A Narrative Review of Internet Use, Interpersonal Connectedness, and Sexual Behaviour Among Gay, Bisexual and Other Men Who Have Sex With Men

ABSTRACT

Researchers have often considered the impact that online dating has had on gay communities; with some arguing that changes in social behavior may impact the spread of HIV. However, these conclusions are based on the premise that the Internet has fundamentally changed the way gay and bisexual men connect with their communities. Addressing this issue, we searched the PubMed and Web of Science databases for studies examining Internet use and interpersonal connectedness among gay and bisexual men to determine whether those who used the Internet to find sexual partners exhibited different patterns of community connectedness. Though sporadic, findings suggest that Internet use may be associated with lower gay identity, community attachment, and social embeddedness. However, recent reports have suggested that online sex seeking might be associated with greater, not less, interpersonal connectedness. We conclude that additional longitudinal analyses and consistent measurement

Introduction

In the United States, gay, bisexual, and other men who have sex with men (GBM) account for an estimated two thirds of all new HIV cases and represent one half of all persons living with HIV (Centers for Disease Control and Prevention, 2015). Similar trends are apparent in Canada, where in 2011 GBM accounted for approximately one half of HIV cases (Public Health Agency of Canada, 2014). Responding to this epidemic, public health professionals in North America have relied heavily on community-based organizations to promote social norms amenable to a variety of health outcomes—particularly condom use and sexual partner reduction (Rowe & Dowsett, 2008). As such, community-driven prevention has become an important instrument in reducing HIV risk among GBM.

However, researchers tracking widespread social change have wondered whether gay communities continue to play a vital role in the lives of GBM (Rowe & Dowsett, 2008). Broader sociological examinations of contemporary communities have suggested that Western culture has transitioned from a pattern of tight-knit collectivist groups to one of "networked individualism" (Wellman, 2001); and among GBM specifically, researchers have documented a shift away from geographically defined and institutional communities toward less formal personal networks (Holt, 2011). Given the importance of communities in promoting health among GBM, there are concerns that changes in these patterns of connectedness might negatively impact the HIV epidemic by changing social norms around condom use and sexual partnering.

Naturally, the emergence of the Internet has been identified as a key contributor to these structural changes (Goltz, 2014; Hightow-Weidman et al., 2014; Lewis et al., 2015; Miller, 2015; Rowe & Dowsett, 2008; Simon Rosser, West, & Weinmeyer, 2008; Zablotska, Holt, & Prestage, 2012). Indeed, since the early 1990s, the Internet has come to play an increasingly important role in the lives of GBM (Jennings et al., 2015). According to Weinrich (1997), the Internet's very origins, in the suburbs of San Francisco, made it sort of a virtual gay

neighborhood. Therein, GBM are able to explore their sexual identity, contest their social marginalization, connect with friends, and build communities (Grov, Breslow, Newcomb, Rosenberger, & Bauermeister, 2014; Harper, Serrano, Bruce, & Bauermeister, 2015). In particular, the Internet has also provided a new space for GBM to find sexual partners (Bolding, Davis, Hart, Sherr, & Elford, 2007; Jennings et al., 2015; Menza, Kerani, Handsfield, & Golden, 2009). Given this, it is important for health promotion specialists to understand whether the Internet has really changed how GBM connect to each other and their communities. With this in mind, the present review seeks to examine whether the Internet was associated with decreased interpersonal connectedness in offline venues (these being juxtaposed to the emergent kinds of social connections that take place in online settings). In doing so, we hope to illuminate what significance these findings might have for the HIV epidemic and existing public health responses to it.

