

Sexually transmitted infections and factors associated with condom use in dating app users in Brazil

Infecções sexualmente transmissíveis e fatores associados ao uso do preservativo em usuários de aplicativos de encontro no Brasil

Infecciones de transmisión sexual y factores asociados al uso del preservativo en usuarios de aplicaciones de citas en Brasil

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Keywords

Homosexuality, male; Sexually transmitted diseases; HIV infections; Sexual behavior; Mobile applications; Health vulnerability

Descritores

Homossexualidade masculina; Doenças sexualmente transmissíveis; Infecções por HIV; Comportamento sexual; Aplicativos móveis; Vulnerabilidade em saúde

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Abstract

Objectives: To establish the characteristics of Brazilian geosocial dating app users, estimate the prevalence of sexually transmitted infections (STIs) and factors associated with condom use.

Methods: This was a cross-sectional descriptive study with a sample of 2,250 men who have sex with men (MSM) from across Brazil. The social network Facebook® was used to disseminate and collect data for the survey, through a post boosted weekly, between November 2016 and January 2017. The data were submitted to univariate and bivariate analysis with the help of SPSS software.

Results: Most participants were young (25 years old), had a university degree (57.8%), were homosexual (75.7%), and had met their partners on dating apps (64.1%), especially Tinder® (57.3%) and Grindr® (53.3%), for sexual purposes (69.7%). The prevalence of STIs was 11.1%, and 7.1% were HIV+. Factors associated with condom use were: meeting partners on app ($p=0.003$), using Grindr® ($p=0.002$), Scruff® ($p=0.027$) or Hornet® ($p<0.001$), using apps to find friends ($p<0.001$), sex ($p<0.001$) or relationships ($p<0.001$), frequency of app use ($p<0.001$) and using apps at night ($p=0.003$).

Conclusion: App users are young, with high education levels and are familiar with the apps due to time of use. The prevalence of STIs was high, especially HIV. The sociodemographic characteristics and particularities of the use and consumption of app were associated with consistent condom use, especially reason for use, frequency, time of day, and app used.

Resumo

Objetivos: Caracterizar os usuários brasileiros de aplicativos de encontro baseados em geolocalização, estimar a prevalência de Infecções Sexualmente Transmissíveis (ISTs) e fatores associados ao uso do preservativo.

Métodos: Estudo descritivo, transversal, com amostra de 2.250 homens que fazem sexo com homens (HSH) de todo o Brasil. Utilizou-se da rede social Facebook® para a coleta e divulgação da pesquisa, por meio de uma postagem impulsionada semanalmente, de novembro de 2016 a janeiro de 2017. Os dados foram analisados de forma uni e bivariada com o auxílio do software SPSS.

Resultados: Houve a predominância de participantes jovens (25 anos), com ensino superior completo (57,8%) e homossexuais (75,7%), que conheceram os seus parceiros através de aplicativos (64,1%), utilizando, principalmente, o Tinder® (57,3%) e Grindr® (53,3%) para fins sexuais (69,7%). A prevalência de ISTs foi de 11,1%, sendo 7,1 de HIV. Foram fatores associados ao uso de preservativos: conhecer o parceiro pelo app ($p=0,003$), utilizar o Grindr® ($p=0,002$), Scruff® ($p=0,027$) ou Hornet® ($p<0,001$), usar os apps para amizade ($p<0,001$), sexo ($p<0,001$) ou relacionamento ($p<0,001$), frequência de uso do aplicativo ($p<0,001$) e utilizar os apps durante à noite ($p=0,003$).

Conclusão: Os usuários são jovens, com alto nível educacional e que demonstram familiaridade com as apps pelo tempo de uso. A prevalência de ISTs foi elevada, sobretudo da infecção pelo HIV. Características sociodemográficas e particularidades do uso e consumo dos apps estão associadas a utilização consistente do preservativo, principalmente o motivo de uso, frequência, horário e aplicativo utilizado.

Resumen

Objetivos: caracterizar a los usuarios brasileños de aplicaciones de citas basadas en geolocalización, estimar la prevalencia de infecciones de transmisión sexual (ITS) y factores asociados al uso del preservativo.

