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Prevalence of HIV in men who have sex with men in three Colombian cities. 2010, 2016, 2019

Prevalencia de VIH en hombres que tienen sexo con hombres de tres ciudades de Colombia. 2010, 2016, 2019

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Abstract

Introduction: Worldwide, around 33.10 million to 45.70 million individuals are infected with HIV, with men who have sex with men (MSM) constituting a significantly affected demographic.
Objective: To determine the prevalence of HIV among MSM in three major cities of Colombia and to describe the characteristics of this population, including HIV risk behaviors.
Materials and methods: Cross-sectional observational study conducted using secondary data collected from 3 171 adult MSM residing in Bogotá D.C. and the metropolitan areas of Cali and Medellín, as reported in 3 studies conducted at 3 different points in time: 2010, 2016 and 2019. In all studies, participants were recruited by respondent-driven sampling (RDS). HIV prevalences were calculated for the 3 cities/metropolitan areas and the 3 study years, while the chi-square test of independence was used to compare the 3 years in each city/metropolitan area.
Results: HIV prevalence over the 3 years ranged from 15.00% to 26.40%, 9.10% to 21.00%, and 15.00% to 23.40 in Bogotá and the metropolitan areas of Medellín and Cali, respectively. Between 27.53% and 58.03% of MSM in the 3 cities/metropolitan areas were younger than 24 years and between 79.28% and 87.68% had a low socio-economic level (strata 0-3); less than 40.48% reported having a stable male partner; more than 76.81% reported having sex with casual male partners; less than 45.78% claimed to participate in HIV/AIDS information or education activities; less than 33.03% stated having had STIs; and more than 84.45% reported using psychoactive substances, with alcohol and marijuana being the most consumed (92.03-98.53% and 25.1-45.07%).
Conclusion. The prevalence of HIV in this population was high in the 3 cities/metropolitan areas during the 3 years analyzed. Furthermore, risk behaviors included a significant use of psychoactive substances and high proportions of MSM who reported not using a condom with their regular partner (male or female) or the last time they had anal intercourse with a casual male partner.

Resumen

Introducción. Se estima que en el mundo hay entre 33.10 millones y 45.70 millones de personas con VIH, siendo los hombres que tienen relaciones sexuales con otros hombres (HSH) un grupo poblacional frecuentemente afectado.
Objetivo. Determinar la prevalencia de VIH en HSH de tres ciudades principales de Colombia y describir las características de estos hombres, incluyendo los comportamientos de riesgo para VIH.
Materiales y métodos. Estudio observacional transversal realizado con datos secundarios de 3 171 HSH adultos de Bogotá D.C. y las áreas metropolitanas de Cali y Medellín reportados por 3 estudios en 3 momentos diferentes: 2010, 2016 y 2019. En todos los estudios los participantes fueron reclutados mediante muestreo dirigido por el entrevistado. Se calcularon las prevalencias de VIH para las 3 ciudades/áreas metropolitanas y los 3 años de estudio y se usó la prueba de independencia de chi cuadrado para realizar comparaciones entre los 3 años en cada ciudad/área metropolitana.
Resultados. La prevalencia de VIH en los 3 años varió entre 15.00% y 26.40%, 9.10% y 21.00%, y 15.00% y 23.40 en Bogotá y las áreas metropolitanas de Medellín y Cali, respectivamente. Entre 27.53% y 58.03% de los HSH en las 3 ciudades/áreas metropolitanas eran menores de 24 años y entre 79.28% y 87.68% eran de nivel socioeconómico bajo (estratos 0-3); menos de 40.48% reportaron tener una pareja estable hombre; más de 76.81% informaron tener relaciones sexuales con parejas ocasionales hombres; menos de 45.78% indicaron participar en actividades de información o educación sobre VIH/SIDA; menos de 33.03% afirmaron haber tenido ITS y más de 84.45% reportaron haber consumido sustancias psicoactivas, siendo el alcohol y la marihuana las más consumidas (92.03-98.53% y 25.1-45.07%).
Conclusión. La prevalencia de VIH en esta población fue alta en las 3 ciudades/áreas metropolitanas en los 3 años analizados; además, entre las conductas de riesgo, destaca un alto consumo de sustancias psicoactivas y altas proporciones de HSH que reportaron no usar condón con su pareja estable (hombre o mujer) ni la última vez que tuvieron sexo anal con pareja ocasional hombre.

Introduction

According to UNAIDS, 39.9 million people worldwide were infected with HIV (human immunodeficiency virus) in 2023.[1] Although HIV infection can affect the entire population, there are population groups at higher risk such as men who have sex with men (MSM).[2-5] The term MSM was coined in the 1990s due to the need to prioritize sexually transmitted infection (STI) prevention strategies for people at higher risk, particularly HIV.[6] This term encompasses all men who, regardless of their sexual orientation, have sexual intercourse with other men.[7]

It has been described that MSM, both biologically and behaviorally, are at increased risk for STIs.[5] Sexual risk behaviors in this population group include having unprotected oral and anal sex,[8] having multiple sexual partners,[9] having sex with casual partners or strangers,[10] participating in sexual networks,[11] initiating sex at an early age,[12] and using alcohol and psychoactive substances before sexual encounters.[13]

Notwithstanding the above, MSM continue to be a population that is difficult to access. As a result, there are limitations to the development and implementation of differentiated interventions aimed at STI prevention in this group, in particular HIV, given that more than 21 countries in the world reported prevalence figures between 3.00% and 15.00%[14] in 2012, while they currently account for about 41.00% of new HIV infections in the world.[15] With this in mind, the objective of the present study was to determine the prevalence of HIV in MSM in 3 main cities of Colombia at 3 different times (2010, 2016 and 2019) and to describe the characteristics of these men, including HIV risk behaviors.

Materials and methods

Study design and data analyzed

Cross-sectional study in which a secondary data analysis was performed. Data from adult MSM residing in Bogotá D.C. and the metropolitan areas of Cali and Medellín (3 major cities in Colombia) reported in 3 studies (2 across the country, including these 3 cities, and 1 in these 3 cities) conducted at 3 different times (2010,[16] 2016,[17] and 2019)[18] were analyzed.

In each of the studies, after estimating sample size per city, participants were recruited by respondent-driven sampling (RDS). It was considered the most appropriate sampling technique for working with population groups in which the total population is unknown and there is no sampling frame (presence of hidden populations), as is the case of MSM.[19]

According to RDS,[10] recruitment in all 3 studies began with seeds (key informants) selected by convenience sampling in each city (3-12 per city depending on the study), who in turn recruited other individuals who met the inclusion criteria (being male and having sex with another man in the last 12 months, being over 18 years of age, and living in the city or metropolitan area). In this way, recruitment chains were initiated to complete the estimated samples per city in each study; this strategy included the delivery of a primary incentive for participating in the study and a secondary incentive for the successful recruitment of 3 new participants. This recruitment method made it possible to complete the sample sizes estimated for each city in the studies, with the exception of the Cali metropolitan area in the study conducted in 2016[17] and the 3 cities/metropolitan areas in the study conducted in 2010.[16]

Data were analyzed conforming to how they were reported in the source studies (the studies conducted in 2010 and 2019 report data for a final sample in which the seeds are

not included, while the one conducted in 2016 reports data for all participants, including seeds). Data regarding the estimated sample size, seeds, and total participants recruited (seeds and non-seeds) by city in each study are presented in Table 1.

Table 1. Sample size and final sample in the three cities of the source studies.

