


CASE STUDY

Men who have sex with men: An approach to social network analysis

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[Correction added on 20 October 2022, after first online publication: The name of the last author has been updated in this version.]

Abstract

Background: Dating apps for men who have sex with men (MSM) have favored unprotected sexual encounters; other unsafe practices, including drug use, are widespread. No evidence is available from the perspective of the structure of their relationships, a personal aspect included in all nursing meta-paradigms.

Aim: To study the structure of MSM networks through dating and contact applications and this relationship to risky sexual activities such as condom use, chemsex (sex while using drug), and group sex.

Design: Descriptive cross-sectional study.

Sample: A total of 32 MSM participants from Madrid (Spain).

Measurements: Socio-demographic and structural variables with Social Network Analysis (SNA) metrics. Data on condom use, drug use during encounters, and group sex were included.

Results: Twenty-five percent of respondents practiced chemsex, and 75% of these used poppers. MSM with higher socioeconomic status participated in group sex sessions more frequently than those with lower socioeconomics. Within the network analysis, the relationships strong showed greater ease in having unprotected anal intercourse.

Conclusion: SNA can be effective in the study of MSM sexual networks and their risk behaviors for community nurses to improve their interventions in sexual health promotion.

KEYWORDS

drug users, homosexuality, nurses, sexual health, social network analysis

1 | BACKGROUND

Sexual practices and substance use are of interest to public health practitioners because of their relationship with the transmission of sexually transmitted infections (STIs), predisposition to psychotic pathologies, and participants' willingness to engage in high-risk behaviors (Bourne et al., 2015; Fernández-Dávila, 2016; Lea et al., 2016). Drug overdoses

can lead to respiratory depression, memory loss, and loss of control (Bourne et al., 2015). The phenomenon of the use of psychoactive drugs for sex between men is known by different names, but the most widespread is "chemsex" (Bourne et al., 2015). Over 40% of men who have sex with men (MSM) who had their last sexual relationship with a casual partner, or with a threesome with their steady partner, had practiced chemsex in Spain (Grupo de Trabajo sobre Chemsex, 2020).

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While new scenarios of sex practices are occurring, little has been done to explore causal elements involving relationships and sociological aspects of rituals, including who participants were, how planning occurred, and how practices were carried out these questions need more than a simple descriptive statistical analysis. The lack of studies that address sexual practices among men and substance use from a structural or network perspective provides the rationale for the current study in which we apply the methodology of Social Network Analysis (SNA) (Valente et al., 2015). The results obtained will assist public health nurses to design preventive policies in a collective and not individual key.

The risk of contracting HIV is 28 times higher among men who have sex with men (https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_es.pdf). In Spain in 2015, 53.6% of new HIV cases occurred in MSM and this proportion was even higher in large cities such as Madrid (Área de vigilancia del VIH y conductas de riesgo, 2018). In addition, are a set of determinants associated with the vulnerability of MSM with respect to suffering HIV infection, such as: (a) having condomless sex with multiple casual sex partners; (b) engaging in transactional sex; (c) chemsex; and (d) finding casual sex partners through the internet, such as mobile dating and dating apps, for offline sex (Torres et al., 2013). The high rates of HIV make it necessary for nurses to refine techniques to work with this group of MSM to improve their health (Valdes et al., 2022).

Most studies have focused on demographic characteristics, but risk factors for condomless are multidimensional (Cheng et al., 2014). However, these papers did not study social communication characteristics. HIV-related risk behaviors among MSM, especially condomless, are associated with strong ties dyads and with different patterns according to age, educational level, and marital status (Yang et al., 2019).

The MSM population has pioneered the use of online social networking sites to arrange sexual dates and encounters (Groves et al., 2014). Dating apps for MSM allow users to use Global Positioning Systems (GPS) to search for nearby potential partners, thereby facilitating and expediting sexual encounters (Rice et al., 2012). These applications give subscribers the ability to create individualized profiles, share photos, send messages, and forward their location (Rice et al., 2012). These apps are increasingly used among MSM (Tsang et al., 2016). MSM is up to seven times more likely than non-MSM to have sex with a partner they met online, and an estimated 3–6 million MSM meet sexual partners worldwide using Internet-based technology (Chan et al., 2016; Tsang et al., 2016). The first of these apps, Grindr (created in 2009), had reached approximately 6 million users worldwide by 2013, with an estimated 8000 new users every day (Winetrobe et al., 2014).