Métodos: estudio descriptivo, transversal, con muestra de 2.250 hombres que tienen sexo con hombres (HSH) de todo Brasil. Se utilizó la red social Facebook® para la recolección y difusión de la investigación, por medio de una publicación impulsada semanalmente, de noviembre de 2016 a enero de 2017. Los datos fueron analizados de forma uni y bivariada con la ayuda del software SPSS.

Resultados: hubo un predominio de participantes jóvenes (25 años), con educación superior completa (57,8%) y homosexuales (75,7%), que conocieron a sus parejas a través de aplicaciones (64,1%), utilizando principalmente Tinder® (57,3%) y Grindr® (53,3%) para fines sexuales (69,7%). La prevalencia de ITS fue de 11,1%, siendo 7,1 de VIH. Los factores asociados al uso de preservativos fueron: conocer a la pareja a través de la app ($p=0,003$), utilizar Grindr® ($p=0,002$), Scruff® ($p=0,027$) o Hornet® ($p<0,001$), usar las apps para amistad ($p<0,001$), sexo ($p<0,001$) o relaciones ($p<0,001$), frecuencia de uso de la aplicación ($p<0,001$) y utilizar las apps durante la noche ($p=0,003$).

Conclusión: los usuarios son jóvenes, con alto nivel educativo y que demuestran familiaridad con las apps por el tiempo de uso. La prevalencia de ITS fue elevada, sobre todo de la infección por el VIH. Características sociodemográficas y particularidades del uso y consumo de las aplicaciones están asociadas a la utilización consistente del preservativo, principalmente el motivo de uso, frecuencia, horario y aplicación utilizada.

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Introduction

Men who have sex with men (MSM) belong to a population which classically presents additional vulnerability to sexually transmitted infections (STIs), due to factors such as homophobia, discrimination, difficulty accessing health services and sexual behavior.⁽¹⁾ Coupled with these vulnerabilities, the use of geosocial dating apps to find partners has boosted vulnerability behaviors.^(2,3)

Even though the literature presents several studies about this issue worldwide, most are conducted in the United States and other developed countries, with a lack of studies in Latin America that would allow to establish a profile of app users.^(2,4) In general, previous studies have shown that the use of these apps to find sexual partners can result in new patterns of behaviors and relationships that place MSM at risk of STIs.⁽⁴⁻⁷⁾

In general, there are two types of apps: those aimed at the general population and those directed only at specific populations, such as lesbians, gays, bisexuals, transvestites, transsexuals, and transgenders (LGBTQ+). Among the latter, the most popular in Brazil and the world are Grindr®, SCRUFF® and Hornet®. The first of its kind, Grindr® alone has 2.4 million active users every day in almost 200 countries.⁽²⁾

Even though the market for these apps is one of the greatest in the technology field, little is known about Brazil's participation, with most information limited to assumptions made by high-circulation nonscientific newspapers.⁽⁸⁾ Identifying the profile of users is the first step to assessing vulnerability behaviors and provide an idea of the social, demographic and use characteristics that can influence the consumption of apps and, consequently, associated vulnerabilities.⁽⁹⁾

Based on the above, the goal of the present study was to be the first to conduct a nationwide survey to establish the profile of geosocial dating app users in Brazil in terms social, demographic and consumption variables of apps and estimate the prevalence of STIs and factors associated with condom use.

Methods

This was a descriptive and cohort cross-sectional study with 2250 individuals who participated in the epidemiological survey "Behaviors, Practices and Vulnerabilities of men who have sex with men who use geosocial dating apps in Brazil" (*Comportamentos, Práticas e Vulnerabilidades de homens que fazem sexo com homens usuários de aplicativos para encontros baseado em geocalização no Brasil*)⁽¹⁰⁾ The study was coordinated by researchers of the Ribeirão Preto College of Nursing at the University of São Paulo, in partnership with the Federal University of Piauí and the Federal Fluminense University.

To reach the intended sample size, the study was disseminated on Facebook®. A fixed post was created associated with the survey's official page (<https://www.facebook.com/taafimdeque/>), presenting information about the study and an invitation to participate. This post was boosted weekly, between November 2016 and January 2017, reaching all regions of Brazil, until the planned sample size was reached.