Study and cities		Estimated sample	Seeds	Total participants including seeds	Final sample with no seeds
2010[16]	Bogotá	504	12	496	**485 ***
	Medellín	350	5	354	**349**
	Cali	350	5	338	**333**
2016[17]	Bogotá	407	8	**415**	407
	Medellín	263	4	**267**	263
	Cali	578	11	**444**	433
2019[18]	Bogotá	439	3	442	**439**
	Medellín	447	5	453	**448**
	Cali	413	5	419	**414**
Total		**3 751**	**58**	**3 628**	**3 571**

* The number 485 is shown instead of 484 since this is what the source study reported; in other words, this was the final sample without seeds for Bogotá in the 2010 study.[16]

Procedures

In all studies, once recruited, each participant was tested for HIV seroprevalence (positive filter paper test results were confirmed by a Western Blot test sent to the laboratory) and administered a 14-section survey developed following the guidelines for repeated behavioral surveys in populations at risk for HIV.[20]

The following information on each participant was collected through the survey: age, socioeconomic level, educational attainment, marital status, type of insurance coverage, sexual orientation, stable male partner, occasional male partner, HIV diagnosis in male partner (stable or occasional), discussion of STI, HIV or AIDS issues with male partner (stable or occasional), stable female partner, sexual activity with stable or casual partners (male and female), condom use in different situations, sex work, participation in HIV/AIDS information or education activities in the last 12 months, entities that have provided information or education on HIV/AIDS, history of STIs, and diagnosed STIs.

It should be noted that socioeconomic level in Colombia is divided into 6 strata depending on place of residence and access to basic services (1: low-low, 2: low, 3: medium-low, 4: medium, 5: medium-high, and 6: high).[21] However, in the present study, socioeconomic level was categorized as low and high in accordance with the classification used in the source studies (strata 0-3 and 4-6, respectively).

Data analysis

Once collected, data were entered into a database created in Microsoft Excel for subsequent analysis in the RDSAT version 7.1 software. Data are described using absolute frequencies and percentages since all variables were categorized. A radial chart was employed to present the prevalence of HIV in each of the study cities and in the 3 years

evaluated. Furthermore, bivariate analyses were performed using the chi-square test of independence to evaluate the differences in the variables considered by year of data collection (2010, 2016, and 2019) in each of the 3 cities/metropolitan areas, considering a significance level of $p<0.05$.

Ethical considerations

The study followed the ethical principles for biomedical research involving human subjects established in the Declaration of Helsinki,[22] as well as the scientific, technical, and administrative standards for health research in Resolution 8430 of 1993 issued by the Colombian Ministry of Health.[23] On the other hand, since the present study was an analysis of publicly available secondary data, it did not require approval by an ethics committee; however, following the ethical principles of biomedical research, it was evaluated and approved by the Ethics Committee on Human Research of the Universidad CES as recorded in minutes No. 130 of February 5, 2019. Also, in all 3 studies, all participants signed an informed consent prior to entering the research.

Results

Data from 3 571 MSM reported in the 3 studies (1 167 in 2010, 1 103 in 2016, and 1 301 in 2019) were analyzed; of these, 37.27% were from Bogotá D.C., 33.04% from the Cali metropolitan area, and 29.69% from the Medellín metropolitan area. When analyzing the behavior of each variable over the years analyzed, statistically significant differences were found between the 3 years (2010, 2016, and 2019) regarding the frequency of MSM aged 45 years old or above in the 3 cities, as well as in the proportion of men who were 18 to 24 years old in the metropolitan areas of Medellín and Cali. Furthermore, regardless of city/metropolitan area and year of data collection, most participants had a low socioeconomic level (79.28-87.68%), with no statistically significant differences (Table 2).

Concerning educational attainment, in the 3 cities/metropolitan areas, statistically significant differences were observed between the 3 years in the proportion of MSM with higher education level (18.11-57.63%). It is noteworthy that there was a very low proportion of participants who had not received any education or who had not completed elementary school (1.12-7.16%), but the difference in these proportions by year of recruitment was only significant in the Medellín metropolitan area (Table 2).

The predominant marital status was single (82.85-94.54%). In addition, although the most common type of insurance coverage in the Colombian health system was the contributory system (38.40-66.26%), statistically significant differences were found in the proportion of MSM who had no insurance by year of data collection in the 3 cities/metropolitan areas. Regarding sexual orientation, in the Medellín metropolitan area, significant differences were seen in the proportion of bisexuals by year of data collection (28.08% in 2010 vs. 12.27% in 2019; $p=0.001$) (Table 2).

Table 2. Social and demographic characteristics of men who have sex with men in Bogotá D.C. and the metropolitan areas of Medellín and Cali in 2010, 2016, and 2019.