With the proliferation of apps, the ease of finding casual partners has increased the proliferation of risky sexual practices (Lehmiller & Loerger, 2014). Previous work has shown that MSM who use these apps tend to have more sexual encounters, more frequent anal intercourse, more unprotected sex, and a greater number of sexual relationships with partners who are HIV-positive or have other sexually transmitted infections (STIs) (Lehmiller & Loerger, 2014; Tsang et al., 2016; Zou & Fan, 2017). A key features that characterize MSM app users are that

they are tested for HIV/STIs more frequently, suggesting that these apps also provide an opportunity to implement nursing prevention strategies and promote sexual health (Zou & Fan, 2017).

Populations have often been analyzed from the perspective of the behaviors or characteristics of individuals. However, people's behaviors and health are interconnected in a social framework related to their physical and mental well-being (Wilson et al., 2014). Social networks influence health through many mechanisms including: social influence and control; establishment of health beliefs and normative behaviors; feelings of identity and belonging; access to resources; and provision of support (Valente et al., 2015). Social networks transmit information, attitudes, and behaviors that determine health outcomes (Valente et al., 2015); early knowledge of the mechanisms of influence within a network allows intervention so that new ideas and behaviors are transmitted through contact with others who have already adopted the new behavior (Valente et al., 2015). Public health nurses can combine different methodologies, aimed at both the social characteristics and the structural aspect of relationships to implement interventions that are effective (Valdes et al., 2022).

To deepen the understanding of MSM relationships SNA provides a set of theories, techniques, and tools useful for understanding how human behavior changes as people interact with others (Valente et al., 2015). SNA is a theoretical and methodological paradigm that allows (a) assessing the context of relationships empirically, (b) recording contexts of social interactions, and (c) determining the behavior of people who are part of those contexts (Freeman, 2004). SNA has previously been used in contexts of organizations or economies (Marqués-Sánchez et al., 2013). In the health domain, SNA has been applied both to study emotional intelligence constructs such as resilience and to evaluate nursing interventions to improve self-care (Márquez-Serrano et al., 2012; Liébana-Presa et al., 2018).

The perspective of the current study posits two types of networks, socio-centric and egocentric. The former describes the existing structure in a given context (e.g., in a company). On the other hand, egocentric social networks focus on indexing people (egos) and how their network members (alters) affect egos; an analysis can generate detailed information from high-risk populations such as MSM (Valente et al., 2015). This perspective emphasizes that both prevention and sexual behaviors are formed in settings through processes of peer influence, social norms, and structural position within the network, as social context is seen as a critical factor influencing sexual behaviors (Kelly et al., 1991; Shah et al., 2014).

In this sense, the egocentric perspective within the SNA is appropriate for the present study, given that our primary objective is to explore the relationship between practiced sexual risk behaviors such as chemsex, non-use of condoms, group sex sessions, and relationship strength with sexual partners. Secondary objectives are to:

- Describe the sociodemographic characteristics of MSM users of dating and contact applications and analyze the relationship between sexual risk behaviors and socioeconomic variables.
- Determine the association between the sexual risk practices of MSM and the network size and the strength of their relationships.

2 | METHODS

2.1 | Design

The present study was a descriptive cross-sectional study based on the self-responses of a sample of MSM. Participants answered questions about their interpersonal networks with their sexual partners and their health behaviors and chemsex use with partners.

2.2 | Sample

The study population consisted of MSM who use mobile dating applications, were of legal age, and had the capacity to give consent. Recruitment was through dating or contact apps.

The sample consisted of 32 MSM from Madrid (Spain).

The study population was captured through the Grindr and Wapo applications. The authors created a profile in each of the applications used in which information about the work was provided. The data were obtained through an online questionnaire accessed through a link that was sent by private message through the application. During the period of time used for data collection, the principal investigator visited different districts of Madrid (Spain) on randomly selected days and at random times, to increase the number of MSM shown by GPS (Hill et al., 2019; Wong et al., 2020).

