

# Social Support and HIV Prevention Behaviors among urban HIV-Negative Gay, Bisexual, and Other Men who Have Sex with Men

Shayna Skakoon-Sparling<sup>1</sup> , Graham Berlin<sup>1</sup> , Nathan J. Lachowsky<sup>2,3</sup> , David M. Moore<sup>3,4</sup> , Gilles Lambert<sup>5,6</sup> , Joseph Cox<sup>5,7</sup> , Daniel Grace<sup>8</sup> , Herak Apelian<sup>5</sup>, Jordan M. Sang<sup>3</sup> , and Trevor A. Hart<sup>1,8</sup> 

**Objective:** Supportive social relationships can have direct positive effects on health and mitigate the negative impact of stressors. This study investigated the main effect of perceived social support on STI/HIV risk and prevention behaviors. The buffering effect of perceived social support on the impact of proximal minority stressors, like internalized homonegativity, was also examined on one risk behavior specifically, condomless anal sex (CAS) without HIV pre-exposure prophylaxis (PrEP) use. **Methods:** HIV-negative gay, bisexual, and other men who have sex with men (GBM) were recruited using respondent driven sampling from three major Canadian urban centers (n = 1,409). GBM completed measures of perceived social support, proximal minority stress, and engagement in STI/HIV risk and prevention behaviors. **Results:** Higher perceived social support was positively associated with a several health behaviors, including recent STI and HIV testing, discussing HIV status with prospective partners, the use of behavioral HIV-risk reduction strategies during sexual encounters, and a lower likelihood of engaging in CAS without PrEP. There was evidence of moderation as well. Among GBM with higher perceived social support, internalized homonegativity was no longer associated with increased odds of engaging in CAS without PrEP. **Conclusions:** The results of the current study advance social support theory to GBM in the context of biomedical prevention, showing both evidence of both direct associations and buffering effects on STI/HIV risk and prevention behaviors. This highlights the importance of promoting social support seeking in interventions aimed at improving GBM health.

*Keywords:* social support, internalized homophobia, HIV, MSM, condomless anal sex (CAS)

Gay, bisexual, and other men who have sex with men (GBM) have been and continue to be disproportionately affected by HIV and many other sexually transmitted and blood borne infections (STBBIs), like syphilis, (CDC, 2018a; Haddad et al.,

2018). For a long time, the most commonly promoted primary prevention tool to reduce HIV transmission among GBM was condoms. This included behavioral interventions to promote condom use and to avoid condomless anal sex (CAS), which was seen as the highest risk sexual behavior for HIV (Pantalone et al., 2016). Given recent advancements in antiretroviral-based HIV prevention, however, individuals now have a wider variety of options to prevent the transmission of HIV (Grace et al., 2020). These options include the use of combination antiretroviral medications by individuals living with HIV, which can prevent onward transmission of HIV (Rodger et al., 2019), and the use of antiretroviral medications by HIV-negative individuals to prevent HIV acquisition (pre-exposure prophylaxis: PrEP) (Sagaon-Teyssier et al., 2016).

Although optimal PrEP use reduces the risk of HIV acquisition via CAS by 86% (Sagaon-Teyssier et al., 2016), PrEP-protected CAS still presents risk for other STIs (e.g., CDC, 2018b). Further, a large number of men who meet clinical recommendations for PrEP do not report using it (Cox et al., 2020; Finlayson et al., 2019), which suggests that these men may be at

1. Department of Psychology, Ryerson University

2. School of Public Health and Social Policy, University of Victoria

3. British Columbia Centre for Excellence in HIV/AIDS

4. University of British Columbia, Vancouver, BC

5. Direction régionale de santé publique de Montréal, CIUSSS Centre-Sud-de-l'Île-de-Montréal

6. Institut national de sante publique du Quebec

7. Research Institute of the McGill University Health Centre

8. Dalla Lana School of Public Health, University of Toronto

## Corresponding author:

Shayna Skakoon-Sparling; s.sparling@ryerson.ca, Psychology Department, Ryerson University.

## Acknowledgements:

The authors would like to thank the Engage/Momentum II study participants, office staff, and community engagement committee members, as well as our community partner agencies and funders (funding information is noted after references).

elevated risk for both STI and HIV transmission when they engage in CAS without PrEP. Given the increased diagnoses of bacterial STIs and other STIs in GBM (e.g., CDC, 2018a; Haddad et al., 2018), CAS (with or without PrEP use) continues to have public health significance, especially in the context of sex partners other than a main partner. This is because individuals typically perceive different levels of risk with a main partner compared to with a novel or irregular partner and/or may have established patterns of safer sexual behavior with their main partner (Di Ciaccio et al., 2020).

### **Social Support among GBM**

According to the social support main effect hypothesis (e.g., Cohen, 2004), social relationships can have a direct protective effect on our health. Subjective perceptions of social support indicate the amount and quality of support an individual believes is available (Dour et al., 2014). The perceived quality and adequacy of this support forms one's subjective perception of social support, rather than the objective quantity. Consistent with the main effect hypothesis for social support, poor perceived social support is associated with higher mortality rates and is predictive of increased incidence of heart disease and stroke, as well as poor mental health outcomes like depression in the general population (Holt-Lunstad et al., 2015; Wang et al., 2018). Within STBBI research, social support has also been associated with safer sex practices (e.g., Althoff et al., 2017; Rudolph et al., 2013); however, these associations have, at times, been inconsistent (e.g., Glick & Golden, 2014; Qiao et al., 2014).

In one study, for example, larger social support networks were associated with higher odds of CAS among young Latino GBM (Kapadia et al., 2013). However, other work found that higher rates of supportive relationships (or social support) was associated with lower rates of CAS with casual partners in US samples of GBM (Lauby et al., 2012), lower rates of higher risk CAS among older Hispanic GBM (Valdes et al., 2019), more recent HIV testing among young Black GBM (Scott et al., 2014), and lower rates of seroconversion among HIV-negative Black GBM (Hermanstyn et al., 2018). Qualitative work has also pointed to a link between higher social support and better communication between prospective GBM partners about HIV status (Saleh et al., 2016). Thus, examining the association of social support with a variety of STI/HIV risk and protective behaviors and mitigated risk behaviors, like PrEP-protected CAS, is important to advance the literature on this topic.

Social support is also hypothesized to buffer against stressors (Cohen, 2004). The perception of the quality and availability of resources from our social relationships can help us respond more adaptively to acute and chronic stressors. Thus, social relationships not only provide objective assistance, but perceived support helps us form a sense of belongingness and meaning in our lives, which facilitates coping (Berkman & Glass, 2000; Tuner & Brown, 2010). Among sexual minorities, social support has been found to buffer against the negative effects of homophobic stressors on emotional distress (Doty et al., 2010; Fingerhut, 2018; Wang et al., 2018). Some research has also found that social support related constructs like social capital (i.e., the resources gained through social relationships; Valente et al., 2020) and social network size (Teixeria da Silva et al., 2020) may mitigate the association of stigma (e.g., sex work stigma) with risk behaviors, including CAS. However, the potential buffering effect of perceived social support on CAS in the context of antiretroviral-based HIV prevention has not been directly examined in GBM. CAS alone is no longer as useful a measure of HIV risk behavior among HIV-negative GBM (e.g., Jin et al., 2015) and we must begin examining CAS without PrEP protection as a health risk behavior.

### **The Role of Social Support in Minority Stress Theory**

Minority Stress Theory (Meyer, 2003) describes how GBM, as men who are members of a sexual minority, will experience more stressful environments. In Minority Stress Theory, minority stress emerges from the experience of distal stressors, like stigma, prejudice, and discrimination, as well as proximal stressors, like internalized homonegativity and concealment of one's sexual identity. The stigma and discrimination GBM experience in their environment (distal stressors) can motivate concealment of one's sexual orientation and internalized homonegativity (proximal stressors). Although Canadians, as a group, tend to hold more liberal attitudes towards same-sex attraction compared to Americans (e.g., Andersen & Fetner, 2008), there is still much work to do in order to eliminate persistent homophobic public policies (e.g., Smith, 2020) and homophobic stigma and bullying at the community level (e.g., Casey, 2019). Consistent with Minority Stress Theory, exposure to higher rates of both proximal and distal stressors can have acute and long-term impacts on the mental and physical well-being of GBM (Cochran & Mays, 2007; Meyer, 2003).