The post contained a hyperlink that provided access to the survey questionnaire, which was subdivided into four sections in order to obtain social, demographic and health information on the participants: (1) Personal characteristics; (2) Sociocultural characteristics; (3) Health issues; and (4) Sexual practices. The researchers used the free tool Google forms to create a form projected so that all questions had to be answered. The questionnaire would only be considered for analysis if all the conditions had been met, and, therefore, incomplete surveys were not saved by the system. To answer the questionnaire, participants provided their email address, preventing duplicated entries.

The inclusion criteria were: identifying as a cisgender man; being 18 years of age or older; and having used apps for sexual encounters at least once in the last 30 days. Users who were in the country at the time of the study but were not Brazilian residents were excluded, as the objective of the survey was to assess Brazilian users.

The information was grouped according to sociodemographic data, data about the consumption of apps, and the prevalence of STIs among participants, which were recorded in a Microsoft Excel database, used for the description and bivariate analysis of the data. Categorical variables were analyzed using the chi-squared test or Fisher's exact test to assess statistical significance, set at $p \leq 0.05$ with a confidence interval of 95%.

The survey was approved by the Research Ethics Committee of the Federal University of Piauí (Resolution no.: 1.523.003). The participants read the free and informed consent form and then signed it, thereby indicating their agreement with the proposed objectives and willingness to participate in the study. This consent was applied and obtained online.

Results

On average, the participants were 25.74 years old ($SD=7.76$), had completed university (57.8%), were single (75.2%), did not practice any religion (63.9%), lived with their parents (55.5%), identified themselves as homosexual (75.7%) and adopt a "versatile" sexual position (40.8%). Most participants lived in the southeast region of Brazil (50.3%) (Table 1).

Table 2 presents data about the consumption of dating apps by MSM. Of these, 64.1% had met their partners on the apps, especially through Tinder® (57.3%) and Grindr® (53.3%). The mean number of total partners in the 30 days prior to the study was 2.8, and the participants had met 1.91 of them on the apps. The participants used the apps primarily for sex (69.7%), mostly every day (36.2), at night (76.7%) and during week days (55.9%). Furthermore, most users reported having used the apps for over a year (55.5%). These findings show that the apps are not used sporadically, but are a recurring part of these men's daily lives (Table 2).

Regarding the prevalence of STIs, 11.1% had presented with an infection in the last year, includ-

Table 1. Sociodemographic characteristics of geosocial dating app users (n=2250)

Variables	n(%)	Mean	SD	Min-Max
Age (in years)		25.74	7.76	18-90
18 to 20	522(23.2)			
21 to 25	836(37.1)			
26 to 30	488(21.7)			
Over 30	376(16.7)			
Education				
Elementary education	57(2.5)			
Secondary education	445(19.7)			
University	1,303(57.8)			
Graduate	445(19.7)			
Region of residence				
North	108(4.8)			
Northeast	336(14.9)			
Center-West	202(9.0)			
Southeast	1,133(50.3)			
South	424(18.8)			
Marital Status				
Single	1,696(75.2)			
Stable relationship	516(22.9)			
Separated/divorced/widowed	38(1.7)			
Practices a religion				
Yes	810(35.9)			
No	1440(63.9)			
Living situation				
Alone	500(22.2)			
With parents/family members	1250(55.5)			
With roommate/friend	293(13.0)			
With partner	205(9.1)			
Sexual Orientation				
Heterosexual	214(9.5)			
Bisexual	291(12.9)			
Homosexual	1707(75.7)			
Pansexual	29(1.3)			
Sex position				
Only insertive	480(21.3)			
Only receptive	600(26.7)			
Versatile	919(40.8)			
Only oral sex	254(11.3)			

ing syphilis (3.1%) and herpes (1.5%). The study also showed a significant prevalence of HIV (7.1%) and a considerable number of individuals who were unaware of their HIV status (28.3%) (Table 3). Considering the high percentage of condomless sex in the 30 days prior to the survey (7.3%), an important risk factor for STIs, the researchers investigated which of the social, demographic and app consumption variables could be statistically associated with the consistent use of the male condom. The following associated factors were considered: meeting partner through app ($p=0.003$), using Grindr® ($p=0.002$), Scruff® ($p=0.027$) or Hornet® ($p<0.001$), using apps for friendship ($p<0.001$),

sex ($p < 0.001$) or relationship ($p < 0.001$), frequency of app use ($p < 0.001$), and using apps at night ($p = 0.003$).