Methods

In February 2017 we searched the PubMed and Web of Science databases for articles relating to gay men (i.e., same-sex, men who have sex with men – MSM, homosexual, gay, men who use the Internet to seek sex with other men – MISM), interpersonal connectedness (i.e., social, cultural, community, peer, group, network, venue, friends, attachment, identification, participation, attendance, involvement, engagement, loneliness, isolation), and Internet use (i.e., online, Internet, apps, Web, cyber, smartphone, chat). Duplicate results were removed by matching digital object (DOI) and PubMed identifiers (PMID). The titles and abstracts of each article were reviewed, and conspicuously irrelevant articles were excluded (e.g., studies using Internet samples but not examining Internet use). Inclusion criteria restricted review to articles that sampled North American GBM. This geographic focus was intended to limit heterogeneity of study findings since we were examining patterns of social behavior—which vary widely across different cultures (Hofstede, 2011). Inclusion was also restricted to studies explicitly examining the association between Internet use and community attachment. This restriction was selected because all articles examining Internet use among GBM, of which there are hundreds, include some sociological dimension (i.e., race/ethnicity, age). However, the aim of this review was to conduct a narrative review specifically into the questions surrounding interpersonal connectedness. Articles with abstracts meeting these criteria were reviewed more thoroughly, and ineligible articles were screened out. Two independent searches were conducted, and differences in selection were adjudicated by review of the full article. Studies were also restricted to those with quantitative findings. We did not a priori determine which forms of social connectedness would be included.

Using an inductive thematic approach for identifying themes, eight categories of measures were identified by extracting the key indicator variables related to community and social attachment and then grouping similar variables together (i.e., gay identification and disclosure, community connectedness, social embeddedness and support, bar/club attendance, sex on

premises venue attendance, cruising spot attendance, concurrent online and offline use, and geographic residence). We did not allow for preexisting theoretical conceptions to restrict the inclusion of articles to those matching only one conceptualization of community connectedness. Instead, delineation of themes was done based on differences identified in reading the articles identified through our literature search. Evidence relating to each category was then assessed based on statistical significance ($p < 0.05$) of reported results. Risk of bias was not assessed due to only nonrandom sampling procedures being used. Meta-analyses were not conducted due to the diverse ways in which online behavior and social behavior were measured.

Results

Figure 1 provides an overview of the article selection process undertaken in this review. In brief, the PubMed and Web of Science databases returned 2,590 unique articles. This relatively large initial sample size is likely due to the broadness of search terms included in our literature search and the methodological use of Internet-based research (i.e., studies with Internet samples investigating social phenomena). Of these, 817 did not relate to GBM (e.g., studies about same-sex friends), 1,038 did not relate to their Internet use (e.g., Internet samples), 520 did not explicitly examine dimensions of interpersonal connectedness, 121 were not relevant to the research question (e.g., online interventions, studies examining online behavior), 37 were conducted in other cultural settings (e.g., European or Asian samples), and 27 were qualitative. This search process returned 30 articles for inclusion. Table 1 provides an overview of included articles and the reported prevalence of Internet use. Table 2 provides an overview of each themes and identifies the evidence considered in evaluating the relationship between the various Internet use measures and each theme.**Table 1**. Overview of studies. (Table view)

Study	Location	Years	Sampling	*N*	Internet Use Variable	Recall	%[a]
Hirshfield et al. (2004)[2]	United States	2001	Online	2,916	Met online partners	P6M	80
McKirnan et al. (2007)[2]	Chicago, Illinois	2001	Offline (varied)	817	Online sex seeking	Ever	36
Rhodes et al. (2002)[1]	Birmingham, Alabama	≤ 2002	Online and offline (bars)	381	n/a	-	-
Smith et al. (2006)[2]	Southern California	2002–2005	Offline (clinics)	194	Online sex seeking	P12M	70
					% of events initiated online	Last 3	37
Fernández et al. (2007)[1]	Miami-Dade, Florida	2003–2004	Online and offline (varied)	566	n/a	-	-