Social support can buffer against and help an individual cope with the negative effects of

stigmatization, which is common among sexual minority groups like GBM, who are more likely to experience social rejection in their family and peer networks (Hatzenbuehler, 2009; Meyer, 2003; Perales & Plage, 2020). Thus, social supports may be particularly important for GBM; indeed, members of sexual minority groups tend to experience a stronger positive effect of social support compared with heterosexual people (Hsieh, 2014). Consistent with Minority Stress Theory, strong positive social connections and access to good social support systems in gay communities are protective for health among gay men overall (Heckman et al., 1998) and are associated with safer sexual practices, like condom use (Hart et al., 2017; Ramirez-Valles, 2002) and more regular HIV testing (Jin et al., 2002). Despite increasing data on minority stressors and STI/HIV health behaviors, it is still unclear if social support is directly associated with health outcomes or buffers against minority stressors in the context of biomedical HIV prevention.

### **The Current Study**

The current study examines the associations between social support and minority stressors with STI/HIV risk and prevention behaviors. In particular, we set out to explore the buffering effect of social support on the impact of proximal stressors, like internalized homonegativity, on CAS without PrEP use among GBM. Thus, this study of HIV-negative GBM had two primary objectives: 1) to examine the direct association of perceived social support with various STI/HIV risk and prevention behaviors and 2) to determine whether perceived social support buffers against (i.e., moderates) the effects of minority stressors on CAS without PrEP. It was hypothesized (H1) that men with low perceived social support would be less likely to engage in STI/HIV risk reduction behaviors and would be more likely to report CAS without PrEP. It was also hypothesized (H2) that greater perceived social support would be associated with lower scores on measures of proximal minority stress. Additionally, we hypothesized (H3) that perceived social support would mitigate the negative impact of proximal minority stressors on STI/HIV risk behavior (i.e., CAS without PrEP). Finally, we include an examination of ethnoracial groups because several authors have pointed to the importance of considering the ethnoracial make-up of a population of interest, as different groups may experience a unique array of stressors, supports, and risk factors (e.g., Kapadia et al., 2013). This may be particularly important given the potential for racialized GBM to experience concurrent

stressors (e.g., racism and homophobia; Han et al., 2015; Mizuno et al., 2012, das Nair & Thomas, 2012).

## **Methods**

### **Procedure**

Participants were recruited to visit a study site in one of the three cities (Vancouver, Toronto, or Montreal) from February 1, 2017 to July 31, 2019 as part of a larger bio-behavioral study examining the role of biomedical prevention in the sexual health of GBM (Hart et al., 2020). Eligible participants self-identified as sexually active (reporting at least one male sex partner in the past six months) GBM who were aged 16 years or older at the time of recruitment. Participants were recruited using respondent driven sampling (RDS), a method where participants are chain recruited through their own social networks, in order to attenuate the bias of convenience sampling and approximate probability sampling (Heckathorn, 2011). See (Hart et al., 2020) for additional information related to the RDS recruitment conducted for this study sample. At their study visit, participants provided written informed consent for study procedures and self-completed computer-assisted questionnaires in French or English. This study protocol was approved by institutional research boards including McGill University, Ryerson University, The University of Toronto, and The University of British Columbia.

### **Measures**

**Social support.** Social support was measured using the Social Support Survey Instrument (SSSI; Hays et al., 1995). This 18-item scale assesses the degree to which individuals perceive that they have sources of social support in their lives. The measure contains four social support subscales: emotional/information support (“someone you can count on to listen to you when you need to talk”), tangible support (“someone to take you to the doctor if you needed it”), affectionate support (“someone to love and make you feel wanted”), and positive social interactions (“someone to get together with for relaxation”). Combined, the subscales inform the overall social support index. Responses are scored on a 5-point Likert scale where 1 = “none of the time” and 5 = “all of the time”; we used mean scores, with higher scores indicating greater perceived social support in each domain. The SSSI has strong convergent and discriminant validity, as well as good test-retest reliability (Sherbourne & Steward, 1991). In the current study, the SSSI showed excellent reliability (total scale  $\alpha = .97$ ). Table 1 shows a breakdown of scores by city.

**Proximal minority stressors.** The Lesbian, Gay, and Bisexual Identity (LGBI) Scale includes nine items that assess the degree to which participants agree with statements related to *concerns about acceptance* (“I think a lot about how my sexual orientation affects the way people see me”), *motivation to conceal one’s sexual identity* (“my sexual orientation is a very personal and private matter”), and *internalized homonegativity* (“if it were possible, I would choose to be straight”). Items are scored using a 7-point Likert scale ranging from 1 (disagree strongly) to 7 (agree strongly); mean scores for were computed for each subscale. The LGBI Acceptance Concerns, Identity Concealment, and Internalized Homonegativity subscales have been shown to have good convergent and discriminant validity and strong test-retest reliability has also been demonstrated for all three subscales (Mohr & Kendra, 2011). In the current study the subscales demonstrated good reliability (alphas: Acceptance Concerns = .79, Identity Concealment = .80, Internalized Homonegativity = .86). Table 1 shows a breakdown of scores by city.

**Condomless anal sex without the use of PrEP.** Condom use was determined using responses to a set of event-level questions on participants’ most recent sexual encounter. Participants were asked whether they had anal sex, if yes, whether they used a condom, whether their sexual partner was a main/primary partner, and whether they were using PrEP. Note that event-level condom use is recognized as an effective indicator of typical condom usage (Lachowsky et al., 2018; Younge et al. 2008). These data were used to create a derived variable indicating whether CAS without PrEP had occurred at the most recent sexual encounter.

**STI and HIV testing behavior.** Testing behavior was assessed using responses to two binary items that determined whether participants had been tested for STIs or HIV (respectively) within the 12 months preceding their study visit. For example: “when were you last tested for any sexually transmitted infections (STI) (other than HIV)?”

**Use of behavioral or seroadaptive HIV risk reduction strategies.** Participants indicated whether or not they had engaged in behavioral HIV risk reduction strategies over the preceding six months by responding to binary items. A composite variable was created using responses to the following five behaviors: “being the top (insertive partner) for anal sex”, “only having condomless sex with guys I know are HIV-negative”, “sex without condoms with HIV-positive guys who have 'undetectable' (low) viral loads”, “used post-

exposure prophylaxis (PEP)”, and “not letting my sex partners cum inside me”.

**Talking about HIV status with sex partners.** Talking about HIV status was examined using two items. One asked participants how often (over the past six months) they asked sex partners about their HIV status and the second asked how often they talked to sex partners about their own HIV status. Responses were scored on a 6-point scale (0 = never/0% to 5 = all of the time/100% of the time).

**Number of sex partners.** Number of partners was assessed using a single item that asked participants to report the number of male sex partners they had engaged in anal sex with during the six months preceding their study visit.

#### **Data Analysis**

Scale scores were calculated for participants who had completed the majority of scale items (at least 80% completed), otherwise missing data was deleted listwise. Missing data resulted in the exclusion of 24 to 104 participants, depending on the analysis. Given our large sample size ( $n = 1,409$ ), this was not a concern for our analyses. In order to examine the direct associations of social support with STI/HIV risk and prevention behaviors, we conducted logistic regressions to examine: past year STI testing, past year HIV testing, endorsement of HIV risk reduction strategies in the past six months (P6M), and engaging in CAS without PrEP. Linear regressions were conducted with the following STI/HIV risk and prevention behavior outcomes: frequency of asking partners about their HIV status, frequency of telling partners about their own HIV status, and number of male sexual partners within the past six months.

Linear regressions were also used to examine the association of social support with internalized homonegativity, identity concealment, and acceptance concerns. In each regression, social support was entered as the independent variable and the following covariates were included: city (Toronto and Vancouver; with Montreal as reference category), age, sexual orientation label (bisexual and queer; with gay as reference category), education level, whether participants were born in Canada (vs. not), and three ethnoracial variables: Black (vs. all others), Latino (vs. all others), and East/South-East Asian (vs. all others). These ethnoracial categories were selected based on feedback from our study community advisory boards related to sub-populations of interest for elevated HIV risk. To account for the number of regression analyses conducted (10), alpha was reduced to .005. Analyses were conducted applying RDS-II weights, which

account for individuals with larger social networks being more likely to be recruited into the sample and were calculated for each city's sample (weights are inversely proportional to social network size; Heckathorn, 2002) and then pooled. Thus, for all logistic regressions, odds ratios are presented as adjusted odds ratios (aOR) and 95% confidence intervals. Diagnostics indicated no multicollinearity with all values within acceptable ranges. To examine the proposed moderation of social support in the relation between minority stressors and health behaviors, we computed an interaction term between social support and each of the proximal stress scales associated with CAS without PrEP and conducted a logistic regression. Data preparation and analyses were conducted using R (R Core Team, 2007) and SPSS (IBM Corp., 2017).