Characteristics		Medellín Metropolitan Area (n=1 064)					Bogotá D.C. (n=1 339)					Cali Metropolitan Area (n=1 191)				
		2010 (n=349)	2016 (n=267)	2019 (n=448)	X2	*p*-value	2010 (n=485)	2016 (n=415)	2019 (n=439)	X²	*p*-value	2010 (n=333)	2016 (n=444)	2019 (n=414)	X²	*p*-value
		n (%)	n (%)	n (%)			n (%)	n (%)	n (%)			n (%)	n (%)	n (%)		
Age	18 to 24 years old	190 (54.44)	98 (36.70)	260 (58.03)	15.70	**0.047**	248 (51.13)	205 (49.40)	192 (43.73)	2.77	0.948	139 (41.74)	237 (53.37)	114 (27.53)	34.78	**0.000**
	25 to 34 years old	95 (27.22)	89 (33.33)	140 (31.25)	1.96	0.982	138 (28.45)	135 (32.53)	150 (34.16)	2.51	0.961	109 (32.73)	116 (26.12)	123 (29.71)	2.81	0.946
	35 to 44 years old	37 (10.60)	41 (15.35)	31 (6.91)	11.74	0.163	53 (10.92)	55 (13.26)	41 (9.33)	3.00	0.934	51 (15.31)	36 (8.10)	54 (13.04)	8.75	0.363
	45 years and older	27 (7.74)	39 (14.60)	17 (3.79)	25.05	**0.002**	46 (9.48)	19 (4.58)	56 (12.75)	15.88	**0.044**	34 (10.21)	55 (12.38)	123 (29.71)	50.75	**0.000**
Socioeconomic level	Strata 0, 1, 2, and 3	306 (87.68)	227 (85.02)	378 (84.38)	0.26	1.000	400 (82.47)	362 (87.23)	372 (84.74)	0.71	0.999	264 (79.28)	362 (81.54)	358 (86.47)	1.29	0.996
	Strata 4, 5, and 6	40 (11.46)	40 (14.98)	70 (15.62)	2.61	0.956	79 (16.29)	51 (12.29)	67 (15.26)	2.50	0.959	61 (18.32)	82 (18.46)	56 (13.53)	3.91	0.871
	Don't know / No response	3 (0.86)	0 (0.00)	0 (0.00)	6.14	0.631	6 (1.24)	2 (0.48)	0 (0.00)	10.56	0.643	8 (2.40)	0 (0.00)	0 (0.00)	20.74	**0.008**
Highest level of education attained	None / elementary	25 (7.16)	4 (1.50)	5 (1.12)	25.66	**0.001**	31 (6.39)	18 (4.33)	12 (2.73)	6.87	0.551	14 (4.20)	16 (3.61)	29 (7.00)	5.88	0.661
	Secondary	110 (31.52)	93 (34.83)	110 (24.55)	6.78	0.560	160 (32.99)	170 (40.96)	87 (19.81)	31.44	**0.000**	120 (36.04)	212 (47.96)	202 (48.79)	7.81	0.452
	Technical / Technological	92 (26.36)	97 (36.33)	87 (19.42)	18.47	**0.018**	74 (15.26)	76 (18.31)	87 (19.81)	2.79	0.947	78 (23.42)	117 (26.47)	108 (26.08)	0.70	1.000
	University	122 (34.96)	73 (27.34)	246 (54.91)	35.95	**0.000**	220 (45.36)	151 (36.38)	253 (57.63)	20.87	**0.007**	121 (36.34)	97 (21.94)	75 (18.11)	26.62	**0.001**
Current marital status [a]	Single	330 (94.55)	242 (90.64)	399 (89.06)	0.65	1.000	404 (83.30)	364 (87.71)	384 (87.47)	0.71	1.000	289 (86.79)	366 (84.14)	343 (82.85)	0.39	1.000
	Married / domestic partnership	15 (4.30)	20 (7.49)	46 (10.27)	9.12	0.332	70 (14.43)	48 (11.57)	52 (11.85)	1.83	0.986	35 (10.51)	62 (14.25)	66 (15.94)	4.45	0.815
	Separated / divorced / widower	4 (1.15)	4 (1.50)	3 (0.67)	1.19	0.997	11 (2.27)	2 (0.48)	3 (0.68)	7.41	0.493	9 (2.70)	7 (1.60)	5 (1.20)	2.47	0.963
	Don't know / No response	0 (0.00)	1 (0.37)	0 (0.00)	3.00	0.940	0 (0.00)	1 (0.24)	0 (0.00)	3.00	0.940	0 (0.00)	0 (0.00)	0 (0.00)	3.00	1.000
Health care provided by [b]	Health Promoting Entity of the Contributory Regime	134 (38.40)	134 (51.34)	274 (61.16)	19.60	**0.011**	241 (49.69)	275 (66.26)	273 (62.18)	11.76	0.162	160 (48.05)	262 (59.82)	194 (46.85)	8.25	0.409
	Health Promoting Entity of the Subsidized Regime / Indigenous Reservation Card	120 (34.38)	115 (44.06)	147 (32.81)	6.28	0.624	129 (26.60)	81 (19.51)	111 (25.28)	5.20	0.736	74 (22.22)	124 (28.31)	180 (43.47)	28.94	**0.000**
	No coverage	90 (25.79)	7 (2.68)	12 (2.68)	121.65	**0.000**	108 (22.27)	50 (12.04)	27 (6.15)	44.87	**0.000**	98 (29.43)	47 (10.73)	29 (7.00)	70.53	**0.000**
	Other (Military Forces, Police, Teachers, or ECOPETROL special regime)	5 (1.43)	5 (1.91)	15 (3.35)	3.32	0.913	7 (1.44)	9 (2.16)	28 (6.37)	19.32	**0.013**	1 (0.30)	5 (1.14)	11 (2.65)	7.52	0.482
Self-identification of sexual orientation	Homosexual	242 (69.34)	235 (88.02)	387 (86.38)	10.652	0.932	337 (69.48)	315 (75.90)	358 (81.55)	5.524	0.813	240 (72.07)	299 (67.34)	276 (66.67)	1.985	0.999
	Heterosexual	8 (2.29)	0 (0.00)	4 (0.89)	6.503	0.878	18 (3.71)	19 (4.57)	3 (0.68)	9.174	0.144	16 (4.80)	22 (4.95)	10 (2.41)	3.012	0.846
	Bisexual	98 (28.08)	32 (11.98)	56 (12.5)	44.992	**0.018**	127 (26.19)	77 (18.55)	70 (15.95)	16.342	0.116	67 (20.12)	115 (25.90)	125 (30.19)	7.928	0.508
	Don't know/Other	1 (0.28)	0 (0.00)	1 (0.22)	2.732	0.706	3 (0.62)	4 (0.96)	8 (1.82)	8.960	0.927	10 (3.00)	8 (1.80)	3 (0.72)	2.830	0.710

[a] For this variable, the 2016 study only reported data on 435 participants in the Cali metropolitan area.

[b] For this variable, the 2016 study only reported data on 261 participants in the Medellín metropolitan area and 438 participants in the Cali metropolitan area.

Regarding variables related to stable male partners (proportion of MSM with stable partners living with HIV; who have discussed STIs, HIV, or AIDS with their stable partner; who used a condom in the last anal intercourse with their stable partner, among others), no significant statistical differences were found by year of data collection in Bogotá D.C. and the Medellín metropolitan area. However, in the Cali metropolitan area, significant differences were found in the proportion of MSM who reported having a stable male partner (2010: 27.63%, 2016: 24.77% and 2019: 39.13%; p=0.046) (Table 3).

On the other hand, in all 3 cities and in the 3 years of data collection, there was a high proportion of participants who reported having sex with male casual partners in the last 12 months (76.81-92.19%), with no statistically significant differences by year of recruitment. Regarding the proportion of MSM who stated that their occasional male partner was living with HIV, although no statistical differences were found in any of the 3 cities/metropolitan areas, it is striking that in the Medellín metropolitan area a considerable increase was evident between 2010 and 2016 (1.89% and 5.11%) with a subsequent reduction in 2019 (3.19%), while the increase was constant in Bogotá D.C. (2010: 4.94%, 2016: 5.72%, and 2019: 11.60%). On the contrary, in the Cali metropolitan area, there was a decreasing trend (2010: 6.51%, 2016: 5.44% and 2019: 4.40%).

Regarding the proportion of participants who reported having engaged in anal sex with a casual male partner in the last 12 months, a statistically significant difference was observed in the Medellín metropolitan area between the years of data collection (2010: 88.36%, 2016: 94.46%, and 2019: 91.75%; p=0.000). Moreover, the proportion of men who reported having used a condom the last time they had sex with a casual male partner ranged from 13.62% to 45.31%, with significant differences in the 3 cities/administrative areas by year of recruitment of the participants (p=0.000). Another noteworthy finding on this last point is that 2016 was the year in which the lowest proportions were observed for this practice in the 3 cities/metropolitan areas (Table 3).

With respect to sexual relations with women, there were differences in 3 variables in the Medellín metropolitan area: proportion of MSM who reported having sex with 1-4 women in the last 12 months (p=0.001), proportion of MSM who reported having a stable female partner (p=0.010), and proportion of MSM who reported having causal sex with women in the last 6 months (p=0.000). In Bogotá D.C. there were differences only in the variable proportion of MSM who reported having causal sex with women in the last 6 months (p=0.000), and in the Cali metropolitan area there were no differences between the 3 years in any of the 5 variables. It should be noted that in all 3 cities/metropolitan areas and in the 3 years of study, a high proportion of participants reported that they always used condoms during sex with a casual female partner (31.34-73.68%), with no statistically significant differences in the 3 cities/metropolitan areas (Table 3).

In the case of variables related to sex work, no significant differences were found in Bogotá D.C. or in the Cali metropolitan area. In the case of the Medellín metropolitan area, it was found that the proportion of MSM who reported having received money in exchange for penetrative sex went from 15.76% in 2010 to 8.99% in 2016 and to 4.69% in 2019, observing a statistically significant difference (p=0.002); in the other variables related to sex work, no statistically significant differences were observed in this area. Notably, of the respondents who reported having received money in exchange for penetrative sex in the past 12 months, commercial sex is the main source of income in 9.52-39.39% of the respondents in the 3 cities and in the 3 years of study (Table 3).

Table 3. Characteristics of sexual behaviors of men who have sex with men in Bogotá D.C. and the metropolitan areas of Medellín and Cali in 2010, 2016, and 2019.