2.3 | Measures

The present study included the following variables:

Demographic variables (age, district of residence, sexual orientation, gender, educational level, and socioeconomic status).

The structural variables of SNA metrics:

- Size (network size): Number of nodes in a network (Wasserman & Faust, 1994).
- Strength of weak ties: “a (probably linear) combination of the amount of time, emotional intensity and intimacy (mutual trust) that characterize the tie” (Granovetter, 1973).

Sexual risk behaviors for each sexual contact:

- Condom use
- Drug use
- Participation in group sex sessions (Hill et al., 2019; Wong et al., 2020; Yang et al., 2019).

The data used were obtained through a questionnaire constructed for the present research from the studies of Granovetter (1973), Yang et al. (2019), and Wong et al. (2020). Participants were asked about the type of relationship they had with their sexual partners to determine the strength of such a dyad as performed by Granovetter in his study (1973). Questions on sexual risk behaviors were adapted from the studies of Yang et al. (2019) and Wong et al. (2020).

2.4 | Recruitment and procedure

The data used for the present study were obtained through an online questionnaire that was conducted between February and March 2021.

2.5 | Analytic strategy

SPSS v.26.0 software was used for statistical processing of the data obtained. For the analysis of descriptive data, frequencies, and percentages were used for qualitative variables, while the mean and standard deviation were used for quantitative variables. Student's t-test was used to compare mean scores between groups. Statistical significance was set at $p < .05$. The UCINET tool, version 6.679 was used for the calculation of SNA measures, a software tool for exploratory network data analysis and visualization (Borgatti et al., 2002).

2.6 | Ethical considerations

The information collected for the study was processed in accordance with the provisions of Organic Law 3/2018, of December 5, on the Protection of Personal Data and guarantee of digital rights and the Regulations of the Ethics Committee of the University of León, and the principles of the Helsinki declaration were also respected. All the information collected were anonymized and was protected by electronic means so that only the principal investigators of the study had access to it. All participants were given the option of contacting the research team to clarify any doubts that might arise.

3 | RESULTS

A total of 32 responses were obtained, excluding incomplete and duplicate responses, in which there were 88 relationships.

3.1 | Demographic characteristics and their relationship with sexual risk behaviors

The mean age of the study population was 35.1 years (SD 11.2, range 20–69). Twenty-five per cent of the men practiced chemsex and among these, 75% inhaled alkyl nitrites with poppers/rush being the most widespread (Table 1). No statistically significant differences were found in the relationship between condom use and any of the socioeconomic characteristics.

There was a statistically significant difference ($p = .014$) between the district in which the participants live and participation in group sex sessions. There were also statistically significant differences ($p = .005$) between participants who had group sex and monthly income, with MSM with higher income levels participating more in these encounters.

In the multivariate analysis, MSM who engaged in oral sex without a condom also engaged in more anal sex without a condom

TABLE 1 Sociodemographic variables

Variables	Participants	
	N	%
Age		
18–25 years	7	21.9
26–30 years	7	21.9
31–40 years	9	28.1
41–50 years	6	18.8
>50 years	3	9.4
Gender identity		
Cisgender person	30	93.7
Fluid gender	2	6.3
Civil status		
Single	27	84.4
Married	1	3.1
In a couple	2	6.3
Separated	2	6.3
Sexual orientation		
Bisexual	5	15.6
Homosexual	24	75
Predominantly homosexual, although with sporadic heterosexual contacts.	3	9.4
Birth country		
Spain	20	62.5
Venezuela	2	6.3
Colombia	3	9.4
Ecuador	2	6.3
México	1	3.1
Argentina	1	3.1
Camerún	1	3.1
Brasil	1	3.1
District		
Puente de Vallecas	8	25
Villa de Vallecas	2	6.3
Centro	9	28.1
Villaverde	2	6.3
Arganzuela	3	9.4
Usera	3	9.4
Latina	1	3.1
Chamberí	2	6.3
San Blas-Canillejas	1	3.1
Moratalaz	1	3.1
Education		
University	15	42.9
Graduate	7	21.9
High school	7	21.9

(Continues)

TABLE 1 (Continued)

Variables	Participants	
	N	%
Higher grade VET		
Higher grade VET	2	6.3
Intermediate VET	1	3.1
Monthly income		
I have no monthly income	8	25
1000–1499 euros	8	25
500–999 euros	7	21.9
Hasta 499 euros	5	15.6
1500–1999 euros	2	6.3
2000–2499 euros	2	6.3

Abbreviation: VET, Vocational Education Training.