## Results

### Participants

The analytic sample was drawn from a sample of sexually active HIV-negative GBM ( $N = 2,008$ ) aged 16+ who were recruited in Montreal ( $n = 968$ ), Toronto ( $n = 418$ ), and Vancouver ( $n = 622$ ) from February 1, 2017 to July 31, 2019. The analytic sample included only men who reported that their most recent sexual encounter was with a casual partner (i.e., not a boyfriend or husband) ( $n = 1,409$ ). This was done because, as noted above, the CAS without PrEP variable was derived from information about participants' most recent sexual encounter. See Table 1 for demographic description of participants by city. Our sample included 1,120 gay men, 117 bisexual men, 105 queer men, and 67 men who used other sexual orientation identity labels (e.g., questioning, pansexual, Two-Spirit). The racial diversity represented in our sample approximates the racial/ethnic diversity in the general population (Statistics Canada, 2019) (see Table 1)

### Association of Social Support with Sexual Health Related Behaviors

Adjusting for age, city, race/ethnicity, and sexual identity, greater perceived social support was associated with most STI/HIV-related health behaviors (see Tables 2 and 3). Social support was positively associated with seeking HIV testing (aOR = 1.23, 95% CI: 1.14, 1.32,  $p < .001$ ) and STI testing (aOR = 1.45, 95% CI: 1.35, 1.55,  $p < .001$ ) within the past 12 months, greater frequency of talking about HIV status (one's own [ $\beta = .051$ , 95%CI: 0.05, 0.17,  $p = .001$ ] and one's partners' [ $\beta = .078$ , 95% CI: 0.10, 0.22,  $p < .001$ ]) with sexual partners, and with

engaging in behavioral or seroadaptive HIV risk reduction strategies (aOR = 1.26, 95% CI: 1.10, 1.35,  $p = .001$ ) (see Tables 2 and 3). Higher perceived social support was associated with a lower likelihood of engaging in CAS without PrEP use (aOR = 0.81, 95% CI: 0.72, 0.90,  $p < .001$ )<sup>1</sup>. Higher perceived social support was associated with a *greater* number of male sex partners reported in the past six months ( $\beta = .068$ , 95% CI: 0.59, 1.50,  $p < .001$ ). Higher perceived social support was also associated with lower levels of proximal minority stressors (see Table 4): lower acceptance concerns ( $\beta = -.214$ , 95% CI: -0.35, -0.27,  $p < .001$ ), lower identity concealment ( $\beta = -.244$ , 95% CI: -0.40, -0.32,  $p < .001$ ), and lower internalized homonegativity ( $\beta = -.185$ , 95% CI: -0.31, -0.22,  $p < .001$ ).

### Buffering Effect of Social Support Against Minority Stressors

Moderation analysis using hierarchical regression with CAS without PrEP as the dependent variable indicated a significant interaction between social support and internalized homonegativity (interaction term  $B = -0.18$  SE = .06, aOR = .83, 95% CI: 0.74, 0.94,  $p = .004$ ). Among GBM with low perceived social support, higher internalized homonegativity was associated with a higher odds of engaging in CAS without PrEP. However, among GBM with high perceived social support, internalized homonegativity was not associated with increased odds of engaging in CAS without PrEP. This moderation effect is visualized in Figure 1.

Moderation analysis indicated no significant moderation of identity concealment by social support (interaction term  $p = .158$ ) on CAS without PrEP. There was also no significant evidence of moderation of acceptance concerns by social support ( $p = .007$ ).

### Race and Ethnicity

Controlling for age, city, sexual identity label, being Canadian born, and social support, we found that self-identifying as Latino was associated with a significantly greater likelihood of reporting CAS without PrEP (aOR = 3.27, 95% CI: 1.93, 5.53,  $p < .001$ ); these GBM were less likely to report engaging in HIV risk reduction strategies (aOR = 0.71, 95% CI: 0.57, 0.88,  $p = .002$ ), and had a significantly lower likelihood of reporting HIV testing (aOR = 0.44, 95% CI: 0.35, 0.56,  $p < .001$ ) or STI testing (aOR = 0.71, 95% CI: 0.57, 0.88,  $p = .002$ ) within the past 12 months (see Tables 2 and 3). We also found that self-identifying as East or South-East

<sup>1</sup> We conducted a sensitivity analysis where we refined the concept of sexual risk taking to receptive CAS without PrEP with a non-main partner whose HIV status was either uncertain or was

positive (with either a detectable or unknown viral load). Overall social support was still associated with a lower odds (aOR = 0.52,  $p < .001$ , 95% CI: -.39, 0.71) of sexual risk taking.

Asian was associated with higher scores on proximal minority stress: acceptance concerns ( $\beta = .155$ , 95%CI: 0.56, 0.82,  $p < .001$ ), identity concealment ( $\beta = .160$ , 95%CI: 0.61, 0.88  $p < .001$ ), and internalized homonegativity ( $\beta = .058$ , 95% CI: 0.12, 0.40,  $p < .001$ ) as well as significantly lower frequency of asking prospective partners about their HIV status ( $\beta = -.041$ , 95% CI: -0.60, -0.21,  $p < .001$ ). Among GBM who self-identified as Black, we found significantly lower reported rates of HIV testing within the past 12 months (aOR= 0.51, 95% CI: 0.32, 0.79,  $p = .003$ ).

Table 1

*Demographics and variables of interest by city of recruitment*

|  | <u>Vancouver</u>  |  | <u>Toronto</u>   |  | <u>Montreal</u>  |   |
|--|---|--|--|--|--|---|
|  | <u>Crude</u>  | <u>RDS Adj.</u>  | <u>Crude</u>   | <u>RDS Adj.</u>  | <u>Crude</u>   | <u>RDS Adj.</u>   |
| Age  | M= 34.33, SE = .60  | M=33.71, SE=.33<br>95%CI: 33.06, 34.36                           | M = 33.13, SE= .59   | M=33.70, SE= .38<br>95%CI: 32.95, 29.00                        | M=36.90, SE= .51   | M= 36.15, SE= .28<br>95%CI: 35.61, 36.70                        |
| Race/Ethnicity                                       | 69.7% White,<br>2.4% Black,<br>7.9% Latino,<br>17.9% E/SE Asian | 67.3% White,<br>1.7% Black,<br>11.9% Latino,<br>17.9% E/SE Asian | 70.1% White,<br>4.7% Black,<br>7.7% Latino,<br>9.7% E/SE Asian | 70.6% White,<br>3.7% Black,<br>7.1% Latino,<br>8.9% E/SE Asian | 83.2% White,<br>1.4% Black,<br>9% Latino,<br>2.2% E/SE Asian | 81.5% White,<br>1.5% Black,<br>10.1% Latino,<br>2.1% E/SE Asian |
| Education –<br>completed post-<br>secondary ed.      | 66.90%  | 63.90%   | 63.90%   | 69.10%   | 64.70%   | 55.90%  |
| Proportion of full<br>sample HIV<br>Negative/Unknown | 80.80%  | 84.90%   | 86.90%   | 90.60%   | 86.60%   | 89.90%  |
| Social Support                                       | M= 3.66, SE = .04   | M=3.52, SE=.02<br>95%CI: 3.47, 3.56                              | M= 3.63, SE = .05  | M=3.33, SE=.03<br>95%CI: 3.25, 3.38                            | M= 3.63, SE = .04  | M=3.50, SE=.02<br>95%CI: 3.45, 3.52                             |
| Acceptance<br>Concerns                               | M= 3.24, SE = .06   | M=3.40, SE=.03<br>95%CI: 3.33, 3.46                              | M= 3.29, SE = .08  | M=3.28, SE=.04<br>95%CI: 3.19, 3.36                            | M= 3.00, SE = .05  | M=3.14, SE=.03<br>95%CI: 3.09, 3.21                             |
| Identity<br>Concealment                              | M= 3.06, SE = .07   | M=3.46, SE=.04<br>95%CI: 3.39, 3.54                              | M= 3.04, SE = .08  | M=3.25, SE=.05<br>95%CI: 3.17, 3.34                            | M= 3.36, SE = .05  | M=3.59, SE=.03<br>95%CI: 3.53, 3.65                             |
| Internalized<br>Homonegativity                       | M= 2.04, SE = .06   | M=2.30, SE=.03<br>95%CI: 2.23, 2.36                              | M= 2.02, SE = .07  | M=2.23, SE=.04<br>95%CI: 2.15, 2.30                            | M= 2.18, SE = .05  | M=2.47, SE=.03<br>95%CI: 2.41, 2.53                             |
| Used PrEP at last sex<br>encounter                   | 10.20%  | 6.00%  | 7.00%  | 7.30%  | 9.88%  | 8.63%   |
| CAS at last sex<br>encounter                         | 76.70%  | 71.90%   | 64.00%   | 65.70%   | 69.90%   | 69.33%  |
| CAS without PrEP                                     | 60.40%  | 58.90%   | 56%  | 60.80%   | 63.90%   | 64.60%  |