Study	Location	Years	Sampling	*N*	Internet Use Variable	Recall	%[a]
Chiasson et al. (2007)[2]	United States/Canada	2003–2004	Online	1683	Met online partners	Ever	82
					Met online partners	Last 1	51
Menza et al. (2009)[2]	Seattle, Washington	2003	Random Digit Dialing	400	Met anal sex partner online	P12M	19
		2006		400	Met anal sex partner online	P12M	29
Knapp Whittier et al. (2004)[1]	United States	≤ 2004	Online and offline (CBO)	551	Met online partners	P2M	54
Ogilvie et al. (2008)[2]	Canada	2004	Offline (pride festivals)	2,312	Sought sex online	P12M	33
Garofalo et al. (2007)[2]	Chicago, Illinois	2004–2005	Offline (varied)	270	Online sex seeking	Ever	68
					Met online partners	Ever	48
Kakietek et al. (2011)[2]	United States	2004–2005	Offline (pride festivals)	1,243	Met online partners	P12M	47
Kelly et al. (2012)[2]	New York/New Jersey	2005	Offline (gay expos)	661	Met online partners	P3M	87
Horvath et al. (2008)[2]	United States	2005	Online	770	Met online partners	P3M	85
Wilkerson et al. (2010)[3]	United States	2005	Online	2,577	Online information seeking	Ever	76
Reisner et al. (2009)[2]	Massachusetts	2007	Offline (varied)	214	Met online partners	P12M	36
Kerr et al., 2015)[2]	San Francisco, California	2007	Offline (bathhouse)	459	Met online partners	P3M	55
Jenness et al. (2010)[1,2]	New York, New York	2008	Offline (VBPS)	479	Met online partners	P12M	28

Study	Location	Years	Sampling	*N*	Internet Use Variable	Recall	%[a]
Downing (2012)[2]	United States	2008	Online and offline	112	Frequent online sex seeking	P1M	52
White et al. (2013)[2]	Boston, Massachusetts	2008	Respondent-driven sampling	197	Met online partners	P12M	20
Veinot et al. (2013)[2,3]	Southeastern Michigan	2008–2010	Online and offline (varied)	194	Daily Internet Use	P12M	99
					Online information seeking	P12M	68
					Met online partners	P12M	37
Grov (2011)[1]	United States	2009–2010	Online and offline (bars/baths)	601	n/a	-	-
Grov and Crow (2012)[1,2]	United States	2009–2010	Online and offline (bars/baths)	592	Most common venue	P3M	46
Jennings et al. (2015)[2]	Baltimore, Maryland	2009–2014	Offline (clinics)	412	Met online partners	P12M	38
Hernandez et al. (2014)[1,2]	Atlanta, Georgia	2010–2012	Online and offline (varied)	803	Used Facebook	P1M	66
					Met online partners	P1M	60
(Grov, Breslow, Newcomb, Rosenberger, & Bauermeister, 2014; Harper, Serrano, Bruce, & Bauermeister, 2015)[1,2]	United States	2010–2012	Online and offline (varied)	147	Online sex seeking	P3M	84
Beymer et al. (2014)[2]	Los Angeles, California	2011–2013	Offline (clinics)	7,184	Met online partners	P12M	54
Phillips et al. (2014)[2]	Washington, DC	2011	Offline (VBPS)	379	Online sex seeking	P12M	64

Study	Location	Years	Sampling	*N*	Internet Use Variable	Recall	%[a]
					Met online partners	P12M	24
Noor et al. (2014)[2]	United States	2011	Online	5,047	Met online partners	P3M	87
Broaddus et al. (2015)[2]	United States	2011	Offline (varied)	205	Used social media	-	83
					Met online partners	P3M	53
Jennings et al. (2015)[2]	Baltimore, Maryland	2009–2014	Offline (clinics)	412	Met online partners	P12M	38
Card et al. (2016)	Vancouver, Canada	2012–2014	Respondent-driven sampling	774	Online sex seeking	P6M	76

Relevance: [1] Online vs. offline sampling; [2]Seeking sex or meeting partners online; [3]Seeking information online

Notes: P1M = Past 1 month, P2M = Past 2 months, etc.; VBPS = Venue-based probability sampling; n/a = not assessed.

[a] Percent reporting Internet use.

