



Published in final edited form as:

*AIDS Educ Prev.* 2019 December ; 31(6): 523–537. doi:10.1521/aeap.2019.31.6.523.

## Stigma and mobile app use among young black men who have sex with men

A. Lina Rosengren, MD, MPH, MS<sup>1</sup>, Timothy W. Menza, MD, PhD<sup>2</sup>, Sara LeGrand, PhD<sup>3</sup>, Kathryn E. Muessig, PhD<sup>1</sup>, Jose A. Bauermeister, PhD, MPH<sup>4</sup>, Lisa B. Hightow-Weidman, MD, MPH<sup>1</sup>

<sup>1</sup>University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

<sup>2</sup>Oregon Health Authority, Portland, Oregon, USA

<sup>3</sup>Duke University, Durham, North Carolina, USA

<sup>4</sup>University of Pennsylvania, Philadelphia, Pennsylvania, USA

### Abstract

**INTRODUCTION:** Young black men who have sex with men (YBMSM) are disproportionately affected by HIV. Intersectional stigmas are associated with increased HIV vulnerability, and worse outcomes for YBMSM with HIV. YBMSM find sex partners via sexual networking apps, but stigma on apps has been poorly studied.

**METHODS:** We conducted cross-sectional analysis of 324 YBMSM seeking sex partners via apps to assess stigma experiences in eight dimensions compared to non-users (N=150). We conducted detailed stratified analyses to identify granular stigma data.

**RESULTS:** App users had higher median scores than non-users in perceived HIV discrimination, perceived HIV stigma, experienced sexual minority stigma, racial discrimination, and perceived homophobia.

**DISCUSSION:** We demonstrate higher levels of intersectional stigmas among app users than non-users, but did not find an overall increase in stigma with increasing app use. Considering the prominent role of apps in YBMSM sexual networking, interventions that reduce stigma on apps are needed.

### INTRODUCTION

Young Black men who have sex with men (YBMSM) carry a disproportionate burden of HIV in the United States. YBMSM have nearly 3.5 times the odds of being diagnosed with HIV compared to White MSM of the same age (Centers for Disease Control and Prevention, 2019). Individual risk behaviors have largely failed to explain the marked disparity in HIV acquisition between YBMSM and other young MSM (Mustanski et al., 2019), and prior studies have suggested that stigma plays a role (Arnold, Rebchook, & Kegeles, 2014;

**Correspondence:** Lina Rosengren-Hovee, MD, MPH, MS, Division of Infectious Diseases, University of North Carolina Chapel Hill, 130 Mason Farm Road, Chapel Hill, North Carolina 27599, Phone: (919) 843-5110, Fax: (919) 966-6714, lina\_roho@med.unc.edu.

The authors have no conflicts of interest to disclose.

Mustanski et al., 2019; Phillips, Birkett, Hammond, & Mustanski, 2016). Stigma is the devalued sociocultural status resulting from a condition or attribute that creates and perpetuates disadvantage for marginalized groups (Hatzenbuehler, 2016; Steward et al., 2008).

YBMSM experience stigma related to sexual minority status, race, and HIV status (Bogart, Landrine, Galvan, Wagner, & Klein, 2013), whether actual or presumed (Gamarel et al., 2018; Philbin et al., 2016)—a phenomenon often referred to as intersectional stigma (Viruell-Fuentes, Miranda, & Abdulrahim, 2012). Intersectionality within the context of stigma refers to different types of stigma being culturally intertwined, and therefore must be studied as a whole (Arnold et al., 2014). Beyond intersectionality, stigma also exists in multiple dimensions (Turan et al., 2017). Exposure to acts of stigma are referred to as *experienced stigma*, while the interpretation or views about one's experiences and the broader sociocultural climate are considered as *perceived stigma*. For example, feeling that there is an increase in homophobia in the U.S. would constitute perceived stigma. *Internalized stigma* is the extent to which an individual accepts and internalizes acts of stigma or stigmatizing beliefs, accepting them as their own (Turan et al., 2017). Applying intersectionality theory to this framework, these dimensions can be categorized across race, sexual minority status, and HIV status, such that an individual can be affected by experienced sexual minority stigma and perceived HIV stigma, for example. These multiple, intersectional stigmas can have additive or multiplicative negative health consequences for YBMSM (Choi, Paul, Ayala, Boylan, & Gregorich, 2013; Reidpath & Chan, 2005). Intersectional stigma affects quality of life for YBMSM and contributes to worse HIV-related health outcomes among HIV-positive YBMSM (Bogart et al., 2013). High levels of stigma also contribute to HIV-negative YBMSM's increased risk of acquiring HIV (Mustanski et al., 2019). Stereotypes of YBMSM's HIV risk contribute to high rates of HIV stigma affecting HIV-negative YBMSM (Muessig et al., 2017). This is particularly evident in the literature describing stigma related to HIV Pre-Exposure Prophylaxis (PrEP). Stigmatization of people living with HIV transfers to the individuals, groups, and communities they are associated with, reproducing HIV stigma in HIV-negative individuals who belong to groups at high risk of HIV (Sang, Matthews, Meanley, Eaton, & Stall, 2018; Steward et al., 2008).

Recent studies have demonstrated higher rates of stigma among YBMSM compared to other young MSM, suggesting in network analysis that YBMSM's exposure to stigmatizing environments may facilitate the transmission of HIV (Mustanski et al., 2019). It has also been postulated that YBMSM experience social isolation as a result of intersectional racial and sexual minority stigma which impacts the formation of their sexual networks, thereby clustering HIV incidence within these minority populations (Phillips et al., 2016). YBMSM are also less likely to disclose positive HIV status to sex partners, and less likely to be aware of their HIV status and therefore to have a high viral load resulting in greater transmissibility within clustered networks (Millett et al., 2012). Conceptualizing the HIV vulnerability of YBMSM requires a shift away from focus on individual risk behaviors, and acknowledgement of disparities in societal stigmas that disproportionately affect YBMSM and place them at higher risk of HIV. While stigma affects MSM of all races and ages,

YBMSM appear to experience stigma at higher levels than other MSM (Arnold et al., 2014), due at least in part to intersectionality.

