Cancer Risk Behaviors, Cancer Beliefs and Health Information Seeking Among Under-Represented Populations in San Francisco: Differences by Sexual Orientation and Gender Identity

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Abstract

Background

Compared to the general population, sexual and gender minorities (SGM) are at increased risk of some types of cancer, in part due to engagement in high-risk behaviors and lack of adequate preventive care. Understanding how SGM perceive cancer risk and their practices and preferences for accessing health information is key for improving the preventive and healthcare services they receive.

Methods

In this cross-sectional study we analyzed data from the San Francisco Health Information National Trends Survey. SGM were identified by self-report. Differences in cancer risk factors and cancer beliefs as well as health information seeking behaviors and preferences were evaluated by sexual orientation and gender identity (SOGI) using multivariable logistic regression models.

Results

Out of 1027 participants, 130 (13%) reported being SGM. In multivariable models adjusting for age, sex at birth, education and race/ethnicity, current smoking was more common in SGM than non-SGM respondents (OR = 1.62, 95% CI = 1.03, 2.54). No differences in health information seeking behaviors, preferences and cancer beliefs were observed by SGM status. However, SGM reported significantly higher odds of feeling frustrated during the most recent health information search (OR = 1.71, 95% CI = 1.14, 2.56).

Conclusions

In this diverse urban population, SGM were more likely to be current smokers. No differences in preferences for accessing and exchanging health information were reported by SGM status. The drivers of increased feelings of frustration while seeking health information and its implications for SGM health and care merit further evaluation. Also, tobacco cessation interventions should be promoted in this community.

Background

In the U.S., it is estimated that 4.5% of the population (or 11.3 million individuals) are sexual and gender minorities (SGM) [1]. Yet, sexual orientation and gender identity (SOGI) information is not routinely collected in health surveillance systems, national surveys, medical records, and biomedical research [2–4]. In recent years, leading health-related organizations in the country recognized the urgency of eliminating this gap in knowledge, and designated SGM as a priority group [5–8]. In 2010, for the first

time, the U.S. Department of Health and Human Services included SGM among the topics and objectives of the Healthy People initiative for 2020 [9]. The Institute of Medicine recommended in 2011 that “the National Institutes of Health (NIH) should implement a research agenda designed to advance the knowledge and understanding of SGM health” [6]. In 2015, NIH established the Sexual & Gender Minority Research Office which leads a series of initiatives to promote and support SGM research [10]. More recently, state and national surveys began including questions about SOGI [11]. Also, health care systems have been incorporating SOGI in patients’ records; and population-based data sources, like the ones collected by the Census Bureau and cancer registries, have initiated work to include this information [4, 12, 13].

Although population-level data about health outcomes by SOGI in the U.S. is limited, reports indicate that SGM have higher incidence and mortality of many diseases than the general population, including cancer [14, 15]. SGM are at increased risk of some types of cancer, in part due to engagement in high-risk behaviors (e.g., use of tobacco products, and alcohol) and lack of adequate care across the cancer continuum [16–22]. For SGM, barriers to receiving optimal care include discrimination, stigma at individual, interpersonal, and structural levels, lack of knowledge about cancer risk factors and screening guidelines, inaccurate cancer beliefs, poor clinician-patient communication, and providers’ limited knowledge of SGM health and their specific needs [23–26]. Also, the absence of information about SGM in data sources and health research in general contribute to this problem and impedes gathering evidence that allows for the development of public health interventions that improve SGM health.

According to recent estimates, 6.7% of people in the San Francisco Bay Area identify as SGM, the highest proportion of any large metropolitan area in the U.S. [27]. Conducting research in this setting represents a great opportunity for obtaining information on this vulnerable population. In this study, we assessed the relationship between SGM status and cancer risk behaviors, cancer beliefs, and health information seeking behaviors, preferences and perceptions in a multiethnic urban population in San Francisco. Understanding how SGM perceive cancer risk, and their practices and preferences for accessing health information is key for improving the healthcare services they receive and reduce health inequities in this group.

Methods

Data source, study design and study population

In this cross-sectional study we analyzed data from the San Francisco Health Information National Trends Survey (SF-HINTS). SF-HINTS was conducted in 2017 as part of the research activities of the San Francisco Cancer Initiative, a collaborative effort between health care providers, academic centers, government, community groups, and residents to reduce the burden of cancer in the city [28].

Unlike HINTS, which employs a two-stage sampling design to recruit a representative sample of the U.S., SF-HINTS used community-based snowball sampling to reach members of diverse populations often

excluded from research [29]. Predefined proportions of the total sample corresponded to two characteristics of interest: language and race/ethnicity. Fifty-percent of all interviews were conducted in English (among those, 50% of respondents were African American) and the remainder in Cantonese or Mandarin (25%) and Spanish (25%). Participants of the study were reached at popular community locations in San Francisco (e.g., street markets, parks, community events) during May-September, 2017. The research team obtained informed consent and administered surveys face-to-face using iPads. Whenever participants were comfortable, they were able to take the survey on their own under the supervision of the survey administrator. Data were collected using the Research Electronic Data Capture (REDCap) web-based application hosted at the University of California, San Francisco [30, 31].