Table 2. Summation of evidence testing the association between Internet use and social behavior. (Table view)

Theme	Positive Findings	Null/Mixed Findings	Negative Findings	Subjective Assessment
Gay identification and disclosure	Card, et al. (2016) Phillips et al. (2014) Smith et al. (2006) White et al. (2013)	Broaddus et al. (2015) Horvath et al. (2008) Jenness et al. (2010)	Rhodes et al. (2002) Knapp Whittier et al. (2004) McKirnan et al. (2007) Chiasson et al. (2007) Fernández et al. (2007) Wilkerson et al. (2010) Grov (2011, 2012, 2014)	Internet users/recruits appear to be less likely to identify and disclose as gay.
Community attachment		Veinot et al. (2013) Grov et al. (2014) Card et al.	Fernández et al. (2007) Grov (2011) Grov, Rendina et al. (2014)	Internet users/recruits appear to exhibit lower community attachment.

Theme	Positive Findings	Null/Mixed Findings	Negative Findings	Subjective Assessment
		(2016) Veinot et al. (2013)		
Social embeddedness and support	Card et al. (2016)	Fernández et al. (2007) Kelly et al. (2012)	McKirnan et al. (2007) Saxton et al. (2013)	Internet users/recruits appear to be less socially embedded.
Venue patronage – Bars and clubs		Menza et al. (2009) Card et al. (2016b) Menza et al. (2009)	Knapp Whittier et al. (2004) Grov et al. (2014) Knapp Whittier et al. (2004)	Internet users appear to be less likely to visit bars.
Venue patronage – Sex on premises venues	Garofalo et al. (2007) Grov et al. (2014) Ogilvie et al. (2008) Reisner et al. (2009)	Downing (2012) Menza et al. (2009)	Grov et al. (2014)	Internet users appear to be more likely to visit sex on premises venues.
Venue patronage – Cruising spots	Knapp Whittier et al. (2004) Ogilvie et al. 2008)	Menza et al. (2009) Downing (2012) Grov et al. (2014) Menza et al. (2009)	Jennings et al. (2015); Menza et al. (2009)	Mixed evidence
Geographic residence	Ogilvie et al. (2008)	Horvath et al. (2008) Kakietek et al. (2011) Kelly et al. (2012)	Knapp Whittier et al. (2004)	Mixed evidence

Figure 1. Literature search.

Most studies leveraged venue-based sampling to examine the covariates of online sex seeking or to compare differences between online and offline samples. Over time, the proportion of GBM who reported meeting sexual partners online increased—though longitudinal data are needed to assess whether the data in the present studies accurately reflect any changes in the actual social

behavior of GBM. Regarding measures of interpersonal connectedness, a variety were used making it difficult to analyze findings with regard to specific indicators. Rather, to characterize these diverse findings, we used an inductive thematic approach to classify each measure into one of the following categories: identity, community attachment, social embeddedness, geographic residence, and venue patronage. Results for each thematic category are discussed below.

Identity

A number of studies suggested that Internet use was associated with non-gay identification (Chiasson et al., 2007; Fernández et al., 2007; Grov, 2011; Grov & Crow, 2012; Grov, Rendina, & Parsons, 2014; Knapp Whittier, Seeley, & St. Lawrence, 2004; Rhodes, DiClemente, Cecil, Hergenrather, & Yee, 2002), or nondisclosure of sexual orientation (McKirnan, Houston, & Tolou-Shams, 2007; Wilkerson, Smolenski, Horvath, Danilenko, & Rosser, 2010). Other studies reported contradictory findings (Card et al., 2016; Phillips et al., 2014; Smith et al., 2006; White, Mimiaga, Reisner, & Mayer, 2013) or reported that the association between Internet use and gay identification was not significant (Broaddus et al., 2015; Horvath, Rosser, & Remafedi, 2008). Jenness et al. (2010) found that the proportion of men who identified as gay did not differ between men who had met sexual partners only online or only offline but was significantly higher among men who met sexual partners at both venues (77% vs. 75% vs. 89%, $p = 0.02$).