In recent years, mobile apps have changed the way individuals find sex partners, particularly among YBMSM who are frequent users of social and sexual networking apps (Grov, Breslow, Newcomb, Rosenberger, & Bauermeister, 2014). Stigma appears to have played a role in the move from physical spaces to mobile apps for sexual networking among YBMSM, particularly in geographic areas without safe and affirming spaces for MSM (White Hughto, Pachankis, Eldahan, & Keene, 2017), yet stigma has also persisted on these apps, where individuals may feel emboldened to perpetuate stigma in a partly anonymized way, particularly under the guise of partner preferences (Horvath, Oakes, & Rosser, 2008). To date, limited research has been conducted specifically about the relationship between stigma and apps. Past studies have documented that among MSM, many use apps to avoid HIV and sexual minority stigma (Lemke & Weber, 2017; White Hughto et al., 2017). Stigma among app users has not been exhaustively studied, however there is overlap between social media apps used for non-sexual purposes and apps used specifically for sex-seeking and romantic relationships (Badal, Stryker, DeLuca, & Purcell, 2018). Stigma on apps is a double-edged sword. On the one hand, YBMSM use apps to avoid stigma and to find supportive communities (Macapagal et al., 2018; White Hughto et al., 2017). Bartone described a strong appeal of virtual spaces among minority MSM, due to societal heteronormativity, and stereotypes and discrimination from within the gay community (Bartone, 2018). On the other hand, intersectional stigma might be fostered or perpetuated on apps. While the cause and effect of this relationship has not been established, one study demonstrated a linear increase in HIV stigma with increased time spent on social media (Garett et al., 2016), suggesting that stigmatized individuals seek out support online, and/or that being online results in experiencing more stigma. Miller (2019), for instance, found that masculinity and physical presentation on apps may result in higher rates of discrimination based on physical attributes on apps than offline environments (Miller, 2019).

Researchers have noted that individuals are more likely to engage in online disinhibition when interacting with others (Nguyen, Bin, & Campbell, 2012; Suler, 2004). Online disinhibition may affect the nature and tone of conversations, which may result in exchanges perceived to be insensitive or stigmatizing. Among HIV-positive MSM who seek sex on social media and apps, internalized HIV stigma has been associated with increased sexual risk taking with HIV-negative partners (Burnham et al., 2016). These findings mirror HIV-positive MSM's behaviors offline regarding the negative impact of internalized stigma on HIV status disclosure and HIV risk behaviors (Hatzenbuehler, O'Cleirigh, Mayer, Mimiaga, & Safren, 2011). One study found that online sex seeking was associated with higher levels of sexual behavior stigma, and higher likelihood of testing positive for HIV at a follow up appointment (Stahlman et al., 2017), demonstrating higher HIV vulnerability of MSM seeking sex online. Other studies have found that MSM who hide their sexuality in offline settings but seek same sex sexual experiences online may have higher levels of sexual minority stigma (Lemke & Weber, 2017). In one study of 852 MSM, those who reported online sex seeking were more likely to report higher levels of perceived sexual minority stigma (Stahlman et al., 2015). While these studies provide preliminary evidence that there are greater levels of intersectional stigma in online environments, future research examining

the associations between intersectional stigma, disinhibition, and HIV vulnerability among those seeking sex online is warranted.

The relationships between stigma, apps and HIV are insufficiently understood, necessitating further study. We hypothesize that YBMSM experience multidimensional, intersectional stigma on apps, creating online environments of higher HIV vulnerability among YBMSM app users than those YBMSM who do not use apps. Research is needed to better understand the relationships between experiences of intersectional stigma and app use. To address this gap, we conducted secondary data analysis of an online HIV risk reduction intervention for YBMSM. The main purpose of this study was to assess stigma experiences of YBMSM app users compared to those who do not use partner-seeking apps. Through exploratory analysis, we sought to describe types of stigma across eight dimensions stratified by overall app use compared to non-use, the number of apps used, and the specific apps used, to provide granular data for targeted stigma reduction interventions.

## METHODS

### Study population

[HealthMpowerment.org](http://HealthMpowerment.org) (HMP) is a mobile phone optimized web-based intervention for YBMSM that provides HIV and sexually transmitted infection (STI) prevention information and a social networking platform for peer support (Hightow-Weidman et al., 2018). A randomized controlled trial of HMP enrolled 474 YBMSM between November 2013 and October 2015. Participants were recruited using venue-based flyers, advertisements and messages on apps and social networking sites, and outreach at local case management organizations and HIV/STI clinics. All participants completed a baseline survey and follow-up assessments. Eligibility criteria were: age 18 to 30; assigned male gender at birth; self-identify as black; currently reside in North Carolina; access to a mobile device with Internet access; and any of the following in the past six months: condomless anal intercourse with male partner, any anal sex with more than three male partners, exchange of money, gifts, shelter, or drugs for anal sex with male partner, or anal sex while under the influence of drugs or alcohol. YBMSM of any HIV status (positive, negative, unknown) were eligible. Additional details regarding the parent study are available elsewhere (Hightow-Weidman et al., 2018).

### Measures

**App use**—App use was evaluated both in a dichotomous manner; having searched for a sex partner online using an app within the past three months, and by asking each respondent to check a box for the apps they used. The HMP baseline survey included the ten most popular sex-seeking and social media apps at the time, based on preliminary survey data (Grindr, Adam4Adam, Black Gay Chat, Facebook, Craigslist, [Gay.com](http://Gay.com), Manhunt, Man4Man, Jack'D, and Scruff). Apps included in our study require users to have a profile, and most have a match feature allowing the user to browse other users' profiles and match with them, followed by the ability to send direct messages. However, since participants indicated that they often use social media sites other than those only used for sex or dating, such as

Facebook and Craigslist, we included these in our analysis as well. Three of the apps included also have a forum, in which users can make public posts.

**Perceived HIV risk**—Perceived risk for HIV was assessed using HIV-negative and unknown status respondents' rating of four statements about HIV risk using a five-point Likert scale from “strongly disagree” to “strongly agree”. The responses were combined into a total risk score ranging from 4–20, with a higher score reflecting higher perceived risk of HIV. This combined score was used to derive the data for a continuous linear variable.

**Stigma scales**—We used derived cumulative scores for each of the stigma categories. For all categories of stigma, higher scores reflect greater levels of stigma. Previous work has framed stigma in the context of experienced stigma, perceived stigma and internalized stigma (Earnshaw, Smith, Chaudoir, Amico, & Copenhaver, 2013; Kalichman et al., 2009). Because stigma for YBMSM is intersectional, stemming from sexual minority, minority race status, and actual or perceived HIV positivity (Glick & Golden, 2010; Han et al., 2015), we investigated stigma in four HIV dimensions, and four non-HIV dimensions, based on these concepts (see descriptions, below). All participants answered all of the stigma items with the exception of experienced HIV discrimination and internalized HIV stigma; only HIV-positive participants responded to these scales.

#### **HIV-related stigma**

**Perceived HIV discrimination.** Perceived HIV discrimination refers to participants' knowledge of other HIV-positive individuals' experiences. Each of the 10 questions begins with “How often have you heard stories about...”, for example “How often have you heard stories about people being forced by family members to leave their home because they had HIV”. We calculated a composite score with range 0–30 based on responses to a four-point Likert scale with options “never” (0), “rarely”, “sometimes”, and “frequently” (3) (Cronbach's  $\alpha=0.91$ ).