Table 2

Association of Social Support with STI/HIV Risk and Protective Behaviours (Logistic Regression Results)

|                             | <u>CAS w/o PrEP</u> |            |          |               | <u>Endorsement of HIV risk reduction strategies</u> |            |          |               | <u>STI testing within the past 12 months</u> |            |          |               | <u>HIV testing within the past 12 months</u> |            |          |               |
|-----------------------------|---------------------|------------|----------|---------------|---|------------|----------|---------------|--|------------|----------|---------------|--|------------|----------|---------------|
|                             | <u>B(SE)</u>        | <u>AOR</u> | <u>p</u> | <u>95%CI</u>  | <u>B(SE)</u>  | <u>AOR</u> | <u>p</u> | <u>95%CI</u>  | <u>B(SE)</u>                                 | <u>AOR</u> | <u>p</u> | <u>95%CI</u>  | <u>B(SE)</u>                                 | <u>AOR</u> | <u>p</u> | <u>95%CI</u>  |
| Social Support              | -0.20<br>(0.06)     | 0.82       | .001     | 0.73,<br>0.92 | 0.14<br>(0.04)                                      | 1.15       | <.001    | 1.07,<br>1.23 | 0.39<br>(0.04)                               | 1.47       | <.001    | 1.37,<br>1.58 | 0.23<br>(0.04)                               | 1.25       | <.001    | 1.16,<br>1.35 |
| Age                         | 0.01<br>(0.01)      | 1.00       | .670     | 0.99,<br>1.01 | -0.03<br>(0.01)                                     | 0.98       | <.001    | 0.97,<br>0.98 | -0.03<br>(0.01)                              | 0.97       | <.001    | 0.97,<br>0.98 | -0.02<br>(.01)                               | 0.98       | <.001    | 0.97,<br>0.98 |
| Education                   | -0.24<br>(0.03)     | 0.78       | <.001    | 0.73,<br>0.84 | 0.17<br>(0.02)                                      | 1.18       | <.001    | 1.14,<br>1.23 | 0.12<br>(0.02)                               | 1.13       | <.001    | 1.09,<br>1.17 | 0.15<br>(0.02)                               | 1.16       | <.001    | 1.12,<br>1.20 |
| Canadian Born               | 0.22<br>(0.12)      | 1.25       | .068     | 0.98,<br>1.58 | -0.07<br>(0.08)                                     | 0.93       | .356     | 0.80,<br>1.08 | -0.23<br>(0.08)                              | 0.80       | .003     | 0.69,<br>0.93 | -0.42<br>(-.09)                              | 0.66       | <.001    | 0.56,<br>0.78 |
| Vancouver (versus Montreal) | -0.97<br>(0.13)     | 0.38       | <.001    | 0.30,<br>0.49 | 0.19<br>(0.08)                                      | 1.21       | .013     | 1.04,<br>1.40 | -0.01<br>(0.08)                              | 0.99       | .986     | 0.85,<br>1.15 | -0.32<br>(0.08)                              | 0.72       | <.001    | 0.62,<br>0.85 |
| Toronto (versus Montreal)   | -0.62<br>(0.15)     | 0.54       | <.001    | 0.40,<br>0.72 | 0.43<br>(0.09)                                      | 1.54       | <.001    | 1.30,<br>1.82 | -0.23<br>(0.08)                              | 0.79       | .006     | 0.67,<br>0.93 | -0.29<br>(.09)                               | 0.73       | .001     | 0.63,<br>0.89 |
| Bisexual (versus gay)       | 0.24<br>(0.18)      | 1.27       | .184     | 0.89,<br>1.82 | -0.28<br>(0.10)                                     | 0.76       | .003     | 0.63,<br>0.91 | -0.36<br>(0.10)                              | 0.70       | <.001    | 0.58,<br>0.84 | -0.54<br>(0.10)                              | 0.58       | <.001    | 0.48,<br>0.71 |
| Queer (versus gay)          | 0.59<br>(0.25)      | 1.81       | .020     | 1.10,<br>2.98 | 0.05<br>(0.14)                                      | 1.05       | .742     | 0.79,<br>1.39 | 0.58<br>(0.16)                               | 1.78       | <.001    | 1.31,<br>2.42 | 0.68<br>(0.18)                               | 1.97       | <.001    | 1.37,<br>2.82 |
| Black (versus not)          | 0.19<br>(0.37)      | 1.21       | .600     | 0.59,<br>2.50 | 0.50<br>(0.25)                                      | 1.65       | .046     | 1.01,<br>2.69 | -0.15<br>(0.22)                              | 0.86       | .510     | 0.56,<br>1.34 | -0.68<br>(0.23)                              | 0.51       | .003     | 0.32,<br>0.79 |
| E/SE Asian (versus not)     | -0.13<br>(0.16)     | 0.88       | .453     | 0.64,<br>1.22 | 0.08<br>(0.12)                                      | 1.08       | .528     | 0.85,<br>1.37 | -0.12<br>(0.12)                              | 0.88       | .290     | 0.70,<br>1.11 | -0.18<br>(0.13)                              | 0.84       | .158     | 0.56,<br>1.07 |
| Latino (versus not)         | 1.19<br>(0.26)      | 3.27       | <.001    | 1.93,<br>5.53 | -0.35<br>(0.11)                                     | 0.71       | .002     | 0.57,<br>0.88 | -0.34<br>(0.11)                              | 0.71       | .003     | 0.57,<br>0.89 | -0.82<br>(0.12)                              | 0.44       | <.001    | 0.35,<br>0.56 |
| Model $\chi^2$ (p)          | 65.38 (<.001)       |            |          |               | 65.67 (<.001)                                       |            |          |               | 176.62 (<.001)                               |            |          |               | 100.43 (<.001)                               |            |          |               |
| N. R <sup>2</sup>           | .110                |            |          |               | .110  |            |          |               | .127   |            |          |               | .126   |            |          |               |

Note: CAS = Condomless Anal Sex, AOR = adjusted odds ratio, N. R<sup>2</sup> = Nagelkerke R squared



Table 3

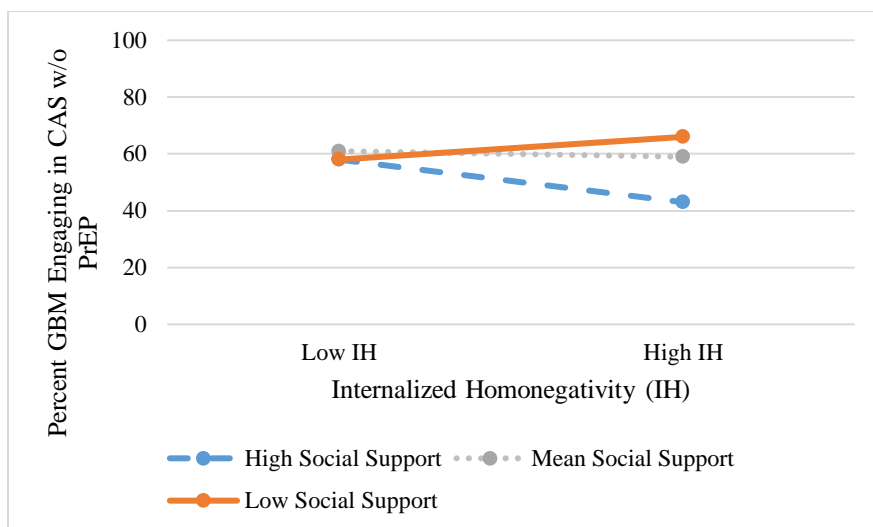
*Association of Social Support with STI/HIV Risk and Protective Behaviours (Linear Regression Results)*