Community attachment

Three studies found that Internet use was associated with lower attachment to the gay community (Fernández et al., 2007; Grov, 2011; Grov, Rendina et al., 2014). However, Veinot, Meadowbrooke, Loveluck, Hickok, and Bauermeister (2013) reported that gay community involvement was positively associated with using the Internet at least several times a day ($r = 0.153$, $p = 0.04$) and using the Internet to find health information ($r = 0.30$, $p < 0.001$); negatively associated with the amount of time spent chatting with other men online ($r = -0.175$, $p = 0.02$); and not significantly associated with meeting friends online ($r = -0.152$, $p = 0.11$) or online sex seeking ($r = -0.113$, $p = 0.13$). Similarly, Card et al. (2016) found that more frequent online sex seeking was associated with reading gay news media (> monthly vs. ≤ monthly, odds ratio [OR] = 1.72, 95% confidence interval [CI] = 1.18, 2.49) and that men who sought sex online were no less likely to play on gay sports teams (OR = 1.24m 95% CI = 0.73–2.09), attend gay specific group meetings (OR = 1.32, 95% CI = 0.84–2.07), read gay news media (OR = 0.85, 95% CI = 0.63– 1.14), or participate in gay Pride events (OR = 0.99, 95% CI = 0.73–1.34). Further, these men had higher collectivism (adjusted OR [aOR] = 1.08, 95% CI = 1.01–1.16), but lower communal altruism (Communal Sexual Altruism Scale; O'Dell, Rosser, Miner, & Jacoby, 2008; aOR = 0.76, 95% CI = 0.61– 0.96).

Social embeddedness

Kelly, Carpiano, Easterbrook, and Parsons (2012) found that using the Internet to find sexual partners was associated with socializing mostly with gay men (OR = 2.45, 95% CI = 1.35–4.42) but not the extent to which they socialized with gay men (OR = 1.27, 95% CI = 0.93–1.75). Card

et al. (2016) found that online sex seekers were less likely to be socially isolated from other GBM (≤25% of social time vs. 26%–75% of social time, aOR = 1.99, 95% CI = 1.33–2.97), were emotionally close to more GBM (OR = 1.01, 95% CI = 1.00–1.01), and had more Facebook friends (OR = 1.16, 95% CI = 1.10–1.23). Conversely, McKirnan et al. (2007) reported that men who used the Internet were more likely to have lower social support scores than men who did not (e.g., "Do you have someone who will…listen to you talk about yourself or your problems?"; 38% vs. 29%, $p < 0.05$). However, Fernández et al. (2007) reported that Internet-recruited men did not differ from community recruits with respect to loneliness scores (Loneliness Scale; Gierveld & Tilburg, 2006; Mean = 2.27 vs. 2.20, $p = 0.29$) or social connection scores (e.g., "Are you satisfied by your relationships?"; Mean = 2.40 vs. 2.52, $p = 0.48$).

Geographic residence

Knapp Whittier et al. (2004) reported that a lower proportion of Internet respondents than paper respondents lived in metropolitan areas (32% vs. 57%, $p < .0001$). Conversely, Ogilvie et al. (2008) reported that online sex seeking was associated with residing in an urban metro area versus a mid-size city (Vancouver vs. Victoria, aOR = 1.53, 95% CI = 1.02–2.30). Meanwhile, Horvath et al. (2008) found that men with online-met sexual partners, offline-met sexual partners, and both online- and offline-met sexual partners did not differ with respect to residence in urban areas (21% vs. 24% vs. 27%, not significant), suburban areas (25% vs, 27%, vs. 25%, ns), medium cities (29% vs. 24% vs. 27%, ns), small towns (20% vs. 17% vs. 17%, ns), or rural areas (5% vs. 8% vs. 5%, ns). Likewise, Kakietek, Sullivan, and Heffelfinger (2011) found that online sex seeking was not associated with rural or urban residence ($p = 0.33$). Kelly et al. (2012) found that using the internet to find sexual partners was not associated with residing in a gay enclave (OR = 0.85, 95% CI = 0.51–1.42).