**Perceived HIV stigma.** Perceived HIV stigma refers to participants' perception of the prevalence of stigmatizing attitudes based on their expectations of their community. All items begin with “In your community, how many people...”. An example item is “In your community, how many people would not share dishes or glasses with someone who has HIV?” Response options are “no one” (0), “very few people”, “some people”, and “most people” (3), with a composite score range of 0–30 (Cronbach's  $\alpha=0.95$ ). We asked both HIV-positive and HIV-negative respondents to rate perceived HIV discrimination and perceived HIV stigma based on prior studies demonstrating high-levels of HIV-related stigma among HIV-negative YBMSM.

**Experienced HIV discrimination.** Steward's abbreviated survey instrument which utilizes 10 questions to assess enacted stigma to identify personal experiences of HIV discrimination, was used in our study with slight adaptations (Steward et al., 2008). Items address interactions with healthcare workers, family members and the community at large. An example item is “Has a healthcare worker not wanted to touch you because you have HIV?” A composite score with range 0–10 was calculated based on dichotomous responses

to the 10 questions (Cronbach's  $\alpha=0.84$ ). Experienced HIV discrimination was assessed among HIV-positive respondents only.

**Internalized HIV stigma.:** Internalized stigma measures HIV-positive participants' own beliefs that they should be treated in a discriminatory manner. All items begin with "How much do you feel...", followed by statements such as "that you have HIV because you have done wrong behaviors?". Response options were "not at all" (0), "a little", "a fair amount", and "a great deal" (3), with composite score range 0–30 (Cronbach's  $\alpha=0.92$ ).

### Minority stigma

**Perceived homophobia.:** Perceived homophobia was assessed using Hatzenbuehler's two statements "I believe the world is a dangerous place for gay people", and "In the last 12 months, I have perceived a rise in homophobia" on a 10-point Likert scale (10 being complete agreement). Composite scores of the two statements in this category ranged from 0–20 with a Cronbach's  $\alpha$  of 0.56, therefore, these questions were analyzed separately (Hatzenbuehler, Nolen-Hoeksema, & Erickson, 2008).

**Internalized homophobia.:** Internalized homophobia was measured using the Revised Internalized Homophobia Scale (IHP-R) developed by Herek (Herek, Gillis, & Cogan, 2009). The IHP-R scale assesses internalized homophobia using five questions related to egodystonic homosexuality on a five-point Likert scale from "strongly disagree" (1) to "strongly agree" (5) (Herek et al., 2009). Statements in the IHP-R include "I wish I weren't gay/bisexual" and four similar statements. Composite scores range in our sample was 5–25 with Cronbach's  $\alpha$  of 0.87.

**Experienced sexual minority stigma.:** We used Bogart's Multiple Discrimination Scale for Sexual Orientation (MDS-Gay) scale. MDS-Gay includes 10 dichotomous items that assess experienced sexual minority stigma, which covers interpersonal discrimination, institutional discrimination and violent discrimination based on sexual orientation (Bogart et al., 2013). Composite score range was 0–10 with Cronbach's  $\alpha$  of 0.88.

**Stigma related to race.:** Racial discrimination was assessed using Bogart's Multiple Discrimination Scale for Race (MDS-Race) scale which includes 10 dichotomous items, composite score range 0–10 and Cronbach's  $\alpha$  of 0.88 (Bogart et al., 2013).

**Covariates**—Demographic variables included age, education, income, health insurance status, and homelessness within the past three months. Respondents were asked about relationship status, having had concurrent partners, having a serodiscordant partner, or engaging in transactional sex within the past three months. Participants' self-reported HIV status was also included.

**Statistical analysis**—We conducted a cross-sectional analysis using baseline data to assess the association between seeking sex partners via apps and stigma. The exposure was defined as searching for a sex partner on an app within the past three months. This variable was dichotomous in the parent HMP study and the same coding was retained in our study. We first conducted bivariable analyses comparing app users with non-users by

sociodemographic variables with chi square tests. Since the scales had varying ranges, we normalized each scale to a range of 0–30 for comparison. Then, we calculated the medians and interquartile ranges (IQR) for each of the stigma scales. We examined survey responses overall and by subgroup. We used Kruskal-Wallis to compare the medians of each stigma scale for groups by app use and frequency of app use (daily, weekly or every few weeks, monthly or less). Analyses were performed using SAS ver 9.4 (SAS Institute, Inc., Cary, NC).

## RESULTS

Of 474 participants, 55% were 18–24 years of age, 32% identified as multiracial or multiethnic and 87% identified as gay or bisexual (Table 1). Most were single (64%), completed more than a high school education (91%), and were employed (65%); 50% reported being in school. Forty-two percent of men were HIV-positive and 72% had health insurance. Almost one-quarter (22%) reported being homeless in the prior three months and 7% reported being arrested or incarcerated in the prior three months. Twelve percent reported engaging in transactional sex in the past three months, and 42% had more than one sex partner in that same time period.

Of 474 participants, 324 (68%) reported using apps to find sex partners in the past three months; 98 (30% of total participants) reported daily use. There were no differences between the groups regarding age, income, health insurance status, history of homelessness, employment status, or HIV status. App users were more likely to have a college degree than non-app users (28% vs 15%,  $p=0.01$ ), more likely to be single (70% vs 50%,  $p<0.0001$ ), have concurrent partners (57% vs 21%,  $p<0.0001$ ), more likely to have engaged in transactional sex (16% vs 3%,  $p=0.03$ ) and have a higher perceived risk of HIV (median 11 [IQR 8–13] vs 9 [IQR 7–11],  $p=0.01$ ). When those participants who had experienced homelessness in the preceding three months were compared with those who had not, there was no difference between groups in terms of app use. However, youth who are HIV-positive were more likely to have been recently homeless (14% vs 8%,  $p<0.0001$ ). A comparable proportion of app users and non-users were living with HIV.

Small differences in stigma between HIV-positive and HIV-negative participants were identified. Notably, HIV-negative app users reported higher levels of perceived HIV stigma than non-users (median 18.1 [IQR 13–24] vs 14.7 [IQR 9–21],  $p=0.005$ ; table 2a). HIV-negative app users also reported higher levels of internalized homophobia (median 8.1 [IQR 2–12] vs 6.1 [IQR 0–11],  $p=0.04$ ). When compared to HIV-positive app users, those who were HIV-negative experienced higher levels of perceived HIV-stigma (median 18.1 [IQR 13–24] vs 15.5 [IQR 10–21],  $p=0.007$ ). Because these differences were small these subgroups were pooled in further analyses and reported in table 2a. We also provide results stratified by HIV-status in table 2b. App users had higher median scores on the perceived HIV discrimination (median 10 [IQR 5–15] vs 8 [IQR 2–13],  $p=0.001$ ) and perceived HIV stigma (median 19 [IQR 11–23] vs 15 [IQR 8–22],  $p=0.01$ ) scales, compared to non-app users (Table 2a). App users also had higher scores on the experienced sexual minority stigma scale (median 6 [IQR 0–12] vs 0 [IQR 0–9],  $p<0.001$ ) and the racial discrimination scale (median 6 [IQR 0–12] vs 0 [IQR 0–6],  $p<0.0001$ ). In addition, app users scored higher on

the statement “In the last 12 months, I have perceived a rise in homophobia/transphobia” (perceived homophobia; median 12 [IQR 3–18] vs 9 [IQR 0–18],  $p=0.04$ ). Daily app users also rated this statement higher than those who used apps on a less than daily basis (median 15 [IQR 6–21] vs 9 [IQR 3–18],  $p=0.03$ ). There were no other differences between daily and non-daily app users.