Table 2. Characteristics related to the consumption of apps and presence of STIs among the participants (n=2250)

Variables	n(%)
Met current partner on apps	
Yes	1445(64.1)
No	727(32.3)
App used	
Grindr®	1201(53.3)
Scruff®	772(34.3)
Hornet®	1063(47.2)
Tinder®	1291(57.3)
Purpose of app use	
Friendship	1211(53.7)
Sex	1571(69.7)
Relationships	996(44.2)
Pass time	1015(45.0)
Time of app use	
Up to one year	1003(44.5)
More than one year	1251(55.5)
Frequency of app use	
Every day	817(36.2)
Twice a week	658(29.2)
Three times a week	206(9.1)
Five days a week	98(4.3)
Every day, whenever there are notifications	470(20.9)
Time of day of app use	
Morning	350(15.5)
Afternoon	654(29.0)
Night	1729(76.7)
Late night	678(30.1)
Days of week of app use	
Weekdays	1259(55.9)
Weekends	991(44.0)
Used condom in every sexual relationship?*	
Yes	2087(92.7)
No	163(7.3)
Tested for HIV? **	
Yes	1394(62.0)
No	856(38.0)
Ever had an STI?	
Yes	250(11.1)
No	1824(80.9)
I don't know	176(7.8)
If affirmative, which one?	
Yeast infection	6(0.3)
Chlamydia	6(0.3)
Gonorrhea	32(1.4)
Syphilis	70(3.1)
HPV	21(0.9)
Herpes	34(1.5)
HIV status	
HIV+	159(7.1)
HIV-	1452(64.4)
I don't know	639(28.3)

* Considering the last 30 days; **Considering the last 12 months

Table 3. Bivariate analysis of factors associated with condom use among men who have sex with men and use geosocial dating apps

Variables	Consistent condom use in the last 30 days		p-value
	Yes n(%)	No n(%)	
Met current partner on the app			0.003
Yes	1360(60.4)	85(3.7)	
No	655(29.1)	72(3.2)	
App used to find partners			
Grindr®			0.002
Yes	1133(50.3)	68(3.0)	
No	954(42.4)	95(4.2)	
Scruff®			0.027
Yes	729(32.4)	43(1.9)	
No	1358(60.3)	120(5.3)	
Hornet®			<0.001
Yes	1003(44.6)	60(2.6)	
No	1084(48.2)	103(4.6)	
Tinder®			0.161
Yes	1206(53.6)	85(3.7)	
No	881(39.1)	78(3.5)	
Reason for using app			
Friendship			<0.001
Yes	1148(51.0)	63(2.8)	
No	939(41.7)	100(4.4)	
Sex			<0.001
Yes	1484(65.9)	87(3.8)	
No	603(26.9)	76(3.4)	
Pass time			0.163
Yes	950(42.2)	65(2.9)	
No	1137(50.5)	98(4.3)	
Looking for a relationship			<0.001
Yes	945(42.0)	51(2.2)	
No	1142(50.7)	112(5.0)	
Frequency of app use			
Every day			0.046
Yes	746(31.1)	71(3.1)	
No	1341(59.6)	92(4.0)	
At least 5 days a week			0.549
Yes	93(4.5)	5(3.1)	
No	1994(95.5)	158(96.9)	
At least 3 days a week			0.588
Yes	193(90.7)	13(3.1)	
No	1894(9.3)	150(96.9)	
Only 1 day a week***			<0.001
Yes	0	1(0.0)	
No	2087(92.7)	162(7.2)	
Sex position			
Only insertive			0.621
Yes	448(21.5)	32(19.6)	
No	1639(78.5)	131(80.4)	
Only receptive			0.581
Yes	560(26.8)	40(24.5)	
No	1527(73.2)	123(75.5)	
Versatile			0.458
Yes	857(41.1)	62(38.0)	
No	1230(58.9)	101(62.0)	
Only oral sex			0.010
Yes	225(10.8)	29(17.8)	
No	1862(89.2)	134(82.2)	

Continue...

Continuation.