|                     | <u># male sex partners in past 6 months</u> |             |          |              | <u>Freq. of Asking partners about HIV status</u> |             |          |              | <u>Freq. of Telling partners about HIV status</u> |             |          |              |
|---------------------|---|-------------|----------|--------------|--|-------------|----------|--------------|---|-------------|----------|--------------|
|                     | <u>B(SE)</u>                                | <u>Beta</u> | <u>p</u> | <u>95%CI</u> | <u>B(SE)</u>                                     | <u>Beta</u> | <u>p</u> | <u>95%CI</u> | <u>B(SE)</u>                                      | <u>Beta</u> | <u>p</u> | <u>95%CI</u> |
| Social Support      | 1.10 (0.23)                                 | .071        | <.001    | 0.64, 1.56   | 0.16 (0.03)                                      | .077        | <.001    | 0.10, 0.22   | 0.11 (0.03)                                       | .049        | .001     | 0.05, 0.17   |
| Age                 | -0.03 (0.02)                                | -.023       | .135     | -0.06, -0.01 | -0.02 (0.01)                                     | -.153       | <.001    | -0.03, -0.02 | -0.02 (0.01)                                      | -.144       | <.001    | -0.03, -0.02 |
| Education           | 0.38 (0.12)                                 | .052        | .002     | 0.14, 0.61   | 0.13 (0.02)                                      | .135        | <.001    | 0.10, 0.16   | 0.15 (0.02)                                       | .151        | <.001    | 0.12, 0.18   |
| Canadian Born       | -1.94 (0.51)                                | -.067       | <.001    | -2.93, -0.94 | -0.24 (0.07)                                     | -.062       | <.001    | -0.37, -0.11 | -0.11 (0.07)                                      | -.028       | .105     | -0.24, 0.02  |
| Vancouver           |   |             |          |              |  |             |          |              |   |             |          |              |
| (versus Montreal)   | -0.23 (0.50)                                | -.008       | .644     | -1.21, 0.75  | -0.41 (0.06)                                     | -.101       | <.001    | -0.53, -0.28 | -0.26 (0.07)                                      | -.064       | <.001    | -0.39, -0.13 |
| Toronto             |   |             |          |              |  |             |          |              |   |             |          |              |
| (versus Montreal)   | 0.05 (0.55)                                 | .001        | .934     | -1.04, 1.12  | -0.27 (0.07)                                     | -.060       | <.001    | -0.41, -0.08 | -0.04 (0.07)                                      | -.009       | .577     | -0.19, 0.10  |
| Bisexual            |   |             |          |              |  |             |          |              |   |             |          |              |
| (versus gay)        | -0.89(0.65)                                 | -.021       | .168     | -2.16, 0.38  | -0.26 (0.08)                                     | -.045       | .002     | -0.42, -0.09 | -0.01 (0.09)                                      | -.001       | .930     | -0.18, 0.17  |
| Queer               |   |             |          |              |  |             |          |              |   |             |          |              |
| (versus gay)        | -2.35 (0.92)                                | -.038       | .011     | -4.16, -0.55 | -0.37 (0.12)                                     | -.045       | .002     | -0.60, -0.14 | -0.56 (0.12)                                      | -.069       | <.001    | -0.80, -0.32 |
| Black               |   |             |          |              |  |             |          |              |   |             |          |              |
| (versus all)        | -0.27 (1.50)                                | -.003       | .855     | -3.22, 2.68  | 0.10 (0.19)                                      | .008        | .592     | -0.27, 0.48  | 0.20 (0.20)                                       | .015        | .312     | -0.19, 0.59  |
| E/SE Asian          |   |             |          |              |  |             |          |              |   |             |          |              |
| (versus all)        | -1.27 (0.78)                                | -.025       | .103     | -2.80, 0.26  | -0.41 (0.10)                                     | -.061       | <.001    | -0.60, -0.21 | -0.29 (0.10)                                      | -.043       | .006     | -0.49, 0.09  |
| Latino              |   |             |          |              |  |             |          |              |   |             |          |              |
| (versus all)        | -0.94 (0.72)                                | -.020       | .192     | -2.34, 0.47  | -.25 (0.10)                                      | -.040       | .012     | -0.44, 0.05  | 0.02 (0.10)                                       | .003        | .850     | -0.18, 0.22  |
| F (p)               | 7.04 (<.001)                                |             |          |              | 35.19 (<.001)                                    |             |          |              | 26.27 (<.001)                                     |             |          |              |
| Adj. R <sup>2</sup> | .014  |             |          |              | .078   |             |          |              | .059  |             |          |              |

Table 4

*Association of Social Support with Proximal Minority Stressors*

|   | <u>Acceptance Concerns</u> |             |          |              | <u>Identity Concealment</u> |             |          |              | <u>Internalized Homonegativity</u> |             |          |              |
|---|----------------------------|-------------|----------|--------------|-----------------------------|-------------|----------|--------------|------------------------------------|-------------|----------|--------------|
|   | <u>B(SE)</u>               | <u>Beta</u> | <u>p</u> | <u>95%CI</u> | <u>B(SE)</u>                | <u>Beta</u> | <u>p</u> | <u>95%CI</u> | <u>B(SE)</u>                       | <u>Beta</u> | <u>p</u> | <u>95%CI</u> |
| Social Support                                  | -0.30 (0.02)               | -.212       | <.001    | -0.33, -0.26 | -0.35 (0.02)                | -.236       | <.001    | -0.39, -0.31 | -0.26 (0.02)                       | -.181       | <.001    | -0.30, -0.22 |
| Age   | -0.01 (0.01)               | -.134       | <.001    | -0.02, -0.01 | 0.01 (0.01)                 | .046        | .001     | 0.00, 0.01   | -0.01 (0.01)                       | -.043       | .005     | -0.01, -0.00 |
| Education                                       | 0.02 (0.01)                | .037        | .018     | 0.01, 0.04   | 0.02 (0.01)                 | .029        | .054     | 0.00, 0.04   | 0.01 (0.01)                        | .010        | .516     | -0.01, 0.03  |
| Canadian Born<br>Vancouver<br>(versus Montreal) | -0.61 (0.04)               | -.232       | <.001    | -0.69, -0.52 | -0.61 (0.05)                | -.223       | <.001    | -0.70, -0.52 | -0.39 (0.05)                       | -.148       | <.001    | -0.48, -0.30 |
| Toronto<br>(versus Montreal)                    | 0.02 (0.04)                | .006        | .714     | -0.07, 0.10  | -0.26 (0.05)                | -.089       | <.001    | -0.34, -0.17 | -0.28 (0.05)                       | -.103       | <.001    | -0.37, -0.19 |
| Bisexual<br>(versus gay)                        | 0.26(0.06)                 | .064        | <.001    | 0.14, 0.37   | 0.72 (0.06)                 | .176        | <.001    | 0.61, 0.84   | 0.54 (0.06)                        | .135        | <.001    | 0.43, 0.66   |
| Queer<br>(versus gay)                           | -0.23 (0.08)               | -.044       | .002     | -0.39, -0.08 | -0.46 (0.08)                | -.082       | <.001    | -0.61, -0.30 | -0.64 (0.08)                       | -.119       | <.001    | -0.80, -0.48 |
| Black<br>(versus all)                           | -0.01 (0.13)               | -.001       | .959     | -0.25, 0.24  | -0.09 (0.13)                | -.009       | .506     | -0.34, 0.17  | -0.11 (0.13)                       | -.013       | .395     | -0.38, 0.15  |
| E/SE Asian<br>(versus all)                      | 0.69 (0.07)                | .155        | <.001    | 0.56, 0.82   | 0.74 (0.07)                 | .160        | <.001    | 0.61, 0.88   | 0.26 (0.07)                        | .058        | <.001    | 0.12, 0.40   |
| Latino<br>(versus all)                          | -0.29 (0.07)               | -.068       | <.001    | -0.42, -0.16 | -0.14 (0.07)                | -.032       | .037     | -0.28, -0.01 | -0.18 (0.07)                       | -.044       | .008     | -0.32, 0.05  |
| F (p)   | 74.72 (<.001)              |             |          |              | 91.29 (<.001)               |             |          |              | 42.48 (<.001)                      |             |          |              |
| Adj. R <sup>2</sup>                             | .162                       |             |          |              | .192                        |             |          |              | .099                               |             |          |              |



*Figure 1. Percentage of GBM Engaging in CAS without PrEP by level of social support and internalized homonegativity. Note: Among GBM with low perceived social support, higher internalized homonegativity was associated with a higher odds of engaging in CAS without PrEP. Among GBM with high perceived social support, internalized homonegativity was not associated with increased odds of engaging in CAS without PrEP. Thus, social support can be seen to moderate the strength of the association between internalized homonegativity and CAS without PrEP. (“High” is equivalent to one standard deviation or more above the mean, whereas “low” is equivalent to one standard deviation or more below the mean.)*

## Discussion

In a large, cross-city sample of GBM, the current study found associations between perceived social support and several STI/HIV risk and prevention behaviors. GBM with higher perceived social support were more likely to engage in the majority of the STI/HIV prevention behaviors included in our analyses, and were less likely to report engaging in CAS without PrEP at their most recent sexual encounter with a non-main partner. Our second hypothesis was also supported: higher social support was associated with lower reported levels of proximal minority stressors like acceptance concerns, identity concealment, and internalized homonegativity. In addition, social support moderated the effect of internalized homonegativity on CAS without PrEP (H3). Thus, social support was found to have both direct and some indirect associations with outcomes related to the sexual health behavior of GBM.