We found no demographic differences between users by app. Of the 302 app users who reported which apps they used, 257 (85%) indicated use of two or more apps for finding sex partners and 116 (38%) reported using four or more apps. Of the 10 apps, five were used by 100 or more participants. Among app users, there were several differences in stigma scores between the most frequently used apps (Table 3). Among all app users, those who use Grindr, a popular gay dating app with a profile search feature only, reported higher perceived HIV stigma (median score 19 [IQR 14–24] vs 16 [IQR 10–21],  $p=0.003$ ) and internalized HIV stigma (median score 6 [IQR 2–11] vs 3 [IQR 0–8],  $p=0.02$ ), as well as racial discrimination (median score 3 [IQR 0–5] vs 3 [IQR 0–4],  $p=0.03$ ). Those who use Facebook to find sex partners reported higher experienced sexual minority stigma (median score 2 [IQR 1–6] vs 2 [IQR 0–4],  $p=0.02$ ) and higher perceived homophobia (median 5 [IQR 2–7] vs 3 [IQR 1–6],  $p=0.02$ ). Users of Jack’D, another popular gay dating app with profile search features only, reported higher internalized HIV stigma (median score 5 [IQR 1–11] vs 3 [IQR 0–6.5],  $p=0.05$ ), but lower experienced sexual minority stigma (median score 2 [IQR 0–4] vs 3 [IQR 0–5],  $p=0.03$ ), and racial discrimination (median score 2 [IQR 0–4] vs 3 [IQR 0–6],  $p=0.02$ ). There were no other differences between apps.

## DISCUSSION

Our study demonstrates higher levels of multiple stigmas among YBMSM app users compared to non-users. Despite the increasing use of apps for seeking sex online, few studies have investigated the association between app use and stigma. These studies have found associations between high levels of internalized HIV stigma and high sexual risk-taking with HIV-negative partners (Burnham et al., 2016), higher risk of HIV with app use (Stahlman et al., 2017), as well as associations between higher levels of sexual minority stigma among app users (Lemke & Weber, 2017; Stahlman et al., 2015; Stahlman et al., 2017). While several authors have described apps and social media as platforms used to avoid stigma (Garett, Smith, Chiu, & Young, 2016; Lemke et al., 2017; White Hughto et al., 2017), and have found higher HIV stigma scores with increasing time spent on social media (Garett et al., 2016), it was not clear if these findings translated to apps. Our study adds to this literature by demonstrating that stigma experienced by YBMSM related to race, sexual minority status and HIV is higher among app users than non-users, and by identifying nuanced differences across multiple types of stigma and different apps.

Compared to non-users, app users reported higher perceived HIV discrimination, perceived HIV stigma, experienced sexual minority stigma and racial discrimination. Prior research has suggested that individuals who experience high levels of stigma seek sex using apps to avoid further stigmatization (Schrimshaw, Downing, & Siegel, 2013). We found that app users have higher stigma scores than non-users, but our results do not support an overall increase in stigma with frequent use or more apps used. Daily users had the highest



perception of increasing homophobia, and those who use four or more apps had the highest racial stigma scores, but groups otherwise reported similar stigma scale scores. We hypothesize that the pervasiveness of stigma across online spaces is reflective of the U.S. socio-political environment, making stigmatizing experiences difficult to avoid for YBMSM. Notably, of 474 participants, 150 (32%) did not use apps. The reason for this was not investigated in our study and would present an opportunity for further investigation.

Though overall stigma scale scores in our study were low to moderate, they were higher in the HIV-related categories than race or sexual minority stigma. Literature in this area is sparse, but contrary to our results. Bogart found that race is the primary driver of stigma for YBMSM who experience intersectional stigma offline (Bogart et al., 2013). Racial discrimination has also been shown to be a more powerful predictor of poor health outcomes for YBMSM than other types of discrimination (Bogart et al., 2013; Millett et al., 2012), though this has not been studied in online environments. Even though prior studies found race to be the primary driver in intersectional stigma, our study confirms HIV as a highly stigmatizing attribute for YBMSM who use apps, which is consistent with literature describing offline environments (Mustanski et al., 2019). Despite the higher prevalence of having same-race partners in the black MSM community (Mustanski et al., 2019; Salamanca et al., 2019) than the white MSM community, it is possible that since apps facilitate sexual exchanges, HIV status has a greater impact on choice of sexual partner based on concordant HIV status (serosorting) than does race. Though it should be noted that serosorting has not proven a consistently effective means of reducing HIV incidence (Purcell, Higa, Mizuno, & Lyles, 2017). It is also possible that this reflects a change over time facilitated by online sex-seeking, which may place a higher emphasis on health status than race.

We found small but meaningful differences in stigma when stratified by HIV status. HIV-negative app users reported higher levels of internalized homophobia than non-users. It may be that these men are hiding their same-sex identity in offline settings and seek sex partners online because of higher perceived anonymity (Lemke et al., 2017; Stahlman et al., 2015) and lower levels of social support or connection to the gay community offline. Interestingly, we found that HIV-negative app users reported higher levels of perceived HIV stigma than non-users, and higher levels than HIV-positive app users. While it is not entirely clear why HIV-negative app users experience higher levels of HIV-related stigma online, this is consistent with prior studies (Arscott, Humphreys, Merwin, & Relf, 2019). A possible explanation is that HIV-positive users exhibit more resilience than HIV-negative users (Barry et al., 2018; White Hughto, Hidalgo, Bazzi, Reisner, & Mimiaga, 2016). In our analyses, we combined participants regardless of their HIV status, except as initially presented in table 2b. Prior studies have shown that YBMSM who are HIV-negative experience high levels of HIV-related stigma regardless of their HIV-status (Arnold et al., 2014; Arscott et al., 2019; Dubov, Galbo, Altice, & Fraenkel, 2018). For example, those who take HIV Pre-Exposure Prophylaxis (PrEP) experience HIV stigma from friends and family due to misconceptions about medications and stereotypes about sexual behaviors (Dubov, Galbo, Altice, & Fraenkel, 2018). Thus, YBMSM experience HIV stigma because of the stereotypes held of YBMSM's higher risk of acquiring HIV (Arnold et al., 2014; Arscott et al., 2019). Our data showed that while the mean perceived risk score among HIV-negative participants was not high, perceived stigma was high among both HIV-positive and HIV-negative respondents,

and higher among app users than non-users. Stereotypes of YBMSM as “high risk” have been previously framed as “sexual racism”, through which YBMSM are seen as less desirable partners due to perception of high rates of HIV in the Black MSM community (Arscott et al., 2019). As a consequence, many YBMSM perceive and internalize HIV stigma despite being HIV-negative themselves (Bird & Voisin, 2013). Because of the high levels of HIV stigma among HIV-negative YBMSM, and the small differences on the stigma scales in our study, we pooled participants in further analyses.