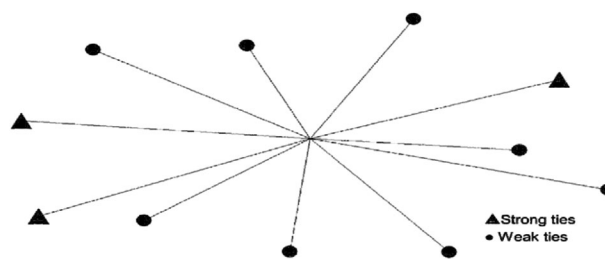


FIGURE 1 Average contact network among MSM in the last 6 months through apps. Source: own elaboration

($p = .029$). Similarly, the MSM who had anal intercourse without a condom showed a greater predisposition to practice chemsex ($p = .007$). Among the rest of the sexual risk behaviors, no statistically significant relationships were found.

3.2 | Characteristics of egocentric networks. Relationship strength, size, and sexual risk behaviors

The 67% of the relationships obtained were weak ties, while the remaining 33% ($n = 29$) were considered strong relationships. The analysis between bonding strength and sexual risk behaviors showed a strong statistically significant positive correlation between anal intercourse without a condom and bonding strength ($p < .001$).

Male respondents had sex with a mean of 11.65 men (SD 11.79, range 0–40) met through dating apps in the last 6 months (Figure 1). The maximum number of sexual contacts in the last 6 months for one of the MSM was 40 (Figure 2), while other participants claimed not to have had sexual contact with any men through these apps in this period.

There was statistically significant differences between MSM who had sex with a greater number of partners and those who have had a smaller network and risky sexual practices, except for participation in group sex sessions. The mean number of sexual contacts is higher for all risky sexual practices analyzed (Table 2). Similarly, the standard

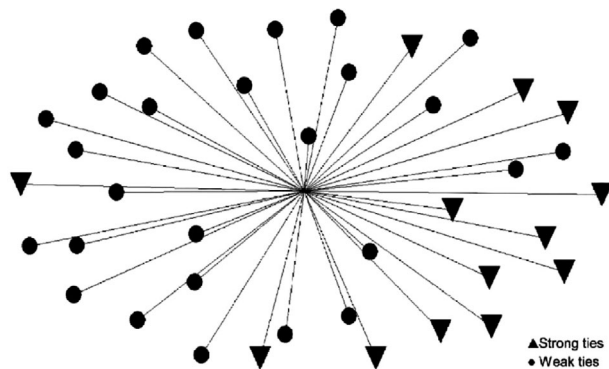


FIGURE 2 Sexual contact network of the participant who nominated a higher number of known sexual contacts through dating apps in the last 6 months

TABLE 2 Average group statistics and standard deviation (\pm SD) of network size and risky sexual practices

	People who do practice Mean (\pm SD)	People who do not practice Mean (\pm SD)
Unprotected oral sex	13.2 (\pm 12.6)	2.8 (\pm 2.6)
Anal sex without a condom	15.1 (\pm 13.1)	5.7 (\pm 7.9)
Group sex	13.6 (\pm 11.8)	9.6 (\pm 12.3)
Chemsex	23.8 (\pm 14.6)	7.1 (\pm 7.7)

deviation is wider for those who engage in risky sexual practices, except for participation in group sex sessions.

4 | DISCUSSION

Regarding the sociodemographic characteristics, it should be noted that the majority of the participants were between 31 and 40 years of age, which is higher than the averages obtained in other studies such as those of Grosskopf et al. with 27 years (2014) or Holloway et al. with 25,56 years (2014). As for the level of education, the majority of the sample (42.9%) had a university education, in agreement with other previous studies (Grosskopf et al., 2014).