Characteristics		Medellín Metropolitan Area (n=1 064)					Bogotá D.C. (n=1 339)					Cali Metropolitan Area (n=1 191)				
		2010 (n=349)	2016 (n=267)	2019 (n=448)	X2	*p*-value	2010 (n=485)	2016 (n=415)	2019 (n=439)	X2	*p*-value	2010 (n=333)	2016 (n=444)	2019 (n=414)	X2	*p*-value
		n (%)	n (%)	n (%)			n (%)	n (%)	n (%)			n (%)	n (%)	n (%)		
Stable male partner	Yes	109 (31.23)	85 (31.83)	148 (33.03)	0.19	1.000	145 (29.9)	168 (40.48)	150 (34.16)	7.27	0.507	92 (27.63)	110 (24.77)	162 (39.13)	15.74	**0.046**
	No	240 (68.77)	182 (68.16)	299 (66.74)	0.12	1.000	339 (69.9)	247 (59.51)	287 (65.37)	3.68	0.883	235 (70.57)	330 (74.32)	252 (60.87)	5.91	0.657
	No response	0 (0)	0 (0.00)	1 (0.22)	1.37	0.995	1 (0.2)	0 (0.00)	2 (0.45)	1.98	0.981	6 (1.80)	4 (0.90)	0 (0.00)	7.16	0.519
Stable male partner living with HIV[a]	Yes	3 (2.75)	14 (16.66)	11 (7.43)	11.27	0.187	10 (6.89)	20 (11.90)	28 (18.66)	8.24	0.411	6 (6.52)	5 (4.54)	25 (15.43)	9.26	0.321
	No	93 (85.32)	56 (66.66)	125 (84.45)	2.70	0.952	128 (88.28)	134 (79.76)	115 (76.66)	1.31	0.995	49 (53.26)	95 (86.36)	128 (79.01)	8.06	0.427
	Doesn't know	12 (11.11)	14 (16.66)	12 (8.10)	3.51	0.898	7 (4.83)	14 (8.33)	7 (4.66)	2.28	0.971	37 (40.22)	10 (9.090)	9 (5.56)	49.88	**0.000**
Discussion of STIs, HIV, or AIDS with stable male partner[a]	Yes	89 (81.65)	71 (83.53)	136 (91.89)	0.88	0.999	128 (88.28)	149 (88.69)	132 (88)	0.00	1.000	70 (76.09)	100 (90.91)	141 (87.04)	1.37	0.995
	No	20 (18.35)	14 (16.47)	12 (8.11)	5.66	0.685	17 (11.72)	19 (11.31)	18 (12)	0.03	1.000	22 (23.91)	10 (9.09)	21 (12.96)	8.07	0.427
Anal sex with stable male partner in the last 12 months[a]	Yes	105 (96.33)	82 (96.47)	148 (100)	0.11	1.000	143 (98.62)	154 (91.67)	133 (88.67)	0.83	0.999	89 (96.74)	105 (95.45)	145 (90.06)	0.35	1.000
	No	4 (3.67)	3 (3.53)	0 (0)	5.34	0.720	2 (1.37)	14 (8.33)	17 (11.33)	10.79	0.214	3 (3.26)	5 (4.55)	16 (9.94)	4.90	0.768
Condom use with stable male partner during the last anal intercourse[b]	Yes	43 (40.95)	48 (58.54)	61 (41.22)	4.15	0.844	62 (43.36)	78 (50.65)	73 (54.89)	1.91	0.984	46 (51.69)	58 (55.24)	70 (48.28)	0.352	1.000
	No	62 (59.05)	34 (41.46)	87 (58.78)	3.44	0.903	81 (56.64)	76 (49.35)	60 (45.11)	1.87	0.985	43 (48.31)	47 (44.76)	75 (51.72)	4.967	0.761
Sexual intercourse with casual male partners in the last 12 months	Yes	318 (91.12)	235 (88.01)	376 (83.93)	1.181	0.997	425 (87.63)	332 (80.00)	362 (82.46)	1.654	0.990	307 (92.19)	349 (78.60)	318 (76.81)	6.212	0.624
	No	31 (8.88)	32 (11.99)	72 (16.07)	8.129	0.421	60 (12.37)	83 (20.00)	77 (17.54)	8.411	0.394	26 (7.81)	95 (21.40)	96 (23.19)	27.882	**0.000**
Discussions on STIs, HIV, or AIDS with casual male partner[c]	Yes	144 (45.28)	119 (50.64)	226 (60.11)	7.431	0.491	216 (50.82)	172 (51.81)	218 (60.22)	3.669	0.886	158 (51.46)	191 (54.73)	170 (53.4)	0.329	1.000
	No	137 (43.08)	101 (42.98)	150 (39.89)	0.530	1.000	177 (41.65)	141 (42.47)	144 (39.78)	0.325	1.000	123 (40.07)	112 (32.09)	148 (46.54)	8.897	0.351
	No data	37 (11.64)	15 (6.38)	0 (0.00)	42.016	**0.000**	32 (7.53)	19 (5.72)	0 (0.00)	25.723	0.001	26 (8.47)	46 (13.18)	0 (0.00)	39.807	**0.000**
Casual male partner living with HIV[c]	Yes	6 (1.89)	12 (5.11)	12 (3.19)	4.31	0.825	21 (4.94)	19 (5.72)	42 (11.60)	13.49	0.096	20 (6.51)	19 (5.44)	14 (4.40)	1.28	0.996
	No	195 (61.32)	112 (47.66)	277 (73.67)	15.74	**0.046**	273 (64.24)	191 (57.53)	249 (68.78)	3.47	0.901	107(34.85)	211 (60.46)	214 (67.30)	33.43	**0.000**
	Don't know / No response	74 (23.27)	97 (41.26)	87 (23.14)	20.65	**0.008**	98 (23.06)	103 (31.02	71 (19.62)	9.71	0.286	148 (48.41)	70 (20.06)	90 (28.30)	42.57	**0.000**
	No data	43 (13.52)	14 (5.96)	0 (0.00)	51.35	**0.000**	33 (7.76)	19 (5.72)	0 (0.00)	26.53	0.001	32 (10.42)	49 (14.04	0 (0.00)	41.83	**0.000**
Anal sex with occasional male partner in the last 12 months[c]	Yes	281 (88.36)	222 (94.46)	345 (91.75)	55.82	**0.000**	395 (92.94)	313 (94.28)	342 (94.48)	0.06	1.000	281 (91.53)	306 (87.68)	282 (88.68)	0.28	1.000
	No	37 (11.64)	13 (5.53)	31 (8.24)	168.27	**0.000**	30 (7.06)	19 (5.72)	20 (5.52)	0.91	0.999	24 (7.82)	41 (11.75)	36 (11.32)	2.85	0.944
	No data	0 (0.00)	0 (0.00)	0 (0.00)	0.00	1.000	0 (0.00)	0 (0.00)	0 (0.00)	0.00	1.000	2 (0.65)	2 (0.57)	0 (0.00)	1.96	0.982
Use of condom with occasional male partner during the last anal intercourse[c]	Yes	119 (37.42)	32 (13.62)	156 (41.49)	36.79	**0.000**	157 (36.94)	47 (14.16)	164 (45.31)	54.51	0.000	131 (42.67)	57 (16.33)	116 (36.48)	39.31	**0.000**
	No	65 (20.44)	195 (82.98)	53 (14.10)	228.86	**0.000**	87 (20.47)	253 (76.20)	55 (15.19)	225.30	0.000	54 (17.59)	257 (73.64)	42 (13.21)	210.70	**0.000**
	No data	134 (42.14)	8 (3.4)	167 (44.41	84.57	**0.000**	181 (42.59)	32 (9.64)	143 (39.50)	73.55	0.000	122 (39.74)	35 (10.03)	160 (50.31)	90.44	**0.000**