Variables	Consistent condom use in the last 30 days		<i>p-value</i>
	Yes n(%)	No n(%)	
Time of day of app use			
Morning			
Yes	323(14.3)	27(1.2)	0.712
No	1764(78.4)	136(6.0)	
Afternoon			0.545
Yes	610(27.1)	44(1.9)	
No	1477(65.6)	119(5.3)	
Night			0.003
Yes	1619(71.9)	110(4.9)	
No	468(20.8)	53(2.3)	
Late night			0.843
Yes	630(28.0)	48(2.1)	
No	1457(64.7)	115(5.1)	

***Fisher's exact test

Discussion

In Brazil, adherence to geosocial dating apps is high among MSM, especially the younger population (>25 years). This result corroborates the findings of a recent review⁽²⁾ and of most studies of this kind in the world.^(7,10-13)

Mobile app use by MSM is a practical and efficient way to establish sexual partnerships quicker than conventional methods. Establishing partnerships through apps allows MSM to select partners according to their preferences and change their profile, which provides users with a different experience for expressing sexuality,⁽¹⁴⁾ especially younger individuals,⁽¹⁵⁾ one reason that explains the growing popularity of these apps.

Dating apps facilitate mutual identification, communication, and encounters for casual sex among MSM. They allow users to create profiles with pictures and brief descriptions of themselves, locate other users close to them using geolocation, and exchange messages with possible sexual and romantic partners easily, discretely, conveniently and free of cost.⁽¹⁴⁻¹⁶⁾

The frequency of app use, according to the data in this study, shows that the use of these apps is, in fact, so significant to MSM that it has become part of the LGBTQ+ community. They enable interactions among members in the same region, creating and strengthening social networks that blend the virtual and real world.

Among the apps aimed exclusively at homoaffective partnerships, Grindr® stood out in terms of fre-

quency of use in this and other similar studies.^(17,18) This app is more popular among this population,^(2,17,18) connecting users discretely, conveniently and free of charge. The success of this app among mobile applications is due to the possibility of building communities, experiences of entertainment and favoring greater socialization, as the app lowers entry barriers of MSM and reduces risk of encountering homophobia.⁽¹⁹⁾ One reason for its greater popularity is that it has been around longer in the market and caused an impact on the LGBTQ+ community, thus defining a model for similar apps and its use by MSM.

Hornet®, another popular app, has over 25 million users worldwide, according to company data,⁽¹⁹⁾ and Brazil is one of its main consumer markets.⁽⁹⁾ Its popularity is associated with its innovative marketing strategies, the use of other social networks, and the pioneer approach of including sexual health information in its settings, which explains its association with condom use in our findings.⁽²⁰⁾

Profile of app users and consumption

Data analysis shows that the profile of users was closely tied to the way these apps were used and consumed. Thus, most users were young individuals, who reported being single and using the app every day for sexual purposes. In the present study, although correlation tests were not conducted among the cited factors, it is evident that the social and demographic characteristics influenced how MSM used the apps.

The predominance of younger adults (>20 years) is corroborated by the literature, with a similar situation in other countries. It is worth noting the absence of MSM 50 years or older in these studies, although there are apps exclusively focused on these users, such as DaddyHunter®.⁽²⁾ However, the predominance of youths is associated to the high frequency of app use, using the app for sexual purposes, and the high number of recent sexual partners (more than two casual partners in 30 days).^(18,20)

Longer time of app use (over one year) shows that MSM were familiar with the apps, who used them daily or at least more than 3 times a week, especially at night, as shown in other studies. This fa-

miliarity is associated with greater ease in using the app and, consequently, finding more sexual partners. On the other hand, this knowledge also favors better negotiation regarding prevention method before sexual encounters.