Apps provide different mechanisms for users to communicate, such as profile searching, direct messaging, and forum posts, providing multiple avenues for perpetuating stigma online. Many app users seek partners via multiple different apps possibly because of differing user attributes between apps (Badal, Stryker, DeLuca, & Purcell, 2018). The majority (nearly 80%) of app users in our study used at least two apps. We identified two major themes in stigma scores that varied between apps: racial discrimination and HIV-related stigma. No prior studies have examined stigma score variations by app. We show several differences in stigma between the most popular apps, but these differences were small. We hypothesize that these differences are a result of prior online and offline stigma experiences, which influence the choice of app and changes in app use over time. Apps with a public forum potentially allow stigmatizing content to be shown both on user profiles and the forum and are thus inherently different from apps with profiles only. Different interactions between users on each app likely also influence YBMSM’s stigma experiences on different apps, and also provides targeted audiences for interventions.

Our study is subject to several limitations. First, the design of this study was cross-sectional, utilizing only baseline data. As such, we are unable to determine temporality or draw conclusions about HIV acquisition risk. While this limits our ability to establish causality, we asked participants about app use in the preceding three months and assessed stigma at baseline. It is therefore likely that some of the stigma stems from app use, though stigma offline and in other online venues may also contribute. Future longitudinal studies are needed to establish causality. Second, the stigma assessment tools used were not designed for assessing online stigma. Validated stigma measures for apps are needed. Third, there is geographic variability in users’ experience and variability in apps’ target demographics that influence the observed differences between app users and non-users and differences by app. For example, users in smaller communities in the South have different stigma experiences than those in metropolitan areas. In the rural South, sexual minority stigma is a powerful driver of HIV infection due to a socially conservative climate with negative cultural and religious attitudes toward homosexuality (Lichtenstein, Kay, Klinger, & Mutchler, 2018). Fourth, we measured frequency of stigma experiences in our study and did not include measure of severity or impact of stigma. This is an area that should be explored in future studies. Fifth, a major methodological limitation is the comparison of apps when many individuals report using multiple apps. We report this in table 3. Therefore, the comparisons between apps must be interpreted with caution. It should also be noted that the levels of stigma vary widely between the stigma categories. For example, as shown in Table 2a, perceived HIV-stigma received a score of 19/30 on the normalized scale, and three measurements of homophobia received scores from 12–15/30, whereas experienced sexual minority stigma received a score of 6/30 among app users. These differences may be a

reflection of the attitudes of the respondents' communities and levels of support, perhaps also influenced by degree of urbanicity of the respondents' community. Also of note are the low scores for the two categories assessed only by HIV-positive respondents. Since the respondents were enrolled in an HIV research study, HIV-positive respondents are more likely to be engaged in care, which may in turn have decreased internalized HIV stigma and experiences of HIV discrimination. Finally, the app market is rapidly changing and stigma experiences may also change over time. Data were collected between 2013 and 2015 and since then there have been changes in the popularity of apps and number of apps available, and the use of apps for dating and sex has become more normalized (Hightow-Weidman et al., 2018). While this is a limitation of our study, due to the rapid changes in technology, survey-based research will always lag behind these changes. Important information can still be gleaned from data showing significant differences in stigma with app use. Our study is underpowered in its ability to distinguish differences in apps that specifically target YBMSM versus apps with a more general demographic target. Future studies should aim to establish whether stigma on apps has increased further with apps' increased place in dating and sex-seeking. Qualitative research is needed to better understand how intersectional stigma is experienced by YBMSM on apps and how it facilitates online environments of high HIV vulnerability. Since stigma is associated with the use of apps, and apps is a place of sexual negotiation for YBMSM, apps provide an important place for anti-stigma interventions aimed to reduce HIV incidence.

## CONCLUSION

Despite these limitations, our study clearly demonstrates a need for socially responsible app development and app-based interventions that address stigma. Apps must maintain stringent community standards and promote environments of diversity and inclusivity to provide safe spaces for YBMSM. Considering the prominent role apps play in social and sexual networking for YBMSM, directed interventions that both reduce stigma on apps and ensure that offline stigma experiences are not perpetuated in online spaces are needed.

## Acknowledgments

Sources of support:

- Addressing stigma among Black MSM in a mobile phone and internet HIV intervention (R21MH105292)
- [Healthpowerment.org](https://www.healthpowerment.org/): an online and mobile HIV intervention for young Black MSM (R01MH093275)
- Increasing engagement and improving HIV care outcomes via stigma reduction in an online social networking intervention among racially diverse young men who have sex with men and transgender women (R01MD013623)
- Training in Sexually Transmitted Diseases and HIV (T32AI007001; Rosengren)

## REFERENCES

- Arnold EA, Rebchook GM, & Kegeles SM (2014). 'Triply cursed': racism, homophobia and HIV-related stigma are barriers to regular HIV testing, treatment adherence and disclosure among young Black gay men. *Culture, health & sexuality*, 16(6), 710–722. doi:10.1080/13691058.2014.905706