Table 3. Characteristics of sexual behaviors of men who have sex with men in Bogotá D.C. and the metropolitan areas of Medellín and Cali in 2010, 2016, and 2019. (Continued)

Characteristics		Medellín Metropolitan Area (n=1 064)					Bogotá D.C. (n=1 339)					Cali Metropolitan Area (n=1 191)				
		2010 (n=349)	2016 (n=267)	2019 (n=448)	X2	*p*-value	2010 (n=485)	2016 (n=415)	2019 (n=439)	X2	*p*-value	2010 (n=333)	2016 (n=444)	2019 (n=414)	X2	*p*-value
		n (%)	n (%)	n (%)			n (%)	n (%)	n (%)			n (%)	n (%)	n (%)		
Number of female sexual partners in the last 12 months	1 to 4 women	54 (15.47)	20 (7.49)	22 (4.91)	25.18	**0.001**	62 (12.78)	49 (11.81)	37 (8.43)	4.26	0.833	31(9.31)	79 (17.79)	70 (16.91)	9.38	0.311
	5 women or more	7 (2.01)	5 (1.87)	5 (1.12)	1.14	0.997	13 (2.68)	16 (3.86)	4 (0.91)	7.64	0.469	9 (2.70)	12 (2.70)	14 (3.38)	0.56	1.000
	None	288 (82.52)	242 (81.61)	421 (93.97)	2.94	0.938	410 (84.54)	350 (84.34)	398 (90.66)	1.31	0.995	293 (87.99)	353 (79.5)	330 (79.71)	1.81	0.986
Stable female partner	Yes	17 (4.87)	1 (0.37)	4 (0.89)	19.95	**0.010**	7 (1.44)	13 (3.13)	3 (0.68)	6.69	0.570	11 (3.30)	26 (5.86)	13 (3.14)	4.64	0.795
	No	332(95.13)	266 (99.63)	444 (99.11)	0.41	1.000	478 (98.56)	402 (96.87)	436 (99.32)	0.11	1.000	322 (96.70)	418 (94.14)	401 (96.86)	0.20	1.000
Condom use with stable female partner the last time[d]	Yes	5 (29.41)	0 (0.00)	0 (0.00)	1.47	0.993	1 (14.29)	5 (35.71)	1 (33.33)	1.02	0.998	5 (45.45)	4 (15.38)	2 (15.38)	3.53	0.897
	No	12 (70.58)	1 (100)	4 (100)	0.43	1.000	6 (85.71)	9 (64.28)	2 (66.66)	0.65	1.000	6 (54.55)	22 (84.61)	11 (84.61)	0.99	0.998
Casual or occasional sexual intercourse with women in the last 6 months	Yes	63 (18.05)	21 (7.87)	19 (4.24)	39.865	**0.000**	78 (16.08)	46 (11.08)	19 (4.33)	30.665	0.000	54 (16.22)	69 (15.54)	61 (14.73)	0.266	1.000
	No	286 (81.95)	246 (92.13)	429 (95.76)	4.273	0.832	407 (83.92)	369 (88.92)	420(95.67)	3.556	0.895	279 (83.78)	375 (84.46)	353 (85.27)	0.049	1.000
Condom use with occasional female partner in the last 12 months[e]	Always	21 (31.34)	11 (52.38)	10 (52.63)	2.86	0.943	32 (41.02)	19 (43.18)	14 (73.68)	3.65	0.887	21 (38.88)	33 (47.82)	28 (45.90)	0.58	1.000
	Usually	8 (11.94)	3 (14.28)	4 (21.05)	0.88	0.999	10 (12.82)	15 (34.09)	2 (10.52)	7.50	0.484	5 (9.26)	17 (24.63)	6 (9.836)	6.44	0.598
	Sometimes	18 (26.86)	4 (19.04)	4 (21.05)	0.50	1.000	16 (20.51)	6 (13.63)	2 (10.52)	1.33	0.995	9 (16.66)	11 (15.94)	15 (24.59)	1.50	0.993
	Never	20 (29.85)	3 (14.28)	1 (5.26)	4.76	0.783	20 (25.64)	4 (9.090)	1 (5.26)	6.27	0.617	19 (35.18)	8 (11.59)	12 (19.67)	8.05	0.428
Money received in exchange for penetrative sex in the last 12 months	Yes	55 (15.76)	24 (8.99)	21 (4.69)	24.917	**0.002**	53 (10.93)	33 (7.95)	26 (5.92)	7.024	0.534	26 (7.81)	41 (9.23)	54 (13.04)	5.576	0.695
	No	294 (84.24)	243 (91.01)	427(95.31)	2.671	0.953	432 (89.07)	382(92.05)	413 (94.08)	0.641	1.000	307 (92.19)	403 (90.77)	360 (86.96)	0.631	1.000
Condom use during penetrative sexual intercourse in exchange for money by the respondent or the client in the last 12 months[f]	Always	32 (58.18)	15 (62.5)	3 (14.29)	0.14	1.000	45 (84.90)	23 (69.69)	8 (30.77)	0.82	0.999	18 (69.23)	27 (65.85)	20 (37.03)	0.27	1.000
	Usually	9 (16.36)	7 (29.16)	3 (14.29)	3.43	0.904	5 (9.433)	5 (15.15)	0 (0)	2.05	0.980	5 (19.23)	2 (4.87)	5 (9.26)	3.10	0.928
	Sometimes	10 (18.18)	2 (8.33)	0 (0)	2.06	0.979	1 (1.88)	2 (6.06)	3 (11.54)	8.54	0.383	3 (11.53)	11 (26.82)	5 (9.26)	2.44	0.965
	Never	4 (7.27)	0 (0)	0 (0)	2.18	0.975	2 (3.77)	3 (9.090)	1 (3.85)	1.05	0.998	0 (0)	1 (2.43)	4 (7.41)	5.00	0.758
	No data	0 (0.00)	0 (0.00)	15 (71.42)	56.42	**0.000**	0 (0.00)	0 (0.00)	14 (53.85)	46.30	0.000	0 (0.00)	0 (0.00)	20 (37.03)	24.81	**0.002**
Commercial sex as a main source of income[f]	Yes	16 (29.09)	7 (29.16)	2 (9.52)	2.55	0.960	15 (28.30)	13 (39.39)	5 (19.23)	2.05	0.979	5 (19.23)	7 (17.07)	11 (20.37)	0.13	1.000
	No	39 (70.90)	17 (70.83)	19 (90.47)	0.85	0.999	38 (71.69)	20 (60.60)	21 (80.76)	0.86	0.999	21 (80.76)	34 (82.92)	43 (79.63)	0.03	1.000
Person with whom sexual intercourse has taken place in exchange for money (each category equals 100%)[f]	Men	55 (100)	23 (95.83)	21 (95.45)	0.47	1.000	52 (70.27)	32 (96.96)	26 (89.65)	1.58	0.991	26 (100)	40 (97.56)	53 (98.14)	0.11	1.000
	Women	7 (12.73)	1 (4.16)	1 (4.54)	1.32	0.995	15 (20.27)	12 (36.36)	2 (6.89)	3.06	0.930	3 (11.53)	5 (12.19)	8 (14.81)	0.12	1.000
	Transgender	4 (7.27)	0 (0)	0 (0)	2.79	0.947	7 (9.459)	5 (15.15)	1 (3.44)	1.11	0.997	0 (0)	2 (4.87)	3 (5.55)	1.32	0.995

[a] Percentages were calculated only for participants who had a stable male partner.
[b] Percentages were calculated only for participants who had anal sex with a stable male partner in the last 12 months.
[c] Percentages were calculated only for participants who had sex with a casual partner in the last 12 months..
[d] Percentages were calculated only for participants who reported having a stable female partner.
[e] Percentages were calculated only for participants who reported having casual female partners in the past 12 months for the studies conducted in 2010 and 2016 and only for participants who reported having occasional or causal sex in the past 6 months for the study conducted in 2019.
[f] Percentages were calculated only for participants who reported receiving money in exchange for penetrative sex in the past 12 months.