Although most of the participants reported being single, a significant percentage (22.9%) were looking for partners on the app even despite being in a stable relationship, which indicates that the search for partners, especially sexual ones, occurs even in the presence of a serious relationship.⁽⁵⁾ This situation fosters multiple partners and elicits a discussion about affective/romantic and sexual needs, which can be met by different people reinforcing new patterns of behaviors and relationships in the LGBTQ+ population.^(2,9)

However, the immediacy of relationships enabled by apps makes it harder for users to learn more about the preventive behavior of partners, which can increase the frequency of exposure of subjects to situations of vulnerability.⁽²⁾

HIV/AIDS and other STIs

There was significant prevalence of STIs among MSM/app users, with special mention to syphilis. The literature has shown an increase in the prevalence of the infection among the general MSM population, reaching more than 30% in some Latin American and Asian countries. For example, a Japanese study reported an association between greater rotation of sexual partners found on dating apps and elevated incidence of syphilis, indicating a pattern of re-emergence of the infection.⁽²³⁾

On the other hand, the Centers for Disease Control and Prevention (CDC) published the result of a successful initiative using Grindr® as an intervention tool to increase screening tests for syphilis.⁽²⁴⁾ These data, which depict opposite poles of the same problem, show that apps cannot be classified purely as positive or negative in terms of infection, but rather, must be associated with aspects that should be understood within a context.

Regarding the prevalence of HIV/AIDS (7.1%), the present findings can be considered cause for concern when compared to the results of the general Brazilian population (0.6%).⁽²⁵⁾

However, they are still lower than those presented in a recent survey conducted in 12 Brazilian cities⁽²⁶⁾, in which one of five MSM had HIV. However, such comparison with studies of such amplitude/sample size and different methods requires caution, because the present study worked with self-reported data, while that of Kerr (2019) worked with in-person testing.⁽²⁶⁾ Despite methodological differences, the growth in cases of HIV among this population is undeniable and reported all over the world.^(1,14-17)

Factors associated with condom use

The use of apps influenced how MSM used prevention methods, especially condoms. Use was more inconsistent among those with only casual partners, considering that these relationships are usually quick and little information tends to be exchanged.^(2,9)

Even the type of app used influences the choice of using condoms in all sexual relationships. Tinder® was the only app that was not associated with condom use, probably because it works differently from other apps. Because it functions through a system of matches between profiles and does not allow users to exchange pictures through the app, its dynamics is considered “slower” and little practical. It also favors the creation of relationships instead of just casual sex, in addition to being the only app that is not exclusive for MSM.⁽²⁷⁾

The present data show that apps are a part of the daily lives of the LGBTQ+ community, used practically every day, and an association was found between frequency of app use and condom use. Such daily and recurring use results in greater familiarity with the app, which is associated with greater contact with risk situations, allowing individuals to use the resources more effectively, optimizing the time spent on the app.⁽¹⁶⁾ Among these risk situations, unprotected anal sex with partners who they had met on the app was the most common in the literature.^(2,5)

Longer time of use of the app was also associated with condom use. An epidemiological study found variation in app use in urban areas among days of the week (weekdays and weekends), with greater use at night.⁽²⁹⁾ This leads to the inference that in periods of greater app use, there is a higher

probability of establishing sexual partnerships, with direct implications on condom use.

The present study brings important contributions to public health, showing an epidemiological scenario surrounding the introduction of new communication technologies in establishing partnerships and its implications on the increase of STIs in Brazil, filling an important gap in the area. Nursing must increasingly appropriate itself of this theme, and by understanding the complex content it can propose public health strategies that seek to reach this population that has been so marginalized by health services.

This study has several limitations. The first and probably most important one is the self-report method of data collection. Although there are caveats about the reliability of the data, the literature is full of studies that reinforce the viability of using self-reports to study diseases that are heavy in stigma and prejudice, such as HIV/AIDS, especially among populations that are hard to reach, such as MSM.^(29,30)

Engaging with the younger population on social networks (such as Facebook), may have impacted the results, which shows that the young adult population is willing to participate in studies that assess their health.⁽³¹⁾

Last, it is important to emphasize that the findings, especially those regarding the number of partners and prevalence of STIs, must be understood as part of a context, as they reflect the characteristics of individuals who belong to a given population (MSM) and are users of a tool whose purpose is to enable certain behaviors.

Conclusion

Dating apps in Brazil are mainly used by youths who identify as homosexual, have high education levels and are single. These youths use the apps intensely, especially as a way to meet new sexual partners. The particularities of this consumption are associated with condom use, especially purpose, frequency, and time of day of app use. The experiences provided by the search for partners on apps lead to patterns of behaviors and relationships, expos-

ing MSM to situations of vulnerability in terms of STIs, which present elevated prevalence, especially HIV and syphilis.