### Social Support and Sexual Health

The current findings extend the literature on social support in the antiretroviral prevention era (e.g. Ramirez-Valles, 2002) to demonstrate that social support has a positive main effect for a variety of STI/HIV risk and prevention behaviors. Critically, the findings related to STI/HIV prevention behaviors also add some much needed context to the fact that participants who scored higher on social support also tended to report a higher number of male sex partners

within the past six months. A higher number of male sex partners is typically viewed as conferring HIV risk among GBM. However, our results suggest that GBM with higher social support may be using strategies to mitigate their risk for STIs and HIV. That is, although men with higher social support are more likely to report a larger number of male partners, they were also more likely to take steps to protect their sexual health, such as 1) seeking regular STI/HIV testing, 2) talking about HIV status with their partners, and 3) engaging in HIV risk reduction behavior such as using PrEP when engaging in CAS. Other work (see Card et al., 2017), which also used a Canadian sample, found that GBM in their highest quartile for number of sex partners were also more likely to engage in HIV prevention-related behaviors (like sero-positioning). It may be that social support is an important factor in that association. Certainly more research is needed to further explore this potentiality. Our findings add strength to a body of work that suggests that simply examining the number of sexual partners among GBM may not be a nuanced enough metric for judging sexual risk taking and highlight that variables associated with risky sexual behaviors should be considered in context. Having a higher number of male sex partners may not increase HIV risk if GBM are consistently engaging in other safer sex measures. Thus, a sex-positive risk reduction approach that goes beyond absolute numbers of sexual partners will likely be useful

in the modern era of PrEP for encouraging GBM to maintain their sexual health. For example, developing programs that avoid shame around sex and instead affirm desire and consensual sexual activities among sexual minority men, while promoting the varying methods to reduce risk for STI/HIV transmission (e.g., Dehlin, 2019).

### **Social Support and Proximal Minority Stressors**

As expected, GBM with higher perceived social support were less likely to experience proximal minority stressors (i.e., acceptance concerns, internalized homonegativity, and identity concealment), demonstrating that, as hypothesized by Meyer (2003), supportive social relationships are important in this population and are associated with reduced minority stress. We also found that internalized homonegativity was associated with higher sexual risk behavior (i.e., CAS without PrEP); however, this effect was moderated by social support. In fact, higher perceived social support seemed to buffer particularly well against higher levels of internalized homonegativity. This is consistent with the work by Heckman et al. (1998) which demonstrated that having strong social connections in the gay community is protective for gay men's health. The current findings suggests that this may be true for GBM more broadly, even with the advent of antiretroviral prevention measures, and demonstrate the mechanism by which this occurs. Social support had a buffering effect on minority stressors associated with higher risk for HIV and bacterial STIs, as well as direct effects on HIV and STI prevention behaviors.

### **Consideration of Race/Ethnicity**

Race/ethnicity (Black, East/South-East Asian, and Latino) was controlled for in our analyses; however, there are some important significant results in this domain that should be highlighted. Latino identity was associated with important STI/HIV risk factors in this sample: Latino GBM were more likely to engage in CAS without PrEP, were less likely to report engaging in HIV risk reduction strategies, and were less likely to seek STI or HIV testing compared with all other ethnoracial groups. These findings are consistent with existing work on Latino MSM in the US (e.g., Jarama et al., 2005). East/South-East Asian identity was also significantly associated with all three proximal minority stressors. This is consistent with previous work showing that high heterosexism in Asian-American communities negatively impacts Asian-American sexual minorities (e.g., Szymanski & Sung, 2010). These findings highlight the importance of considering the ethnoracial make-up of a target population for interventions, as different groups may experience a unique array of

stressors and risk factors (e.g., Kapadia et al., 2013). Additionally, as highlighted in work like Mizuno et al. (2012), GBM who are also members of a visible minority can experience concurrent and intersecting stressors (e.g., racism and homophobia; das Nair & Thomas, 2012), which can increase their risk for negative health outcomes including CAS. Minority GBM can experience racism within the gay community, which negatively impacts health outcomes as well (e.g., Han et al., 2015). Finally, literature based on American samples (e.g., Beymer et al., 2017; Painter et al., 2019) has highlighted that the HIV epidemic impacts Latino MSM more severely; the data in the current study suggest that similar effects could be seen in Canada as well, which is also supported by other existing preliminary work (e.g., Lee et al., 2018). Intervention is needed to provide additional supports for these men, as well as research to uncover the inequities faced by this population in Canada.

### **Strengths and Limitations**

A significant strength of our study is the large sample size of GBM, who were recruited using RDS from the three largest urban centers in Canada to improve generalizability. However, our study is limited by its cross-sectional nature and reliance on self-report. Longitudinal data could provide evidence as to whether low levels of social support would mediate the relation between proximal minority stressors and health outcomes over time. Data are also needed demonstrating whether social support also temporally predicts biomedical health outcomes, such as confirmed STI and HIV diagnoses. Our current analyses cannot speak to whether certain acts of CAS without PrEP occurred after our HIV-negative participants confirmed that any partners living with HIV had a suppressed viral load. Given consistent data showing that people living with HIV who have a suppressed viral load cannot transmit HIV to their partners (Rodger et al., 2019), future studies should examine how social support factors into sexual negotiation/ communication strategies, including asking partners living with HIV about their viral load. Readers should also be aware that there may be additional variables of interest that were not included in the models presented in this paper. Factors such as identity importance, resilience, agreeableness, social skills, and distal stressors may also play a role in the associations among social support, proximal stress and sexual health-related behaviors. These represent important avenues of inquiry for future work. Additionally, the source of social support is unknown due to the format of the items in the scale used; in future work researchers may wish to

compare the importance of support from family, partner, and/or peer sources.

### Implications

Our findings support the notion that interventions that promote social engagement (group counselling, social clubs, sports leagues, online social networking, etc.) are important for GBM health and are relevant for STI/HIV prevention. Given that the link between social support and well-being is broadly supported for a wide variety of populations in the extant literature (e.g., Cohen 2004; Holt-Lunstad et al., 2015; Wang et al., 2018), this likely holds true for GBM of varying identities, including those who may not strongly identify as members of the gay community. Social networks can provide a wide variety of supports, for instance, friend groups may encourage members to seek out more regular STI or HIV testing, to engage in protective health behaviors like talking to partners about their HIV status and condom use, and can share information about the benefits of PrEP use for preventing HIV. Existing work examining the success of social support interventions

suggest that interventions will be most successful when there is an emphasis on mutual exchanges of support (e.g., Hogan et al., 2002), highlighting the potential benefits of encouraging GBM to build strong reciprocal social connections. Indeed, our findings indicate that interventions aimed at bolstering social connection have the potential to improve sexual health outcomes directly as well as indirectly, via reductions in the experience of minority stressors.

### Conclusion

The results of the current study advance our understanding of social support and proximal minority stressors. Higher social support was associated with lower levels of proximal minority stressors and buffered against the effects of internalized homonegativity on CAS without PrEP. Future interventions aimed at improving the sexual health outcomes of GBM may consider incorporating elements related to training and group work that encourage GBM to build and maintain social connections and that reinforce a sense of support and community.