- Arscott J, Humphreys J, Merwin E, & Relf M (2019). "That Guy is Gay and Black. That's a Red Flag." How HIV Stigma and Racism Affect Perception of Risk Among Young Black Men Who Have Sex with Men. *AIDS and Behavior*. doi:10.1007/s10461-019-02607-4
- Badal HJ, Stryker JE, DeLuca N, & Purcell DW (2018). Swipe Right: Dating Website and App Use Among Men Who Have Sex With Men. *AIDS and Behavior*, 22(4), 1265–1272. doi:10.1007/s10461-017-1882-7 [PubMed: 28884248]
- Barry MC, Threats M, Blackburn NA, LeGrand S, Dong W, Pulley DV, . . . Muessig KE (2018). "Stay strong! keep ya head up! move on! it gets better!!!!": resilience processes in the healthMpowerment online intervention of young black gay, bisexual and other men who have sex with men. *AIDS Care*, 30(sup5), S27–s38. doi:10.1080/09540121.2018.1510106 [PubMed: 30632775]
- Bartone MD (2018). Jack'd, a Mobile Social Networking Application: A Site of Exclusion Within a Site of Inclusion. *J Homosex*, 65(4), 501–523. doi:10.1080/00918369.2017.1324676 [PubMed: 28506123]
- Bird JD, & Voisin DR (2013). "You're an open target to be abused": a qualitative study of stigma and HIV self-disclosure among Black men who have sex with men. *American Journal of Public Health*, 103(12), 2193–2199. doi:10.2105/ajph.2013.301437 [PubMed: 24134345]
- Bogart LM, Landrine H, Galvan FH, Wagner GJ, & Klein DJ (2013). Perceived discrimination and physical health among HIV-positive Black and Latino men who have sex with men. *AIDS and Behavior*, 17(4), 1431–1441. doi:10.1007/s10461-012-0397-5 [PubMed: 23297084]
- Burnham KE, Cruess DG, Kalichman MO, Grebler T, Cherry C, & Kalichman SC (2016). Trauma symptoms, internalized stigma, social support, and sexual risk behavior among HIV-positive gay and bisexual MSM who have sought sex partners online. *AIDS Care*, 28(3), 347–353. doi: 10.1080/09540121.2015.1096894 [PubMed: 26461452]
- Centers for Disease Control and Prevention. (2019). HIV Among Youth. Retrieved from <https://www.cdc.gov/hiv/group/age/youth/index.html>
- Choi KH, Paul J, Ayala G, Boylan R, & Gregorich SE (2013). Experiences of discrimination and their impact on the mental health among African American, Asian and Pacific Islander, and Latino men who have sex with men. *American Journal of Public Health*, 103(5), 868–874. doi:10.2105/ajph.2012.301052 [PubMed: 23488483]
- Dubov A, Galbo P Jr., Altice FL, & Fraenkel L (2018). Stigma and Shame Experiences by MSM Who Take PrEP for HIV Prevention: A Qualitative Study. *Am J Mens Health*, 12(6), 1843–1854. doi: 10.1177/1557988318797437 [PubMed: 30160195]
- Earnshaw VA, Smith LR, Chaudoir SR, Amico KR, & Copenhaver MM (2013). HIV stigma mechanisms and well-being among PLWH: a test of the HIV stigma framework. *AIDS and Behavior*, 17(5), 1785–1795. doi:10.1007/s10461-013-0437-9 [PubMed: 23456594]
- Gamarel KE, Nelson KM, Stephenson R, Santiago Rivera OJ, Chiaramonte D, & Miller RL (2018). Anticipated HIV Stigma and Delays in Regular HIV Testing Behaviors Among Sexually-Active Young Gay, Bisexual, and Other Men Who Have Sex with Men and Transgender Women. *AIDS and Behavior*, 22(2), 522–530. doi:10.1007/s10461-017-2005-1 [PubMed: 29214408]
- Garett R, Smith J, Chiu J, & Young SD (2016). HIV/AIDS stigma among a sample of primarily African-American and Latino men who have sex with men social media users. *AIDS Care*, 28(6), 731–735. doi:10.1080/09540121.2016.1146395 [PubMed: 26873022]
- Glick SN, & Golden MR (2010). Persistence of racial differences in attitudes toward homosexuality in the United States. *Journal of Acquired Immune Deficiency Syndromes*, 55(4), 516–523. doi: 10.1097/QAI.0b013e3181f275e0 [PubMed: 20838226]
- Grov C, Breslow AS, Newcomb ME, Rosenberger JG, & Bauermeister JA (2014). Gay and bisexual men's use of the Internet: research from the 1990s through 2013. *Journal of Sex Research*, 51(4), 390–409. doi:10.1080/00224499.2013.871626 [PubMed: 24754360]
- Han CS, Ayala G, Paul JP, Boylan R, Gregorich SE, & Choi KH (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 [PubMed: 25060122]
- Hatzenbuehler ML (2016). Structural stigma: Research evidence and implications for psychological science. *American Psychologist*, 71(8), 742–751. doi:10.1037/amp0000068 [PubMed: 27977256]

- Hatzenbuehler ML, Nolen-Hoeksema S, & Erickson SJ (2008). Minority stress predictors of HIV risk behavior, substance use, and depressive symptoms: results from a prospective study of bereaved gay men. *Health Psychology, 27*(4), 455–462. doi:10.1037/0278-6133.27.4.455 [PubMed: 18643003]
- Herek GM, Gillis JR, & Cogan JC (2009). Internalized stigma among sexual minority adults: Insights from a social psychological perspective. *Journal of Counseling Psychology, 56*(1), 32–43. doi: 10.1037/a0014672
- Hightow-Weidman LB, LeGrand S, Muessig KE, Simmons RA, Soni K, Choi SK, . . . Egger JR (2018). A Randomized Trial of an Online Risk Reduction Intervention for Young Black MSM. *AIDS and Behavior*. doi:10.1007/s10461-018-2289-9
- Horvath KJ, Oakes JM, & Rosser BR (2008). Sexual negotiation and HIV serodisclosure among men who have sex with men with their online and offline partners. *Journal of Urban Health, 85*(5), 744–758. doi:10.1007/s11524-008-9299-2 [PubMed: 18649141]
- Kalichman SC, Simbayi LC, Cloete A, Mthembu PP, Mkhonta RN, & Ginindza T (2009). Measuring AIDS stigmas in people living with HIV/AIDS: the Internalized AIDS-Related Stigma Scale. *AIDS Care, 21*(1), 87–93. doi:10.1080/09540120802032627 [PubMed: 19085224]
- Lemke R, & Weber M (2017). That Man Behind the Curtain: Investigating the Sexual Online Dating Behavior of Men Who Have Sex With Men but Hide Their Same-Sex Sexual Attraction in Offline Surroundings. *Journal of Homosexuality, 64*(11), 1561–1582. doi: 10.1080/00918369.2016.1249735 [PubMed: 27754811]
- Lichtenstein B, Kay ES, Klinger I, & Mutchler MG (2018). Ricky and Lucy: gender stereotyping among young Black men who have sex with men in the US Deep South and the implications for HIV risk in a severely affected population. *Cult Health Sex, 20*(3), 351–365. doi: 10.1080/13691058.2017.1347280 [PubMed: 28720021]
- Macapagal K, Moskowitz DA, Li DH, Carrion A, Bettin E, Fisher CB, & Mustanski B (2018). Hookup App Use, Sexual Behavior, and Sexual Health Among Adolescent Men Who Have Sex With Men in the United States. *Journal of Adolescent Health, 62*(6), 708–715. doi:10.1016/j.jadohealth.2018.01.001 [PubMed: 29784114]
- Miller B (2019). A Picture is Worth 1000 Messages: Investigating Face and Body Photos on Mobile Dating Apps for Men Who Have Sex with Men. *Journal of Homosexuality, 1–25*. doi: 10.1080/00918369.2019.1610630
- Millett GA, Peterson JL, Flores SA, Hart TA, Jeffries W. L. t., Wilson PA, . . . Remis RS (2012). Comparisons of disparities and risks of HIV infection in black and other men who have sex with men in Canada, UK, and USA: a meta-analysis. *Lancet, 380*(9839), 341–348. doi:10.1016/s0140-6736(12)60899-x [PubMed: 22819656]
- Muessig K, Barry M, Dong W, Pulley D, Blackburn N, Sallabank G, . . . Bauermeister J, editors. . (2017). “How do we as young Black gay men stand strong?”: the healthMpowerment online intervention as a space to engage with stigma related to HIV, sexuality, and race. Paper presented at the 9th IAS Conference on HIV Science (IAS 2017), Paris, France.
- Mustanski B, Morgan E, D’Aquila R, Birkett M, Janulis P, & Newcomb ME (2019). Individual and Network Factors Associated With Racial Disparities in HIV Among Young Men Who Have Sex With Men: Results From the RADAR Cohort Study. *Journal of Acquired Immune Deficiency Syndromes, 80*(1), 24–30. doi:10.1097/qai.0000000000001886 [PubMed: 30365451]
- Nguyen M, Bin YS, & Campbell A (2012). Comparing online and offline self-disclosure: a systematic review. *Cyberpsychol Behav Soc Netw, 15*(2), 103–111. doi:10.1089/cyber.2011.0277 [PubMed: 22032794]
- Philbin MM, Parker CM, Parker RG, Wilson PA, Garcia J, & Hirsch JS (2016). The Promise of Pre-Exposure Prophylaxis for Black Men Who Have Sex with Men: An Ecological Approach to Attitudes, Beliefs, and Barriers. *AIDS Patient Care and STDS, 30*(6), 282–290. doi:10.1089/apc.2016.0037 [PubMed: 27220036]
- Phillips G 2nd, Birkett M, Hammond S, & Mustanski B (2016). Partner Preference Among Men Who Have Sex with Men: Potential Contribution to Spread of HIV Within Minority Populations. *LGBT Health, 3*(3), 225–232. doi:10.1089/lgbt.2015.0122 [PubMed: 26907954]
- Purcell DW, Higa D, Mizuno Y, & Lyles C (2017). Quantifying the Harms and Benefits from Serosorting Among HIV-Negative Gay and Bisexual Men: A Systematic Review and Meta-