Collaborations

Matos MCB, Queiroz AAFLN, Sousa AFL, Araújo TME and Reis RK declare that they contributed to the conception of the study, data analysis and interpretation, drafting the article, critical review of its intellectual content, and final approval of version to be published.

References

1. D'Anna LH, Warner L, Margolis AD, Korosteleva OA, O'Donnell L, Rietmeijer CA, et al. Safe in the city study group. consistency of condom use during receptive anal intercourse among women and men who have sex with men: findings from the safe in the city behavioral study. *Sex Transm Dis*. 2015;42(7):393–9.
2. Francisco Luz Nunes Queiroz AA, Lopes de Sousa AF, Evangelista de Araújo TM, Milanez de Oliveira FB, Batista Moura ME, Reis RK. A review of risk behaviors for hiv infection by men who have sex with men through geosocial networking phone apps. *J Assoc Nurses AIDS Care*. 2017;28(5):807–18.
3. Hobbs M, Owen S, Gerber L. Liquid love? Dating apps, sex, relationships and the digital transformation of intimacy. *J Sociol (Melb)*. 2017;53(2):271–84.
4. Queiroz AA, de Sousa AF, Matos MC, de Araújo TM, Brignol S, Reis RK, et al. Factors associated with self-reported non-completion of the hepatitis B vaccine series in men who have sex with men in Brazil. *BMC Infect Dis*. 2019;19(1):335.
5. Winetrobe H, Rice E, Bauermeister J, Petering R, Holloway IW. Associations of unprotected anal intercourse with Grindr-met partners among Grindr-using young men who have sex with men in Los Angeles. *AIDS Care*. 2014;26(10):1303–8.
6. Lehmilller JJ, loerger M. Social networking smartphone applications and sexual health outcomes among men who have sex with men. *PLoS One*. 2014;9(1):e86603.
7. Yeo TE, Ng YL. Sexual risk behaviors among apps-using young men who have sex with men in Hong Kong. *AIDS Care*. 2016;28(3):314–8.
8. G1 [Internet]. Brasil é 2º maior mercado do 'Império do amor', empresa que fatura US\$ 1,1 bilhão com relacionamento online [citado 2018 Set 14]. Disponível em: <https://g1.globo.com/economia/tecnologia/noticia/brasil-e-2o-maior-mercado-do-imperio-do-amor-empresa-que-fatura-us-11-bilhao-com-relacionamento-online.ghtml>
9. Queiroz AA, Sousa AF, Matos MC, Araújo TM, Reis RK, Moura ME. Knowledge about HIV/AIDS and implications of establishing partnerships among Hornet® users. *Rev Bras Enferm*. 2018;71(4):1949–55.
10. Tobin KE, Yang C, King K, Latkin CA, Curriero FC. Associations between drug and alcohol use patterns and sexual risk in a sample of African American men who have sex with men. *AIDS Behav*. 2016;20(3):590–9.