### References

- Althoff, M. D., Theall, K., Schmidt, N., Hembling, J., Gebrekristos, H. T., Thompson, M. M., ... & Kissinger, P. (2017). Social support networks and HIV/STI risk behaviors among Latino immigrants in a new receiving environment. *AIDS and Behavior, 21*(12), 3607-3617. DOI: 10.1007/s10461-017-1849-8
- Andersen, R., & Fetner, T. (2008). Cohort differences in tolerance of homosexuality: Attitudinal change in Canada and the United States, 1981–2000. *Public Opinion Quarterly, 72*(2), 311-330.
- Berkman, L. F., & Glass, T. (2000). Social integration, social networks, social support, and health. *Social Epidemiology, 1*, 137-173. DOI: 10.1007/978-94-007-4276-5\_17
- Beymer, M. R., Weiss, R. E., Halkitis, P. N., Kapadia, F., Ompad, D. C., Bourque, L., & Bolan, R. K. (2016). Disparities within the disparity—determining HIV risk factors among Latino gay and bisexual men attending a community-based clinic in Los Angeles, California. *Journal of Acquired Immune Deficiency Syndromes (1999), 73*(2), 237. DOI: 10.1097/QAI.0000000000001072
- Card, K. G., Lachowsky, N. J., Cui, Z., Sereda, P., Rich, A., Jollimore, J., ... & Moore, D. (2017). Seroadaptive strategies of gay & bisexual men (GBM) with the highest quartile number of sexual partners in Vancouver, Canada. *AIDS and Behavior, 21*(5), 1452-1466. DOI: 10.1007/s10461-016-1510-y
- Casey, B. (chair). (2019). *Minutes of the Proceedings from the Standing Committee on Health*. <https://www.ourcommons.ca/DocumentViewer/en/42-1/HESA/meeting-140/minutes>
- Centers for Disease Control and Prevention. (2018a). HIV Surveillance Report, 2017; vol. 29. Retrieved from <http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html>.
- Centers for Disease Control and Prevention. (2018b). *U.S. Public Health Service: Pre-exposure prophylaxis for the prevention of HIV infection in the United States—2017 update: A clinical practice guideline*. Retrieved from <https://www.cdc.gov/hiv/pdf/risk/prep/cdc-hiv-prep-guidelines-2017.pdf>.
- Cochran, S. D., & Mays, V. M. (2007). Physical health complaints among lesbians, gay men, and bisexual and homosexually experienced heterosexual individuals: Results from the California Quality of Life Survey. *American Journal of Public Health, 97*, 2048-2055.
- Cohen, S. (2004). Social relationships and health. *American psychologist, 59*(8), 676. DOI: 10.2105/AJPH.2006.087254
- Cox, J., Apelian, H., Moodie, E., Messier-Peet, M., Hart, T., Grace, D., Moore, D., ... & the Engage Study Team. (In press). HIV pre-exposure prophylaxis (PrEP) use among urban Canadian gay, bisexual and other men who have sex with men for whom PrEP is clinically recommended: baseline results from the Engage Cohort Study. *Canadian Medical Association Journal: Open*.
- da Silva, D. T., Bouris, A., Voisin, D., Hotton, A., Brewer, R., & Schneider, J. (2020). Social networks moderate the syndemic effect of psychosocial and structural factors on HIV risk among young black transgender women and men who have sex with men. *AIDS and Behavior, 24*(1), 192-205. DOI: 10.1007/s10461-019-02575-9
- das Nair, R., & Thomas, S. A. (2012). Politics of desire: Exploring the ethnicity/sexuality intersectionality in South Asian and East Asian men who have sex with men (MSM). *Psychology of Sexualities Review, 3*(1).
- Dehlin, J. M., Stillwagon, R., Pickett, J., Keene, L., & Schneider, J. A. (2019). # PrEP4Love: An Evaluation of a Sex-Positive HIV Prevention Campaign. *JMIR Public Health and Surveillance, 5*(2), e12822.
- Doty, N. D., Willoughby, B. L., Lindahl, K. M., & Malik, N. M. (2010). Sexuality related social support among lesbian, gay, and bisexual youth. *Journal of Youth and Adolescence, 39*(10), 1134-1147. DOI: 10.1007/s10964-010-9566-x

- Dour, H. J., Wiley, J. F., Roy-Byrne, P., Stein, M. B., Sullivan, G., Sherbourne, C. D., ... & Craske, M. G. (2014). Perceived social support mediates anxiety and depressive symptom changes following primary care intervention. *Depression and Anxiety, 31*(5), 436-442. DOI: 10.1002/da.22216
- Fingerhut, A. W. (2018). The role of social support and gay identity in the stress processes of a sample of Caucasian gay men. *Psychology of Sexual Orientation and Gender Diversity, 5*(3), 294. DOI: 10.1037/sgd0000271
- Finlayson, T., Cha, S., Xia, M., Trujillo, L., Denson, D., Prejean, J., ... & Anderson, B. (2019). Changes in HIV preexposure prophylaxis awareness and use among men who have sex with men—20 urban areas, 2014 and 2017. *Morbidity and Mortality Weekly Report, 68*(27), 597. DOI: 10.15585/mmwr.mm6827a1
- Glick, S. N., & Golden, M. R. (2014). Early male partnership patterns, social support, and sexual risk behavior among young men who have sex with men. *AIDS and Behavior, 18*(8), 1466-1475. DOI: 10.1007/s10461-013-0678-7
- Grace, D., Nath, R., Parry, R., Connell, J., Wong, J., & Grennan, T. (2020). ‘... if U equals U what does the second U mean?’: sexual minority men’s accounts of HIV undetectability and untransmittable scepticism. *Culture, Health & Sexuality, 1*-17. DOI: 10.1080/13691058.2020.1776397
- Haddad, N., Li, J. S., Totten, S., & McGuire, M. (2018). HIV in Canada-Surveillance Report, 2017. *Canada Communicable Disease Report, 44*(12), 324-32.
- Han, C. S., Ayala, G., Paul, J. P., Boylan, R., Gregorich, S. E., & Choi, K. H. (2015). Stress and coping with racism and their role in sexual risk for HIV among African American, Asian/Pacific Islander, and Latino men who have sex with men. *Archives of Sexual Behavior, 44*(2), 411-420. DOI: 10.1007/s10508-014-0331-1
- Hart, T. A., Moore, D. M., Noor, S. W., Lachowsky, N., Grace, D., Cox, J., Skakoon-Sparling, S., ... & Lambert, G. (2020). Prevalence of HIV and sexually transmitted and bloodborne infections (STBBI), and related preventive and risk behaviours, among gay, bisexual and other men who have sex with men in Montreal, Toronto and Vancouver. Results from the Engage Study. *Canadian Journal of Public Health, online ahead of print*. <https://doi.org/10.17269/s41997-021-00546-z>
- Hart, T. A., Noor, S. W., Adam, B. D., Vernon, J. R., Brennan, D. J., Gardner, S., ... & Myers, T. (2017). Number of psychosocial strengths predicts reduced HIV sexual risk behaviors above and beyond syndemic problems among gay and bisexual men. *AIDS and Behavior, 21*(10), 3035-3046. DOI: 10.1007/s10461-016-1669-2
- Hatzenbuehler, M. L. (2009). How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychological Bulletin, 135*(5), 707.
- Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1995). *User’s manual for the Medical Outcomes Study (MOS) core measures of health-related quality of life*. Santa Monica: Rand Corporation. DOI: 10.1037/a0016441
- Heckathorn, D. D. (2002). Respondent-driven sampling II: Deriving valid population estimates from chain-referral samples of hidden populations. *Social Problems, 49*, 11-34. DOI: 10.1525/sp.2002.49.1.11
- Heckathorn, D. D. (2011). Comment: Snowball versus respondent-driven sampling. *Sociological Methodology, 41*(1), 355-366. DOI: 10.1111/j.1467-9531.2011.01244.x
- Heckman, T. G., Somlai, A. M., Kalichman, S. C., Franzoi, S. L., & Kelly, J. A. (1998). Psychosocial differences between urban and rural people living with HIV/AIDS. *The Journal of Rural Health, 14*(2), 138-145. DOI: 10.1111/j.1748-0361.1998.tb00615.x
- Hermanstynne, K. A., Green Jr, H. D., Cook, R., Tieu, H. V., Dyer, T. V., Hucks-Ortiz, C., ... & Shoptaw, S. (2018). Social network support and decreased risk of seroconversion in black MSM: results of the BROTHERS (HPTN 061) study. *Journal of acquired immune deficiency syndromes (1999), 78*(2), 163.
- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science, 10*(2), 227-237. DOI: 10.1177/1745691614568352
- Hsieh, N. (2014). Explaining the mental health disparity by sexual orientation: The importance of social resources. *Society and Mental Health, 4*, 129-146. DOI: 10.1177/2156869314524959
- IBM Corp. (2017). *IBM SPSS Statistics for Windows*. Armonk, NY: IBM Corp. Retrieved from <https://hadoop.apache.org>
- Jarama, S. L., Kenamer, J. D., Poppen, P. J., Hendricks, M., & Bradford, J. (2005). Psychosocial, behavioral, and cultural predictors of sexual risk for HIV infection among Latino men who have sex with men. *AIDS and Behavior, 9*(4), 513-523. DOI: 10.1007/s10461-005-9022-1
- Jin, F. Y., Prestage, G., Law, M. G., Kippax, S., Van de Ven, P., Rawsthorne, P., ... & Grulich, A. E. (2002). Predictors of recent HIV testing in homosexual men in Australia. *HIV Medicine, 3*(4), 271-276. DOI: 10.1046/j.1468-1293.2002.00121.x
- Jin, F., Prestage, G. P., Mao, L., Poynten, I. M., Templeton, D. J., Grulich, A. E., & Zablotska, I. (2015). “Any condomless anal intercourse” is no longer an accurate measure of HIV sexual risk behavior in gay and other men who have sex with men. *Frontiers in Immunology, 6*, 86. DOI: 10.3389/fimmu.2015.00086
- Kapadia, F., Siconolfi, D. E., Barton, S., Olivieri, B., Lombardo, L., & Halkitis, P. N. (2013). Social support network characteristics and sexual risk taking among a racially/ethnically diverse sample of young, urban men who have sex with men. *AIDS and Behavior, 17*(5), 1819-1828. DOI: 10.1007/s10461-013-0468-2
- Lachowsky, N. J., Card, K. G., Cui, Z., Sereda, P., Roth, E. A., Hogg, R. S., & Moore, D. M. (2019). Agreement between gay, bisexual and other men who have sex with men’s period prevalence and event-level recall of sexual behaviour: an observational respondent-driven sampling study. *Sexual Health, 16*(1), 84-87. DOI: 10.1071/SH17223
- Lauby, J. L., Marks, G., Bingham, T., Liu, K. L., Liau, A., Stueve, A., & Millett, G. A. (2012). Having supportive social relationships is associated with reduced risk of unrecognized HIV infection among black and Latino men who have sex with men. *AIDS and Behavior, 16*(3), 508-515. DOI: 10.1007/s10461-011-0002-3
- Lee, H., Colyer, S., Armstrong, H. L., Cox, J., Lambert, G., Hart, T. A., Kroch, A., ... & Moore, D. M. (April, 2018). *Trends in HIV diagnoses by age and ethnicity among men who have sex with men (MSM) in British Columbia, Ontario, and Quebec: 2006-2015*. 27th Annual Canadian Conference on HIV/AIDS Research. Vancouver, BC, Canada.
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin, 129*(5), 674. DOI: 10.1037/0033-2909.129.5.674