Measures

Participants were considered SGM based on self-report to the following questions: “How do you describe your sexual orientation or sexual identity?” and “What is your current gender identity?”. A person was classified as SGM if for sexual orientation chose “Gay/Lesbian/Same-Gender Loving”, “Bisexual” or any response other than “Straight/Heterosexual”, and/or for gender identity selected “Female-to-Male/Transgender Male/Trans Man,” “Male-to-Female/Transgender Female/Trans Woman”, “Genderqueer” or any response other than “Male” and “Female”. These questions were taken from the repository of validated questions featured in HINTS 5, Cycle 1 and the 2016 Behavioral Risk Factor Surveillance System survey [32, 33].

The outcome variables in this study were participants’ health information seeking behaviors, preferences and perceptions, cancer risk behaviors and beliefs. For health information seeking behaviors participants were asked whether they have ever looked for information about health or medical topics from any source, their preferred source of information, their preferences for getting information from providers, sources used for getting health information from a provider in the last year and their perceptions during their most recent health information search.

To assess cancer risk behaviors, respondents were asked about lifetime smoking of at least 100 cigarettes (yes/no), current smoking (yes/no), use of e-cigarettes or other electronic “smoking” devices (yes/no), alcohol use (dichotomized for analysis as either everyday/weekly/monthly use of any beverage containing alcohol or non-use/once-a-year use) and physical inactivity (“any physical activities or exercises such as running, golf, gardening, or walking for exercise” yes/no).

To assess cancer beliefs, a Likert-type scale was used to measure participants’ level of agreement (strongly agree, somewhat agree, somewhat disagree and strongly disagree) with the following five statements: “Everything causes cancer”; “There is not much you can do to lower your chances of getting cancer”; “There are so many recommendations about preventing cancer that it is hard to know which ones to follow”; “Cancer is most often caused by behavior or lifestyle”; and “When I think about cancer, I think about death”. For analysis, responses were classified into two categories (agree, disagree).

Additional sociodemographic and health care access variables were collected and considered in the analysis. These included age (continuous), sex at birth (male or female), race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, non-Hispanic Asian/Pacific Islander and Other), marital status (dichotomized as single/divorced/separated/widowed or married/domestic partnership/living as married), education (less than high school, completed high school and more than high school), employment status (employed, unemployed, retired and disabled), household income (<\$10k, \$10k to <\$20k, \$20k to <\$50k and $\geq$ \$50k) and place of birth (U.S. or foreign-born). For access to care, variables measured were health insurance coverage (Medicaid, Medicare, private, other, or none), having usual place of care (yes/no), and times received care in the last year (0, 1–2, 3–4 and more than 4).

Statistical analysis

Descriptive analyses were conducted to summarize and compare the characteristics of the population under study by SGM status. Differences in sociodemographic characteristics and health care access were evaluated using Student's t-test, Pearson's chi-squared test or Fisher's exact test. Unadjusted and adjusted logistic regression models were fitted to assess the association between SGM status and the outcomes of interest. Multivariable models included age, sex at birth, race/ethnicity and education. Regression results are reported as odds ratios (OR) with 95% confidence intervals (95% CI). For questions in which participants answered "do not know" or refused to answer, the information was treated as missing data and excluded from the analysis. All analyses were conducted in Stata (Version 15.1, College Station, TX, USA).

Results

In SF-HINTS, a total of 1027 participants were surveyed, and among them 130 (13%) were classified as SGM (lesbian/gay, n = 64; bisexual, n = 39; transgender, n = 14; queer/other, n = 13). Compared to non-SGM, SGM were significantly younger and more educated. Also, a significantly higher proportion of SGM reported being assigned male sex at birth, Hispanic, unemployed, and not having a partner (Table 1).

Table 1

Characteristics of participants in the San Francisco Health Information National Trends Survey by sexual orientation and gender identity