Condom use during oral practices was not associated with any sociodemographic characteristic in the present study, contrary to what is reported in other studies (Cheng et al., 2014). This may be due to the small size of the sample or to its heterogeneity. The results obtained show that there is an association between the district in which the participants live and their participation in group sex sessions. It is noteworthy that the districts located more centrally in Madrid are where the greatest number of group meetings take place, as has been described in previous studies in Barcelona, Spain (Área de vigilancia del VIH y conductas de riesgo, 2018). There is also a relationship between participants who engaged in group sex and monthly income, with MSM with higher income levels participating more in these encounters. Regarding the practice of chemsex, it is noteworthy that only 25% claimed to practice it in comparison with other studies point to much

higher percentages (40%–70%) of chemsex use, although once again, poppers are the most commonly used drug (Grosskopf et al., 2014; Holloway et al., 2014).

Regarding the relationships obtained from the analysis between sexual risk behaviors, MSM who have oral sex without a condom are also those who have more anal sex without a condom. Likewise, these MSM who have anal intercourse without a condom showed a greater predisposition for chemsex. The different studies carried out in other MSM communities in other geographical areas agree with the results obtained in Madrid (Área de vigilancia del VIH y conductas de riesgo, 2018).

The percentage of strong ties obtained in comparison with other similar studies is lower 33% compared to 41.88% in Yang et al. (2019), although in both studies they represent a lower percentage than that of weak ties. In the present study, moreover, an association was found between condom use during anal intercourse and the strength of the relationship, with prophylactic use decreasing the closer the sexual partner, as has been demonstrated in other studies carried out in other MSM populations (Yang et al., 2019). However, no associations were found between relationship strength and chemsex, oral sex with condoms, or group sex sessions. This fact suggests that the perceived risk of contracting an STI during anal sex is higher than with other sexual practices.

Regarding the size obtained from the ego-networks of the MSM interviewed, the heterogeneity and dispersion of the range stands out. Two men claimed not to have had sex with other men they knew through dating or contact apps in the last 6 months. At the other extreme, two participants indicated having had sex with 40 known men through these media. In addition, the mean obtained is higher than that obtained in other studies (between 2.69 and 5.31) conducted in different areas (Lehmiller & loerger, 2014). These larger ego-networks increase the likelihood of engaging in risky sexual practices. On the other hand, having a large number of sexual contacts makes it more difficult to create strong bonds, so trust is lower and the possibility of performing anal intercourse without a condom would be lower.

Aligned with the results of other studies that did not use the SNA methodology (Bajos, 2010), our results show a relationship between a greater number of contacts and a greater predisposition to engage in risky sexual relations, and therefore transmit STIs.

5 | LIMITATIONS

The limitations of this study are the small sample size. In addition, the dating applications used during recruitment have a limited number of MSM since you can only contact those who are geolocated closest to you.

6 | CONCLUSION

In dating apps designed for MSM, the higher the socioeconomic level, the greater the participation in group sex encounters and therefore

the greater the possibility of contracting and transmitting STIs. MSM who do not use condoms during oral sex are those who show a greater predisposition not to use them during anal sex. They, in turn, are more likely to participate in group sex sessions. These relational factors mean that STI transmission in these groups of MSM is high, and therefore, they are a key group with which to work on health promotion and STI prevention at all levels (primary, secondary, and tertiary). This study points out that the strength of the relationship does not influence sexual practices (with the exception of unprotected anal sex) and that, therefore, these risk activities are developed independently of the degree of knowledge or closeness of the sexual partner. Through the study of egocentric networks, it can be deduced the alters with a greater risk of carrying out unprotected anal sex, and therefore the ones contracting an STI. Drug use, as in other MSM populations studied, is high and therefore strategic plans should be developed at all levels to inform about its effects, problems, resources for detoxification and to instruct how to act in case of intoxication. These facts make it necessary to define an STI prevention and health promotion strategy for MSM users of mobile dating or dating mobile apps to build a collective responsibility for sexual health. In this sense, community nurses have a fundamental role to play and should be in charge of developing effective health education programs that favour the reduction of these practices and their consequences, which are so common in MSM contact applications.

CONFLICT OF INTEREST

The authors declare the absence of current or potential conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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