- analysis. *AIDS and Behavior*, 21(10), 2835–2843. doi:10.1007/s10461-017-1800-z [PubMed: 28573378]
- Reidpath DD, & Chan KY (2005). A method for the quantitative analysis of the layering of HIV-related stigma. *AIDS Care*, 17(4), 425–432. doi:10.1080/09540120412331319769 [PubMed: 16036227]
- Salamanca P, Janulis P, Elliott M, Birkett M, Mustanski B, & Phillips G 2nd. (2019). An Investigation of Racial and Ethnic Homophily on Grindr Among an Ongoing Cohort Study of YMSM. *AIDS and Behavior*, 23(1), 302–311. doi:10.1007/s10461-018-2262-7 [PubMed: 30141150]
- Sang JM, Matthews DD, Meanley SP, Eaton LA, & Stall RD (2018). Assessing HIV Stigma on Prevention Strategies for Black Men Who Have Sex with Men in the United States. *AIDS and Behavior*, 22(12), 3879–3886. doi:10.1007/s10461-018-2181-7 [PubMed: 29860555]
- Schrimshaw EW, Downing MJ Jr., & Siegel K (2013). Sexual venue selection and strategies for concealment of same-sex behavior among non-disclosing men who have sex with men and women. *Journal of Homosexuality*, 60(1), 120–145. doi:10.1080/00918369.2013.735945 [PubMed: 23241205]
- Stahlman S, Grosso A, Ketende S, Mothopeng T, Taruberekera N, Nkonyana J, . . . Baral S (2015). Characteristics of men who have sex with men in southern Africa who seek sex online: a cross-sectional study. *Journal of Medical Internet Research*, 17(5), e129. doi:10.2196/jmir.4230 [PubMed: 26006788]
- Stahlman S, Nowak RG, Liu H, Crowell TA, Ketende S, Blattner WA, . . . Baral SD (2017). Online Sex-Seeking Among Men who have Sex with Men in Nigeria: Implications for Online Intervention. *AIDS and Behavior*, 21(11), 3068–3077. doi:10.1007/s10461-016-1437-3 [PubMed: 27233248]
- Steward WT, Herek GM, Ramakrishna J, Bharat S, Chandy S, Wrubel J, & Ekstrand ML (2008). HIV-related stigma: adapting a theoretical framework for use in India. *Social Science and Medicine*, 67(8), 1225–1235. doi:10.1016/j.socscimed.2008.05.032 [PubMed: 18599171]
- Suler J (2004). The online disinhibition effect. *Cyberpsychol Behav*, 7(3), 321–326. doi: 10.1089/1094931041291295 [PubMed: 15257832]
- Turan B, Hatcher AM, Weiser SD, Johnson MO, Rice WS, & Turan JM (2017). Framing Mechanisms Linking HIV-Related Stigma, Adherence to Treatment, and Health Outcomes. *American Journal of Public Health*, 107(6), 863–869. doi:10.2105/ajph.2017.303744 [PubMed: 28426316]
- Viruell-Fuentes EA, Miranda PY, & Abdulrahim S (2012). More than culture: structural racism, intersectionality theory, and immigrant health. *Social Science and Medicine*, 75(12), 2099–2106. doi:10.1016/j.socscimed.2011.12.037 [PubMed: 22386617]
- White Hughto JM, Hidalgo AP, Bazzi AR, Reisner SL, & Mimiaga MJ (2016). Indicators of HIV-risk resilience among men who have sex with men: a content analysis of online profiles. *Sex Health*. doi:10.1071/sh16023
- White Hughto JM, Pachankis JE, Eldahan AI, & Keene DE (2017). “You Can’t Just Walk Down the Street and Meet Someone”: The Intersection of Social-Sexual Networking Technology, Stigma, and Health Among Gay and Bisexual Men in the Small City. *American journal of men’s health*, 11(3), 726–736. doi:10.1177/1557988316679563

**Table 1.**

Population demographics.