Venue patronage

Two longitudinal studies suggested that an increasing proportion of men are using the Internet to find sexual partners (Jennings et al., 2015; Menza et al., 2009). Menza et al. (2009) reported that between 2003 and 2006 the proportion of men who met sexual partners online increased from 19% to 29%, but the proportion of men who met sexual partners at cruising spots decreased from 10% to 4%. It is worth noting, however, that they found no significant change in the proportion of men who reported seeking sex at bars and clubs (24% vs. 25%, $p = 0.75$), at bathhouses (6% vs. 4%, $p = 0.25$), in social settings (15% vs. 12%, $p = 0.13$), or through friends (15% vs. 10%, $p = 0.13$). Conversely, although Jennings et al. (2015), too, found that the proportion of clinic morbidity reports where individuals met sexual partners online increased—from 28% in the first half of 2009 to 36% in first half of 2014—the proportion reporting meeting sexual partners at bars decreased from 72% in the first half of 2009 to 22% in the first half of 2014. Likewise, the proportion of men with sexual partners met at schools, parks, or neighborhoods decreased from 19% in 2009 to 11% in 2014.

Despite these trends, there was little consistency in the cross-sectional association between using the Internet and patronage of offline venues. Among six studies that assessed overlap in online and offline venue patronage, five reported that the majority of men who met sexual partners online also met sexual partners offline (Hirshfield, Remien, Humberstone, Walavalkar, & Chiasson, 2004; Horvath et al., 2008; Jenness et al., 2010; Kerr, Pollack, Woods, Blair, & Binson, 2015; Noor, Rampalli, & Rosser, 2014). Several studies reported that Internet users were more likely to visit sexualized venues (Garofalo, Herrick, Mustanski, & Donenberg, 2007; Grov, Rendina et al., 2014; Knapp Whittier et al., 2004; Ogilvie et al., 2008; Reisner et al., 2009), and others found no association (Garofalo et al., 2007; Grov, Rendina et al., 2014). Similarly, some studies suggested that Internet users were less likely to frequent bars (Grov, Rendina et al., 2014; Knapp Whittier et al., 2004), whereas others found no association (Downing, 2012). Conversely, Card et al. (2016) found that more frequent online sex seeking (> monthly vs. ≤ monthly) was positively associated with visiting gay bars (OR = 1.41, 95% CI = 1.01, 1.97).

Discussion

Primary findings

Based on our assessment of these findings, Internet-recruited GBM and those who use the Internet to find sexual partners (herein referred to simply as "Internet users" for lack of a better term) appear to be less likely to identify as gay (Grov, Rendina et al., 2014), and they exhibit lower community attachment and social embeddedness (Fernández et al., 2007; Grov, 2011; Grov, Rendina et al., 2014; McKirnan et al., 2007). These findings generally agree with studies conducted in other settings (Bolding et al., 2007; Ross, Tikkanen, & Månsson, 2000; Saxton, Dickson, & Hughes, 2013; Zablotska et al., 2012). However, while online sex seeking has greatly expanded—partially at the expense of traditional venues (Jennings et al., 2015; Menza et al., 2009)—Internet users do not seem to be totally disconnected from these traditional gay venues (Card et al., 2016; Grov, Rendina et al., 2014). In fact, studies looking at online and offline patterns of behavior suggest that the significant majority of Internet users also report visiting offline venues (Horvath et al., 2008; Jenness et al., 2010; Kerr et al., 2015; Noor et al., 2014); and among more recently published studies, app use has even been correlated with greater, rather than less, interpersonal connectedness (Card et al., 2016; Shilo & Mor, 2015)—potentially suggesting that while early Internet users were less likely to connect to the gay community, in the contemporary era this is no longer the case. However, we note that the timing of these findings may be spurious and that longitudinal assessments are needed to truly understand how patterns of behavior have changed over time.

