV serostatus were self-reported and are subject to the potential biases of survey research, including recall error and social desirability biases.

### Conclusions

Online partner seeking has grown exponentially over the past decade. Many thought that the Internet would increase risk among MSM by allowing for anonymous and efficient partnerships that were intentionally risky [10]. In some cases, that has occurred [15, 20]. But most studies tying sexual risk to the Internet have used analytic approaches that can only show that risky MSM use the Internet. Our study is consistent with the literature supporting the “self-selection hypothesis” that higher rates of UAI among Internet users merely reflect risks that were already there [11, 22]. Further research to investigate the overlap of online and offline partnerships, the impact of confounders on online-associated risk, and partner-related risk factors in both online and offline-recruited samples of MSM are needed to further support these findings.

In terms of prevention programs and interventions, where does that leave us? The primary implication is to target MSM with elevated rates of HIV risk factors (e.g., UAI, multiple partnerships, and concurrent substance) regardless of their online partnerships. Rather than viewing the Internet as a cause of disease, it is more appropriate to understand it as an environment in which risks can occur, and as such, an efficient focus for HIV prevention messages and interventions [46, 47]. But social venues like bars and clubs are also important risk environments that require ongoing targeting for HIV prevention activities. It may be more difficult to target risky MSM than to target presumed risky venues like the Internet. But several interventions targeting MSM, as well as large-scale public health programs to distribute condoms and provide routine HIV testing, have been proven to reduce risk [28, 48, 49]. Their continued integration into both online and offline venues where MSM meet partners will work towards preventing HIV among MSM.

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