- Mizuno, Y., Borkowf, C., Millett, G. A., Bingham, T., Ayala, G., & Stueve, A. (2012). Homophobia and racism experienced by Latino men who have sex with men in the United States: correlates of exposure and associations with HIV risk behaviors. *AIDS and Behavior*, *16*(3), 724-735. DOI: 10.1007/s10461-011-9967-1
- Mohr, J.J., & Kendra, M.S. (2011). Revision and extension of a multidimensional measure of sexual minority identity: The lesbian, gay, and bisexual identity scale. *Journal of Counseling Psychology*, *58*(2), 234-245. DOI: 10.1037/a0022858
- Painter, T. M., Song, E. Y., Mullins, M. M., Mann-Jackson, L., Alonzo, J., Reboussin, B. A., & Rhodes, S. D. (2019). Social support and other factors associated with HIV testing by Hispanic/Latino gay, bisexual, and other men who have sex with men in the US South. *AIDS and Behavior*, *23*(3), 251-265. DOI: 10.1007/s10461-019-02540-6
- Pantalone, D. W., Puckett, J. A., & Gunn, H. A. (2016). Psychosocial factors and HIV prevention for gay, bisexual, and other men who have sex with men. *Social and Personality Psychology Compass*, *2*(1), 109-122. DOI: 10.1111/spc3.12234.
- Perales, F., & Plage, S. (2020). Sexual orientation, geographic proximity, and contact frequency between adult siblings. *Journal of Marriage and Family*. DOI: 10.1111/jomf.12669
- Qiao, S., Li, X., & Stanton, B. (2014). Social support and HIV-related risk behaviors: A systematic review of the global literature. *AIDS and Behavior*, *18*(2), 419-441. DOI: 10.1007/s10461-013-0561-6
- R Core Team (2017). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
- Ramirez-Valles, J. (2002). The protective effects of community involvement for HIV risk behavior: A conceptual framework. *Health Education Research*, *17*(4), 389-403. DOI: 10.1093/her/17.4.389
- Rodger, A. J., Cambiano, V., Bruun, T., Vernazza, P., Collins, S., Degen, O., ... & Raben, D. (2019). Risk of HIV transmission through condomless sex in serodifferent gay couples with the HIV-positive partner taking suppressive antiretroviral therapy (PARTNER): Final results of a multicentre, prospective, observational study. *The Lancet*, *393*, 2428-2438. DOI: 10.1016/S0140-6736(19)30418-0
- Rudolph, A. E., Linton, S., Dyer, T. P., & Latkin, C. (2013). Individual, network, and neighborhood correlates of exchange sex among female non-injection drug users in Baltimore, MD (2005-2007). *AIDS and Behavior*, *17*(2), 598-611. DOI: 10.1007/s10461-012-0305-z
- Saleh, L. D., van den Berg, J. J., Chambers, C. S., & Operario, D. (2016). Social support, psychological vulnerability, and HIV risk among African American men who have sex with men. *Psychology & Health*, *31*(5), 549-564. DOI: 10.1080/08870446.2015.1120301
- Sagaon-Teyssier, L., Suzan-Monti, M., Demoulin, B., Capitant, C., Lorente, N., Préau, M., ... & Meyer, L. (2016). Uptake of PrEP and condom and sexual risk behavior among MSM during the ANRS IPERGAY trial. *AIDS Care*, *28*, 48-55. DOI: 10.1080/09540121.2016.1146653
- Scott, H. M., Pollack, L., Rebhook, G. M., Huebner, D. M., Peterson, J., & Kegeles, S. M. (2014). Peer social support is associated with recent HIV testing among young black men who have sex with men. *AIDS and Behavior*, *18*(5), 913-920. DOI: 10.1007/s10461-013-0608-8
- Sherbourne, C.D., & Stewart, A.L. (1991). The MOS Social Support Survey. *Social Science Medicine*, *32*(6), 705-714. DOI: 10.1016/0277-9536(91)90150-b
- Smith, M. (2020). Homophobia and homonationalism: LGBTQ law reform in Canada. *Social & Legal Studies*, *29*(1), 65-84.
- Statistics Canada (2019). *Ethnic origin, both sexes, age (total), Canada, 2016 census*. Retrieved from: <https://tinyurl.com/y6r6dz3v>
- Szymanski, D. M., & Sung, M. R. (2010). Minority stress and psychological distress among Asian American sexual minority persons. *The Counseling Psychologist*, *38*(6), 848-872. DOI: 10.1177/0011000010366167
- Valdes, B., Gattamorta, K., Jones, S. G., Fenkl, E. A. & De Santis, J. P. (2019). Social support, loneliness, depressive symptoms, and high-risk sexual behaviors of middle-aged Hispanic men who have sex with men. *Journal of the Association of Nurses in AIDS Care*, *30*(1), 98-110. doi: 10.1097/JNC.000000000000002.
- Valente, P. K., Mimiaga, M. J., Mayer, K. H., Safren, S. A., & Biello, K. B. (2020). Social capital moderates the relationship between stigma and sexual risk among male sex workers in the US northeast. *AIDS and Behavior*, *24*(1), 29-38. DOI: 10.1007/s10461-019-02692-5
- Wang, J., Mann, F., Lloyd-Evans, B., Ma, R., & Johnson, S. (2018). Associations between loneliness and perceived social support and outcomes of mental health problems: A systematic review. *BMC Psychiatry*, *18*(1), 156. DOI: 10.1186/s12888-018-1736-5
- Younge, S. N., Salazar, L. F., Crosby, R. F., DiClemente, R. J., Wingood, G. M., & Rose, E. (2008). Condom use at last sex as a proxy for other measures of condom use: Is it good enough?. *Adolescence*, *43*(172), 927.

---

#### Funding Sources:

*Engage/Momentum II* is funded by the Canadian Institutes for Health Research (CIHR, #TE2-138299; #FDN-143342; #PJT-153139), the Canadian Association for HIV/AIDS Research (CANFAR), the Ontario HIV Treatment Network (OHTN, #1051), the Public Health Agency of Canada (#4500345082), and Ryerson University. As well, SSS is supported by postdoctoral fellowships from CIHR and CTN; DMM and NJL are supported by Scholar Awards from the Michael Smith Foundation for Health Research (#5209, #16863); TAH is supported by a Chair in Gay and Bisexual Men's Health from the OHTN; DG is supported by a Canada Research Chair in Sexual and Gender Minority Health; and GB is supported by an Ontario Graduate Scholarship.