11. Duncan DT, Goedel WC, Stuitts CB, Brady WJ, Brooks FA, Blakely JS, et al. A study of intimate partner violence, substance abuse, and sexual risk behaviors among gay, bisexual, and other men who have sex with men in a sample of geosocial-networking smartphone application users. *Am J Men Health*. 2018;12(2):292–301.
12. Goedel WC, Duncan DT. Geosocial-networking app usage patterns of gay, bisexual, and other men who have sex with men: survey among users of Grindr, a mobile dating app. *JMIR Public Health Surveill*. 2015;1(1):e4.
13. Holloway IW, Pulsipher CA, Gibbs J, Barman-Adhikari A, Rice E. Network influences on the sexual risk behaviors of gay, bisexual and other men who have sex with men using geosocial networking applications. *AIDS Behav*. 2015;19(2 Suppl 2):112–22.
14. Brito MO, Hodge D, Donastorg Y, Khosla S, Lerebours L, Pope Z. Risk behaviours and prevalence of sexually transmitted infections and HIV in a group of Dominican gay men, other men who have sex with men and transgender women. *BMJ Open*. 2015;5(4):e007747.
15. Muessig KE, Nekkanti M, Bauermeister J, Bull S, Hightow-Weidman LB. A systematic review of recent smartphone, Internet and Web 2.0 interventions to address the HIV continuum of care. *Curr HIV/AIDS Rep*. 2015;12(1):173–90.
16. Chow EP, Cornelisse VJ, Read TR, Hocking JS, Walker S, Chen MY, et al. Risk practices in the era of smartphone apps for meeting partners: a cross-sectional study among men who have sex with men in Melbourne, Australia. *AIDS Patient Care STDS*. 2016;30(4):151–4.
17. Wang H, Zhang L, Zhou Y, Wang K, Zhang X, Wu J, et al. The use of geosocial networking smartphone applications and the risk of sexually transmitted infections among men who have sex with men: a systematic review and meta-analysis. *BMC Public Health*. 2018;18(1):1178.
18. Grosskopf NA, LeVasseur MT, Glaser DB. Use of the Internet and mobile-based “apps” for sex-seeking among men who have sex with men in New York City. *Am J Men Health*. 2014;8(6):510–20.
19. Hornet [Internet]. Com nova versão 4.0 Hornet torna-se o maior app de encontros gay do mundo [citado 2018 Set 14]. Disponível em: <https://hornet.com/stories/pt-pt/com-nova-versao-4-0-hornet-torna-se-o-maior-app-de-encontros-gay-mundo/>
20. Buckingham L, Becher J, Voytek CD, Fiore D, Dunbar D, Davis-Vogel A, et al. Going social: success in online recruitment of men who have sex with men for prevention HIV vaccine research. *Vaccine*. 2017;35(27):3498–505.
21. Zoni AC, González MA, Sjögren HW. Syphilis in the most at-risk populations in Latin America and the Caribbean: a systematic review. *Int J Infect Dis*. 2013;17(2):e84–92.
22. Brignol S, Kerr L, Amorim LD, Dourado I. Factors associated with HIV infection among a respondent-driven sample of men who have sex with men in Salvador, Brazil. *Rev Bras Epidemiol*. 2016;19(2):256–71.
23. Ishikane M, Arima Y, Itoda I, Takahashi T, Yamagishi T, Matsui T, et al. Responding to the syphilis outbreak in Japan: piloting a questionnaire to evaluate potential risk factors for incident syphilis infection among men who have sex with men in Tokyo, Japan, 2015. *Western Pac Surveill Response J*. 2016;7(3):36–9.
24. Su JY, Holt J, Payne R, Gates K, Ewing A, Ryder N. Effectiveness of using Grindr to increase syphilis testing among men who have sex with men in Darwin, Australia. *Aust N Z J Public Health*. 2015;39(3):293–4.
25. United Nations Programme On HIV/AIDS (UNAIDS). Global report: UNAIDS report on the global AIDS epidemic. Geneva, Switzerland: UNAIDS, 2019.
26. Kerr LR, Kendall C, Guimarães MD, Mota RS, Veras MA, Dourado I, et al. HIV prevalence among men who have sex with men in Brazil: results of the 2nd national survey using respondent-driven sampling. *Medicine (Baltimore)* 2018; 97(1S Suppl 1):S9–S15.
27. Sumter SR, Vandenbosch L, Ligtenberg L. Love me Tinder: Untangling emerging adults’ motivations for using the dating application Tinder. *Tele Inform*. 2017;34(1):67–78.
28. Algarin AB, Ward PJ, Christian WJ, Rudolph AE, Holloway IW, Young AM. Spatial distribution of partner-seeking men who have sex with men using geosocial networking apps: epidemiologic study. *J Med Internet Res*. 2018;20(5):e173.
29. Vanable PA, Carey MP, Brown JL, DiClemente RJ, Salazar LF, Brown LK, et al. Test-retest reliability of self-reported HIV/STD-related measures among African-American adolescents in four U.S. cities. *J Adolesc Health*. 2009;44(3):214–21.
30. LeardMann CA, Smith B, Smith TC, Wells TS, Ryan MA; Millennium Cohort Study Team. Smallpox vaccination: comparison of self-reported and electronic vaccine records in the millennium cohort study. *Hum Vaccin*. 2007;3(6):245–51.
31. Queiroz AA, Sousa AF. Fórum PrEP: um debate on-line sobre uso da profilaxia pré-exposição no Brasil. *Cad Saude Publica*. 2017;33(11):e00112516.