Providing some insight here, Menza et al. (2009) found that despite increasing Internet use between 2003 and 2006, the only venues that experienced statistically significant decline were cruising locations (e.g., parks). This would suggest that early growth in online venues came mostly from its popularity among those who were already less involved with the gay community—and may therefore not have initially competed for the attention of GBM who were

actively engaged with local gay communities. Between 2009 and 2014, however, Jennings et al. (2015) reported that although the proportion of Internet-met sexual partners moderately increased, there was a much larger decline in the proportion of men who reported meeting their sexual partners at bars, schools, parks, and neighborhoods. This suggests that either the proportion of GBM who visit offline venues, or the frequency at which they visit them, has declined. Alternatively, it may be that GBM continue to visit these venues but are meeting their sexual partners online instead of at these venues. Indeed, these findings do not necessarily suggest that online venues are pulling GBM away from traditional venues. Furthermore, if there has been a decline, this decline may be due to a cohort effect, where older GBM are aging out of the bar scene without replacement (Abatiell & Adams, 2011; Harper et al., 2015). Indeed, reports in London suggest that the proportion of GBM who met their first male sexual partner via the Internet dramatically increased from 3% in 1993 to 62% in 2002 (Bolding et al., 2007). This may suggest young GBM, in particular, are being acculturated into gay cultural life through the Internet rather than through traditional venues such as gay bars, clubs, bathhouses, and community centers. Future research should therefore aim to better understand gay and bisexual men's acculturation into online forms of social connectedness—particularly with the goal of understanding how online attachments might benefit GBM or give rise to new expectations and understandings of community and social connectedness.

Implications

Although the negative association between Internet use and interpersonal connectedness might initially seem obscure, when read in context of the broader epidemiolocal literature the association is actually quite fundamental to understanding the contemporary landscape of the HIV epidemic. Indeed, a number of meta-analyses have shown that Internet users are more likely to engage in condomless anal sex (CAS), have more sexual partners, and choose alternative risk management strategies, such as serosorting or strategic positioning, to prevent HIV transmission (Lewnard & Berrang-Ford, 2014; Liau, Millett, & Marks, 2006; Yang, Zhang, Dong, Jin, & Han, 2014). Further, a large body of literature has shown a strong relationship between Internet use and alternative risk management strategies, or even outright disregard for HIV prevention (Balán et al., 2012; Berry, Raymond, Kellogg, & McFarland, 2008; Grov & Parsons, 2006; Halkitis & Parsons, 2003; Klein & Tilley, 2012). But why?

Two competing hypotheses, *the self-selection hypothesis* and *the accentuation hypothesis*, have been advanced to understand the relationship between online sex seeking and GBM's sexual behavior (Liau et al., 2006). The self-selection hypothesis asserts that individuals who are already prone to engage in risky sexual behavior use the Internet to find sexual partners. Meanwhile, the accentuation hypothesis asserts that some feature of online-initiated sexual events contributes directly to increased sexual risk. If the reports in our review are accurate and GBM who seek sex online really are less connected to gay communities, then it is almost certain that both self-selection and accentuation contribute to increased risk in online environments.

This is because most HIV prevention efforts rely on community-based venues, making community connectedness act as a proxy for exposure to the social norms and attitudes that underlie GBM's sexual choices and behavior (Kelly et al., 2012; Veinot et al., 2013; Zablotska et al., 2012). In other words, the venues where GBM connect, either online or offline, are not merely blank slates—but are themselves representative of socially constructed values, dispositions, and beliefs (Noor et al., 2017; Schneider, 1987). From a sociological perspective, the differences between online and offline connectedness are quite profound. This is particularly true with respect to the Internet's role in facilitating greater individualism (Wellman, 2001), which has been previously associated with both technology uptake (Abbasi, Tarhini, Elyas, & Shah, 2015; Lee & Choi, 2005; Lim, Leung, Sia, & Lee, 2004) and more liberal sexual attitudes (Douglas, 2003; Douglas & Calvez, 1990; Lo, So, & Zhang, 2010).