Regarding participation in HIV/AIDS information or education activities in the past 12 months, the proportions of MSM who reported taking part in such activities ranged from 27.33% to 45.78%, with a statistically significant difference observed only in MSM from Bogotá D.C. (2010: 28.04%, 2016: 45.78%, and 2019: 41.91%; p=0.007). As for the entities responsible for these activities, nongovernmental organizations were the most frequently reported in the 3 cities/metropolitan areas and in the 3 years of study (39.52-77.23%), with no statistically significant differences.

For STI history, there were statistically significant differences in the percentage of MSM who reported having a history of STI in all 3 cities/metropolitan areas between the 3 years of analysis, with a decrease observed in all cities/metropolitan areas between 2010 and 2019. In the Medellín metropolitan area, it went from 24.64% to 12.28%, in Bogotá D.C., it dropped from 27.84% to 19.59%, and in the Cali metropolitan area, it fell from 32.73% to 10.63%. Gonorrhea was the most frequently diagnosed STI in a health service in the 3 cities/metropolitan areas over the 3 years of analysis (20.75-48.84%), followed by syphilis (13.76-57.69%) (Table 4).

Finally, the proportion of MSM who reported having used alcohol or drugs at least once in their lifetime was high in the 3 years analyzed in all 3 cities/metropolitan areas w(84.45-97.71%), with no statistically significant differences in each city/metropolitan area. In terms of the type of psychoactive substances used in the last 12 months, statistically significant differences were found in the Medellín metropolitan area in terms of the use of poppers (p=0.036), increasing from 22.29% in 2010 to 38.17% in 2019; in Bogotá D.C., ecstasy use (p=0.013) rose from 5.04% in 2010 to 13.83% in 2019; and in the Cali metropolitan area, the use of marijuana. (p=0.011) increased from 25.16% in 2010 to 41.24% in 2019, while crack (p=0.000) went from 1.89% in 2010 to 11.08% in 2019, and inhalants (p=0.000) rose from 0.94% in 2010 to 6.70% in 2019. It is worth mentioning that a high proportion of alcohol (86.41-98.53%), marijuana (25.16-45.07%), poppers (13.52-38.17%), cocaine (11.24-19.85%), and ecstasy (4.53-13.83%) use was observed in the 3 years analyzed in the 3 cities/metropolitan areas (Table 4).

Table 4. Characteristics related to participation in information or education activities on HIV/AIDS, sexually transmitted infections, and psychoactive substance use among men who have sex with men in Bogotá D.C. and the metropolitan areas of Medellín and Cali in 2010, 2016, and 2019.

Characteristics		Medellín Metropolitan Area (n=1 064)					Bogotá D.C. (n=1 339)					Cali Metropolitan Area (n=1 191)				
		2010 (n=349)	2016 (n=267)	2019 (n=448)	X2	*p*-value	2010 (n=485)	2016 (n=415)	2019 n=439)	X2	*p*-value	2010 (n=333)	2016 (n=444)	2019 (n=414)	X2	*p*-value
		n (%)	n (%)	n (%)			n (%)	n (%)	n (%)			n (%)	n (%)	n (%)		
Participation in HIV/AIDS information or education activities in the last 12 months	Yes	124 (35.53)	101 (37.83)	167 (37.28)	0.256	1.000	136 (28.04)	190 (45.78)	184 (41.91)	20.99	0.007	91 (27.33)	191 (43.02)	147 (35.51)	13.05	0.110
	No	218 (62.46)	166 (62.17)	275 (61.39)	0.040	1.000	347 (71.53)	213 (51.32)	255 (58.09)	15.85	0.045	236(70.87)	253 (56.98)	265 (64.49)	5.84	0.664
	No data	7 (2.01)	0 (0.00)	6 (1.33)	5.068	0.750	2 (0.41)	12 (2.89)	0 (0.00)	19.97	0.010	6 (1.80)	0 (0.00)	2 (0.48)	9.53	0.299
Entities that have provided HIV/AIDS information or education activities (each category equals 100%)[a]	Hospital / Health center	38 (30.65)	27 (26.73)	69 (41.31)	9.42	0.308	42 (30.88)	49 (25.78)	76 (41.30)	2.82	0.945	22 (22.17)	62 (32.46)	68 (46.25)	8.86	0.354
	Non-governmental organizations	55 (44.35)	78 (77.23)	66 (39.52)	7.28	0.506	65 (47.79)	113 (59.47)	105 (57.06)	8.28	0.407	53 (58.24)	121 (63.35)	80 (54.42)	1.13	0.997
	Other	51 (41.12)	44 (43.56)	59 (35.32)	0.95	0.999	52 (38.23)	19 (10.00)	38 (20.65)	22.26	0.004	36 (39.56)	47 (24.61)	28 (19.04)	9.12	0.332
History of STI (in the 2016 and 2019 surveys, the question is " have you had any STI in the last 12 months?", while the 2010 survey does not specify the period)	Yes	86 (24.65)	26 (9.74)	55 (12.27)	27.17	**0.001**	135 (27.84)	63 (15.18)	86 (19.59)	17.69	0.024	110 (33.03)	53 (11.54)	44 (10.62)	63.89	0.000
	No	244 (69.91)	234 (87.64)	388 (86.60)	8.42	0.393	338 (69.69)	342 (82.40)	342 (77.90)	5.13	0.743	208 (62.46)	379 (85.36)	368 (88.88)	18.43	0.018
	NS / NR	0 (0.00)	0 (0.00)	3 (0.66)	4.12	0.846	8 (1.64)	3 (0.72)	2 (0.46)	3.24	0.918	0 (0.00)	8 (1.80)	1 (0.24)	10.39	0.238
	No data	19 (5.44)	7 (2.62)	2 (0.44)	18.62	0.017	4 (0.82)	7 (1.68)	9 (2.05)	1.06	0.998	15 (4.50)	4 (0.90)	1 (0.24	24.78	0.002

Table 4. Characteristics related to participation in information or education activities on HIV/AIDS, sexually transmitted infections, and psychoactive substance use among men who have sex with men in Bogotá D.C. and the metropolitan areas of Medellín and Cali in 2010, 2016, and 2019. (Continued)