	App users		Non-users		Total		P-value <sup>a</sup>
	N=324	%	N=150	%	N=474	%	
Age							
Median (IQR)	24 (22-27)		24 (22-26)		24 (22-27)		0.97
18-24 years old	170	52%	92	61%	262	55%	
25-30 years old	154	48%	58	39%	212	45%	
Multirace or multiethnicity	102	31%	52	35%	154	32%	0.49
Gay or bisexual	287	89%	124	83%	411	87%	0.08
Single	227	70%	75	50%	302	64%	<b>&lt;0.0001</b>
Education							
More than high school	295	91%	136	91%	431	91%	
College degree	92	28%	23	15%	115	24%	<b>0.01</b>
Employed	205	63%	101	67%	306	65%	0.39
In school	167	52%	70	47%	237	50%	0.32
Income <\$10,999	167	52%	81	54%	248	52%	0.47
HIV-positive	127	39%	72	48%	199	42%	0.07
Insured	230	71%	109	73%	339	72%	0.71
Homeless <sup>b</sup>	71	22%	33	22%	104	22%	0.98
Arrested or incarcerated <sup>b</sup>	24	7%	9	6%	33	7%	0.58
Transactional sex <sup>b</sup>	51	16%	5	3%	56	12%	<b>0.03</b>
Concurrent partners <sup>b</sup>	173	53%	27	18%	200	42%	<b>&lt;0.0001</b>
Median perceived HIV risk score (IQR)	9 (7-11)		11 (8-13)		10 (8-13)		<b>0.01</b>

Abbreviations: IQR, interquartile range.

<sup>a</sup>P values were obtained from the Kruskal-Wallis test for continuous variables and chi square for dichotomous variables.<sup>b</sup>In the past three months

**Table 2a.**

Multiple stigma by app use.

Scale	App users		Non-users		<i>P</i> -value <sup>a</sup>
	N=324		N=150		
	<i>Median score</i>	<i>IQR</i>	<i>Median score</i>	<i>IQR</i>	
Perceived HIV discrimination	10	5-15	8	2-13	<b>0.001</b>
Perceived HIV stigma	19	11-23	15	8-22	<b>0.01</b>
Experienced sexual minority stigma	6	0-12	0	0-9	<b>&lt;0.001</b>
Internalized homophobia	15	12-21	15	9-21	<b>0.04</b>
Perceived the world as dangerous for LGBTQ	15	12-21	15	9-21	0.16
Perceived a rise in homophobia/transphobia	12	3-18	9	0-18	0.06
Racial discrimination	8	2.4-12	6	0-10.8	<b>&lt;0.0001</b>
Experienced HIV discrimination (HIV-positive only)	6	0-12	0	0-6	0.16
Internalized HIV stigma (HIV-positive only)	3	0-9	3	0-6	0.35

Abbreviations: IQR, interquartile range.

<sup>a</sup>P-values were obtained from the Kruskal-Wallis test.



**Table 2b.**

Multiple stigma by app use, stratified by HIV-status.

Scale	HIV+ app users N=126 <sup>b</sup>			HIV+ non-users N=71 <sup>b</sup>			HIV- app users N=196 <sup>b</sup>			HIV- non-users N=78 <sup>b</sup>		
	Median score	IQR	P-value <sup>a</sup>	Median score	IQR	P-value <sup>a</sup>	Median score	IQR	P-value <sup>a</sup>	Median score	IQR	P-value <sup>a</sup>
Perceived HIV discrimination	10.8	5-16	<b>0.049</b>	8.3	1-14	<b>0.049</b>	10.8	5-15	<b>0.01</b>	8.5	2-12	<b>0.01</b>
Perceived HIV stigma	15.5	10-21	0.71	14.9	8-23	0.71	18.1	13-24	<b>0.005</b>	14.7	9-21	<b>0.005</b>
Experienced sexual minority stigma	9.4	0-15	<b>0.001</b>	4.9	0-6	<b>0.001</b>	7.4	0-12	<b>0.03</b>	5.5	0-9	<b>0.03</b>
Internalized homophobia	8.5	2-13	0.54	8.3	1-13	0.54	8.1	2-12	<b>0.04</b>	6.1	0-11	<b>0.04</b>
Perceived the world as dangerous for LGBTQ	16.2	12-21	0.35	14.9	6-21	0.35	15.4	12-21	0.25	14.4	9-21	0.25
Perceived a rise in homophobia/transphobia	12.0	3-18	0.15	10.0	0-18	0.15	11.8	3-18	0.16	10.1	3-18	0.16
Racial discrimination	8.1	0-12	<b>0.0002</b>	3.4	0-6	<b>0.0002</b>	8.1	0-15	<b>&lt;0.0001</b>	3.2	0-3	<b>&lt;0.0001</b>
Experienced HIV discrimination (HIV-positive only)	5.9	0-9	0.16	4.4	0-6	0.16						
Internalized HIV stigma (HIV-positive only)	6.7	0-10	0.35	6.0	0-9	0.35						

Abbreviations: IQR, interquartile range.

<sup>a</sup>P-values were obtained from the Kruskal-Wallis test.

<sup>b</sup>Number of missing responses does not exceed 10% for any group

**Table 3.**

Multiple stigmas by most frequently used apps

	Jack'D N=252			Grindr N=161			Facebook N=100			Four or more apps N=116		
	Mean	IQR	P-value <sup>a</sup>	Mean	IQR	P-value <sup>a</sup>	Mean	IQR	P-value <sup>a</sup>	Mean	IQR	P-value <sup>a</sup>
Experienced HIV discrimination (HIV-positive only)	10.5	5-15	0.15	10.3	5-15	0.27	11.6	4-18	0.30	2.2	0-3.5	0.50
Perceived HIV discrimination	17.0	12-23	0.16	18.4	14-24	0.36	16.7	10-21	0.36	11.3	6-16	0.46
Perceived HIV stigma	7.6	0-12	0.68	8.5	0-15	<b>0.003</b>	10.0	3-18	0.42	18.3	14-24	0.10
Internalized HIV stigma (HIV-positive only)	15.4	9-21	<b>0.05</b>	15.7	12-21	<b>0.02</b>	14.3	9-21	0.08	7.4	1-14	0.15
Experienced sexual minority stigma	12.2	3-18	<b>0.03</b>	11.4	3-18	0.66	13.8	6-21	<b>0.02</b>	2.9	0-5	0.55
Perceived the world as dangerous for LGBTQ	8.4	2-12	0.13	8.1	2-12	0.93	8.8	4-13	<b>0.02</b>	5.2	4-7	0.78
Perceived a rise in homophobia/ transphobia	7.5	0-12	0.28	9.0	0-15	0.44	10.0	0-18	<b>0.02</b>	3.9	1-6	0.98
Internalized homophobia	5.2	0-9	0.47	5.6	0-9	<b>0.67</b>	7.6	0-15	0.38	11.5	7-15	0.32
Racial discrimination	7.3	1-11	<b>0.02</b>	7.9	2-11	<b>0.03</b>	8.6	1-16	0.10	3.2	0-5	<b>0.04</b>

Abbreviations: IQR, interquartile range.

<sup>a</sup>P values were obtained from the Kruskal-Wallis test.