If the Internet does, in fact, facilitate greater individualism (Lo et al., 2010)—thus promoting greater risk taking and entrepreneurial risk management (Douglas & Calvez, 1990)—then it is likely that online social environments, in addition to attracting individuals with more liberal sexual attitudes (i.e., self-selection), might likewise acculturate others who first connect to gay communities via these online venues (i.e., accentuation). Consistent with this, online health-promotion efforts should be carefully attuned to how their messages will be received by audiences with more individualistic values and dispositions. This is true for both sexual health campaigns, which continue to be of significant importance to promoting gay men's health, and for campaigns promoting mental and emotional wellbeing. Health-promotion specialists will need to explore ways of tailoring online messages to the cultural values of a diverse audiences—or, perhaps, develop interventions that are more amenable to these values. Anthropologists examining the effects of individualism on risk perceptions have recommended that such interventions must avoid appeals to institutional or collective authority, and instead focus on motivators that are explicitly enticing to idio-centric values (Douglas & Calvez, 1990; Tansey & O'riordan, 1999; Thompson, Ellis, & Wildavsky, 1990). However, although practical applications of "sex-positive" HIV prevention campaigns are increasingly available (e.g., www.thesexyouwant.ca), the effectiveness of these campaigns has not been widely evaluated. As such, further qualitative and empirical analyses are clearly necessary to examine how the cultural values of both individualistic and collectivistic GBM might relate to their sexual, social, and risk management behavior. This is particularly important given the changing landscape of HIV prevention and the availability of biomedical preventions (e.g., pre-exposure prophylaxis [PrEP], post-exposure prophylaxis, and treatment as prevention) that are effective at preventing HIV transmission. Furthermore, given the centrality of patterns of social connectedness in facilitating mental health and emotional wellbeing, understanding how individuals connect with one another and perceive these relationships will greatly benefit GBM and their communities.

Limitations

As with other literature reviews, the present study has limitations. First, although we have searched earnestly to identify all relevant findings, some relevant data may have been excluded. This is especially possible due to underreporting of nonsignificant null findings in the abstracts of published articles. Second, as the results of the studies we reviewed were mixed, it is possible that the relationships discussed here are merely the results of sampling biases or differences in instrumentation. Indeed, venue-based sampling and the very act of asking people to participate in research may restrict participation to a sample of GBM that is not representative of the cultural and behavioral factors that are explored here. Third, as we have made subjective assessments regarding the relative value of contradictory findings, our analysis is subject to potential reviewer bias. Likewise, we have subjectively defined our themes using an inductive approach without providing some organizing theoretical framework for understanding what delineates various patterns of social connectedness and attachment. Fourth, we did not review the qualitative literature, meaning that some important assessments have been missed. Finally, as the analyses we reviewed were characterized by distinct categories of interpersonal connectedness (e.g., identity, emotional attachment, and social behavior), further research is needed to understand the role these distinct patterns of connectedness play in GBM's overall social and sexual behavior.

Conclusion

In conclusion, we find that the weight of existing evidence suggests that as the Internet emerged as a dating venue throughout the late 2000s, Internet use was associated with lower interpersonal connectedness. However, as the Internet and smartphone apps have come to play an increasingly important role in the lives of most GBM, recent studies suggest that this association may be less significant than it once was, and that apps and Web sites may, in fact, be important features of contemporary gay life and culture. Further investigations are needed to understand how gay and bisexual men's relationship to their communities is changing—particularly given the central role that the Internet has come to play in their lives. In particular, there is a pressing need to define some of the key measures we identified here so that they may be measured consistently in future studies, thus allowing for a more systematic and objective evaluation of the relationships identified in the present review. In any case, tailored health-promotion efforts should focus on developing resources and program messaging that are amenable to emergent online communities and cultures.

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