Characteristics		Medellín Metropolitan Area (n=1 064)					Bogotá D.C. (n=1 339)					Cali Metropolitan Area (n=1 191)				
		2010 (n=349)	2016 (n=267)	2019 (n=448)	X2	*p*-value	2010 (n=485)	2016 (n=415)	2019 n=439)	X2	*p*-value	2010 (n=333)	2016 (n=444)	2019 (n=414)	X2	*p*-value
		n (%)	n (%)	n (%)			n (%)	n (%)	n (%)			n (%)	n (%)	n (%)		
STIs diagnosed in a health service (each category equals 100%)[b]	Gonorrhea	42 (48.84)	6 (23.07)	12 (21.82)	8.23	0.411	57 (42.22)	25 (39.68)	19 (22.09)	6.37	0.606	52 (46.79)	11 (20.75)	10 (22.72)	9.30	0.317
	Chlamydia	1 (1.16)	1 (3.85)	2 (3.64)	1.12	0.997	2 (1.48)	3 (4.76)	5 (5.81)	3.15	0.924	0 (0.00)	3 (5.66)	3 (6.82)	6.85	0.553
	Herpes	5 (5.81)	3 (11.53)	6 (10.91)	1.40	0.994	22 (16.30)	6 (9.52)	3 (3.49)	8.03	0.430	17 (15.60)	11 (20.75)	3 (6.82)	3.14	0.925
	Condyloma / Genital warts	20 (23.26)	3 (11.53)	3 (5.45)	7.14	0.521	15 (11.11)	6 (9.52)	8 (9.30)	0.20	1.000	10 (9.17)	10 (18.87)	4 (9.09)	3.19	0.922
	Syphilis	19 (22.09)	15 (57.69)	27 (49.09)	10.47	0.234	22 (16.30)	10 (15.87)	47 (54.65)	31.93	0.000	15 (13.76)	16 (30.19)	23 (52.27)	18.16	**0.020**
	Hepatitis B	0 (0.00)	2 (7.69)	0 (0.00)	10.84	0.211	3 (2.22)	2 (3.17)	0 (0.00)	0.71	0.999	5 (4.59)	1 (1.88)	0 (0.00)	2.52	0.945
Alcohol or drug use at some point in life	Yes	341 (97.71)	263 (98.50)	427 (95.31)	0.21	1.000	476 (98.14)	409 (98.55)	405 (92.25)	1.13	0.997	318 (95.49)	375 (84.45)	388 (93.71)	3.16	0.924
	No	8 (2.29)	4 (1.50)	21 (4.68)	6.56	0.584	9 (1.86)	6 (1.44)	34 (7.74)	29.84	0.000	14 (4.20)	69 (15.54)	26 (6.28)	32.43	**0.000**
	No data	0 (0.00)	0 (0.00)	0 (0.00)	0.00	1.000	0 (0.00)	0 (0.00)	0 (0.00)	**0.00**	1.000	1 (0.30)	0 (0.00)	0 (0.00)	2.57	0.958
Type of substance used in the last 12 months (each category equals 100%)[c]	Alcohol	336 (98.53)	246 (93.54)	393 (92.03)	0.88	0.999	466 (97.89)	396 (96.82)	350 (86.41)	3.59	0.892	298 (93.71)	369 (98.40)	351 (90.46)	1.28	0.996
	Marihuana	145 (42.52)	101 (38.40)	190 (44.50)	1.43	0.994	164 (34.45)	184 (44.99)	163 (40.24)	6.22	0.622	80 (25.16)	169 (45.07)	160 (41.24)	19.87	**0.011**
	Cocaine	55 (16.13)	33 (12.55)	48 (11.24)	3.54	0.896	88 (18.49)	68 (16.63)	54 (13.33)	3.61	0.890	39 (12.26)	52 (13.87)	77 (19.85)	7.49	0.484
	Popper	76 (22.29)	96 (36.50)	163 (38.17)	16.42	**0.036**	68 (14.29)	83 (20.29)	100 (24.69)	12.39	0.135	43 (13.52)	53 (14.13)	75 (19.33)	4.75	0.783
	Ecstasy	19 (5.57)	12 (4.56)	28 (6.56)	1.15	0.997	24 (5.04)	34 (8.31)	56 (13.83)	19.29	**0.013**	21 (6.60)	17 (4.53)	22 (5.67)	1.34	0.995
	Viagra	19 (5.57	16 (6.08)	6 (1.41)	12.21	0.142	29 (6.09)	25 (6.11)	30 (7.41)	0.72	0.999	21 (6.60	24 (6.40)	49 (12.63)	10.77	0.215
	Injected heroin	0 (0.00)	0 (0.00)	0 (0.00)	2.02	0.980	2 (0.42)	3 (0.73)	8 (1.98)	5.69	0.681	1 (0.31)	1 (0.26)	9 (2.31)	10.08	0.259
	Smoked heroin	1 (0.27)	0 (0.00)	3 (0.70)	4.24	0.835	2 (0.42)	1 (0.24)	9 (2.22)	10.66	0.221	1 (0.31)	1 (0.26)	9 (2.31)	10.08	0.259
	Crack	6 (1.76)	5 (1.90)	13 (3.04)	1.62	0.991	13 (2.13)	6 (1.47)	22 (5.43)	9.40	0.309	6 (1.89)	17 (4.53)	43 (11.08)	32.26	**0.000**
	Inhalants	9 (2.64)	0 (0.00)	5 (1.17)	7.80	0.453	10 (2.10)	4 (0.97)	10 (2.47)	2.66	0.954	3 (0.94)	7 (1.86)	26 (6.70)	32.97	**0.000**

[a] Percentages were calculated only for participants who reported participating in HIV/AIDS information or education activities in the last 12 months.
[b] Percentages were calculated only for participants who reported having a history of STIs considering that the question asked in the 2016 and 2019 studies is whether they had had an STI in the last 12 months, while the 2010 study does not specify the period.
[c] Percentages were calculated only for participants who reported ever having used alcohol or drugs at some other point in their lives.

HIV prevalence

The highest HIV prevalence reported in the 3 studies was found in Bogotá D.C., with 26.40 for 2019, and the lowest was reported in the Medellín metropolitan area with 9.10 in 2010.

Regarding the variation of HIV prevalence in each city/metropolitan area, the following was found according to the calculated delta of change: i) the Medellín metropolitan area had a positive variation of 25.3% taking the 2010 and 2019 studies as a reference, with no significant differences in this trend (p=0.13); ii) in Bogotá D.C., the positive variation was 76.00% from 2010 to 2019, with an increase in the trend, which was statistically significant (p=0.001); and iii) in the Cali metropolitan area, a negative variation of 2.90% was reported, with no statistical differences (p=0.570) (Figure 1). Importantly, the delta of change was calculated for each city as follows: the figure reported in 2010 was subtracted from the figure reported in 2019, this result was then divided by the figure reported in 2010, and the resulting figure was multiplied by 100.

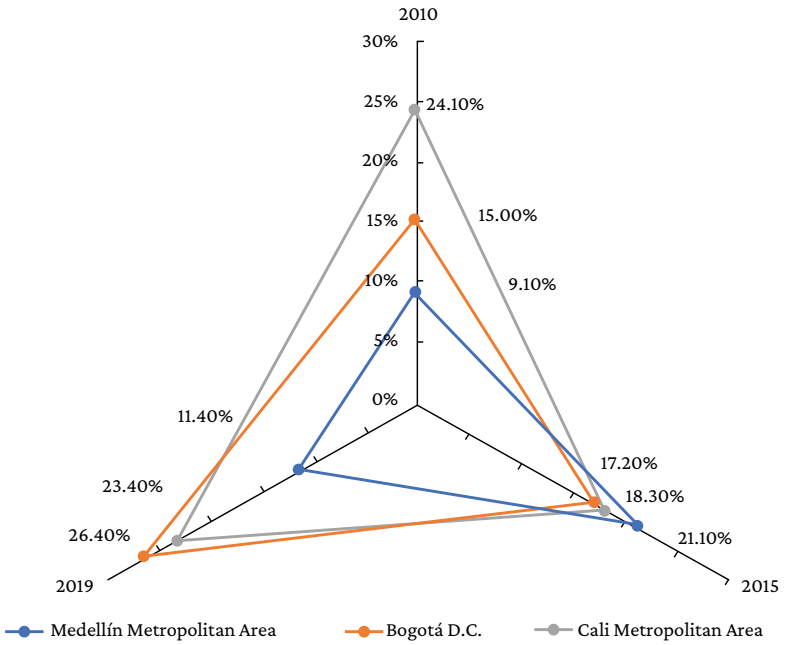

Figure 1. Comparison of HIV prevalence in men who have sex with men in three Colombian cities.
Note: *p*-value (chi-square test for trend): Medellín metropolitan area: 0.13; Bogotá D.C.: 0.001; Cali metropolitan area: 0.570.

Discussion

The present study used secondary data from MSM residing in Bogotá D.C. and the metropolitan areas of Cali and Medellín obtained at 3 different points in time (2010, 2016, 2019) using RDS, so the sample analyzed is widely diverse.

A high prevalence of HIV infection was observed in MSM in the 3 cities/metropolitan areas, with rates between 9.10% and 26.40% in the 3 years analyzed. In this regard, and in accordance with what has been found in the literature, it could be said that these figures are within the range of seroprevalence values reported by several studies and reports worldwide, but that they are also higher than those reported in other studies. For example, Paz-Bailey *et al.*,[24] in a study conducted in the United States in 2011 with 937 adult MSM (over 18 years of age), reported an HIV infection prevalence of 26.04%, while, according to UNAIDS,[25] HIV prevalence in gay and MSM in Latin America was 12.6% between 2015 and 2019. In other words, the seroprevalence figures found in our study are within the range of what is reported by those documents, yet they are higher than the 7.7% reported by UNAIDS[26] for gay men and MSM worldwide in 2023 and the 5.90% found by Magno *et al.*[27] in a study conducted between 2019 and 2021 in Salvador Bahia (Brazil) in 288 adolescent men who have sex with men.

As for STI reporting, between 9.74% and 33.03% reported having a STI in the past 12 months, with gonorrhea (20.75-48.84%) and syphilis (13.76-57.69%) being the most frequent. The latter continues to be a cause of global concern in this population, as different studies have documented an increase in its prevalence among MSM. For example, Read *et al.*,[28] in a study analyzing syphilis notification rates between 2000 and 2013 in 27 high-income countries, found that the proportion of reported cases in MSM went from 26.8% to 55%, with the difference being statistically significant ($p<0.001$). Likewise, in a systematic review that included 18 studies of syphilis trends in MSM in the United

States and Western Europe published between January 2004 and June 2016, Abara *et al.*[29] found increasing rates of syphilis infection among MSM in the United States and Western Europe since 1998, especially in young men.

Notwithstanding the above, lower prevalence rates than those observed in our study have been described in the literature. For example, Blair *et al.,*[30] in a study conducted in Peru between 2012 and 2014 in 898 MSM, found that 10.57% of the participants were diagnosed with syphilis, while Westin *et al.,*[31] in a study that included 677 adolescents (15-19 years) who were MSM, transvestites or transgender women from 3 capital cities of Brazil recruited between April 2019 and December 2020, reported that the prevalence of syphilis was 21.3%.

Concerning the characteristics of MSM, it was found that the most common age group in the 3 cities was 18 to 24 years old (27.53% to 58.03%), which is consistent with what was reported by Almeida *et al.*[32] in a study conducted with 4 176 MSM from 12 Brazilian cities, in which the involvement of MSM in nongovernmental organizations and participation in HIV/AIDS prevention actions was analyzed, with 56.6% of them being under 25 years old. However, our finding differs from previous studies conducted by Fernández-Dávila & Zaragoza-Lorca[33] with 485 MSM in 4 Spanish cities (Madrid, Barcelona, Bilbao, and San Sebastián), where 75.19% were older than 25 years, and by Caravalho-Gomes *et al.*[34] in a systematic review on chemsex and sexual risk behaviors in MSM in which they included 8 studies, finding that the average age of this population was 35 years.

Moreover, MSM with a low socioeconomic level, defined as strata 0-3 (79.28-87.68%), predominated in our study. This differs from Almeida *et al.*,[32] who reported that only 56.70% of their participants had a low socioeconomic status. The high proportion of university students (18.11-57.63%) is also striking when compared with other studies such as the one by Yanli *et al.*,[35] who, in a sample of 659 MSM from Changzhou (China), analyzed the effects of educational attainment among MSM on their high-risk sexual behaviors and HIV/STI infection rates, finding that only 30.2% were university students.

Another notable finding is that most MSM did not have a stable partner (male: 60.87-74.32%; female: 94.14-99.63%), and that a high proportion of participants reported having casual male partners (76.81-92.19%) and not using a condom in the last sexual intercourse with their casual male partner (13.21-82.98%). This last result is consistent with the findings reported by Folch *et al.*[36] in a study conducted in 2010 with 13 111 MSM over 13 years of age living in Spain to identify factors associated with high-risk sexual practices in this demographic. They found that of the 10 030 (76.5%) MSM who reported having sex with casual partners in the last year, 93.6% (9 388) had anal intercourse with one of these partners and that 45.3% of them did not use a condom.

Our study found that between 4.69% and 15.76% of MSM reported receiving money in exchange for penetrative sex, being this percentage high compared to the 5.1% reported by Folch *et al.*[36] A possible explanation for this difference would be that Folch *et al.*[36] conducted their study in a high-income country (Spain), where MSM may have better job opportunities than MSM in Colombia and, consequently, their sexual relations with other men are more related to pleasure than to economic activity.

In the present study, while there was a low participation of MSM in HIV/AIDS information or education activities (between 27.69% and 45.78% in the 3 years analyzed in the 3 cities), figures are similar to those reported by Almeida *et al.*,[32] who found that, in the last 12 months, 38.7% of their participants received educational material on STIs, 23.8% participated in lectures on STIs, and 40.4% received counseling on STIs.

Regarding the use of psychoactive substances, between 84.45% and 98.55% of MSM reported using alcohol or drugs at least once in their lifetime, with alcohol being the most frequently used psychoactive substance in the last 12 months (86.42-98.53%), followed by marijuana (25.16-45.07%). The frequency of marijuana use found in the present study is similar to the 30.1% reported by Folch *et al.*[36] for marijuana and hashish use in the last 12 months. As for cocaine, it is striking that the range of use reported by MSM in the present study (11.24% to 19.85%) is low in comparison with what is reported in the literature, since, for example, according to the systematic review by Carvalho-Gomes *et al.*,[34] the frequency of use of this drug in MSM ranged from 2% to 46.6%.

The main limitation of the present study is the secondary nature of the data, as well as the fact that, with the exception of HIV seroprevalence, the information was self-reported in all three studies, which could lead to a possible reporting bias. However, it should be pointed out that, as stated in the source studies, the surveys were conducted by personnel duly trained and familiar with this population, thus minimizing this possible bias. On the other hand, one of the strengths of the three source studies is the use of RDS, a sampling method that ensures adequate capture and identification of the key population.

Conclusions

According to the results reported here, it is possible to state that the prevalence of HIV among MSM in Bogotá D.C. and the metropolitan areas of Medellín and Cali in the 3 years covered by the study was high and that there are differences in their characteristics depending on the city/metropolitan area in which they reside, which implies that the approach to this population in the country cannot be similar in all territories and must be adapted to the characteristics of MSM in each city or territory. Likewise, it was noted that participation in education or information activities on HIV/AIDS in the last 12 months was 27.69-45.78%, so it is necessary to increase the offer of this type of actions and to design strategies that facilitate and promote the participation of MSM in these activities.

An important matter is condom use, as the study identified that a high proportion of MSM do not use condoms with their regular or occasional partners, which is a risk practice that can lead to increased rates of STIs in this population. Accordingly, there is an urgent need to intensify government actions to address the high prevalence of HIV and promote condom use in the country by designing comprehensive regionalized strategies through prevention and promotion programs (including harm reduction scenarios), as well as to allocate resources to expand and strengthen research and monitoring processes on the aforementioned issues.

Conflicts of interest

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