	All participants, n = 1027	SGM, n = 130	Non-SGM, n = 897	p- value
	n (%)	n (%)	n (%)	
Sociodemographic characteristics				
Age				
Mean, sd	47.4 (16.7)	40.5 (13.3)	48.4 (16.9)	< 0.001
Sex at birth				
Male	488 (47.7)	91 (70.5)	397 (44.4)	< 0.001
Female	536 (52.3)	38 (29.5)	498 (55.6)	
Sexual orientation and gender identity				
Heterosexual men and women	897 (87.3)	-	897 (100)	-
Gay/Lesbian men and women	64 (6.2)	64 (49.2)	-	
Bisexual men and women	39 (3.8)	39 (30.0)	-	
Transgender men and women	14 (1.4)	14 (10.8)	-	
Queer/Other	13 (1.3)	13 (10.0)	-	
Race/ethnicity				
Non-Hispanic White	44 (4.3)	4 (3.1)	40 (4.5)	< 0.001
Non-Hispanic Black	243 (23.7)	19 (14.6)	224 (25.0)	
Hispanic	365 (35.5)	83 (63.9)	282 (31.4)	
Non-Hispanic Asian/Pacific-Islander	317 (30.9)	13 (10.0)	304 (33.9)	
Other	58 (5.7)	11 (8.5)	47 (5.2)	
Marital status				
Single/Divorced/Separated/Widowed	682 (68.4)	104 (81.9)	578 (66.4)	< 0.001
Married/Domestic partnership/Living as married	315 (31.6)	23 (18.1)	292 (33.6)	
Education				

	All participants, n = 1027	SGM, n = 130	Non-SGM, n = 897	p- value
Less than HS	236 (23.3)	14 (10.9)	222 (25.1)	< 0.001
Completed HS	305 (30.2)	28 (21.9)	277 (31.4)	
More than HS	470 (46.5)	86 (67.2)	384 (43.5)	
Employment status				
Unemployed	299 (30.1)	50 (39.4)	249 (28.8)	< 0.001
Employed	435 (43.9)	60 (47.2)	375 (43.4)	
Retired	137 (13.8)	3 (2.4)	134 (15.5)	
Disabled	121 (12.2)	14 (11.0)	107 (12.4)	
Household income				
<\$10k	237 (26.6)	29 (27.9)	208 (26.5)	0.84
\$10k to <\$20k	274 (30.8)	28 (26.9)	246 (31.3)	
\$20k to < \$50k	221 (24.8)	27 (26.0)	194 (24.7)	
≥\$50k	158 (17.8)	20 (19.2)	138 (17.6)	
Born in the US	482 (47.7)	54 (43.2)	428 (48.4)	0.28
Access to health care				
Health insurance coverage				
None	141 (14.4)	20 (16.1)	121 (14.2)	0.25
Medicaid	167 (17.1)	19 (15.3)	148 (17.3)	
Medicare	318 (32.5)	36 (29.0)	282 (33.0)	
Private	236 (24.1)	27 (21.8)	209 (24.4)	
Other	117 (12.0)	22 (17.7)	95 (11.1)	
Usual place of care	848 (88.3)	110 (88.0)	738 (88.4)	0.90
Times received care in last 12 months (no ER)				
0	204 (19.9)	23 (17.7)	181 (20.2)	0.72
1–2	356 (34.7)	42 (32.3)	314 (35.0)	

	All participants, n = 1027	SGM, n = 130	Non-SGM, n = 897	p- value
3–4	258 (25.1)	35 (26.9)	223 (24.9)	
≥ 5	209 (20.4)	30 (23.1)	179 (20.0)	
SGM: Sexual and gender minorities; ER: Emergency room; HS: High school				

Results of the relationship between SGM status and cancer risk behaviors and beliefs are shown in Table 2. For cancer risk behaviors, 35% of the study population had history of smoking at least 100 cigarettes, 25% reported being current smokers, 9% said were using electronic devices to smoke, half of them used alcohol frequently and 23% reported not doing exercises during the last month. When evaluating these behaviors by SGM status using regression models, SGM had significantly higher odds of current smoking (OR = 1.72, 95% CI = 1.15, 2.56) and alcohol use (OR = 2.24, 95% CI = 1.50, 3.34) in unadjusted analysis. In multivariable models, results remained statistically significant for current smoking (OR = 1.62, 95% CI = 1.03, 2.54) but not for alcohol use (OR = 1.46, 95% CI = 0.95, 2.25).

Table 2

Relationship between sexual orientation and gender identity and cancer risk behaviors and cancer beliefs in the San Francisco Health Information National Trends Survey

	All participants, n = 1027	SGM, n = 130	Non-SGM, n = 897	Unadjusted a	Adjusted ab
	n (%)	n (%)	n (%)	OR (95% CI)	OR (95% CI)
Cancer risk behaviors					
Lifetime smoking, at least 100 cigarettes	363 (35.4)	53 (40.8)	310 (34.6)	1.30 (0.89, 1.90)	1.05 (0.68, 1.62)
Current smoking	246 (25.3)	44 (34.9)	202 (23.8)	1.72 (1.15, 2.56)	1.62 (1.03, 2.54)
Current use of e-cigarettes or other electronic products	81 (8.6)	16 (12.9)	65 (7.9)	1.72 (0.96, 3.08)	1.24 (0.64, 2.41)
Alcohol use ^c	493 (51.8)	87 (68.5)	406 (49.3)	2.24 (1.50, 3.34)	1.46 (0.95, 2.25)
Physical inactivity ^d	226 (22.7)	28 (22.1)	198 (22.8)	0.96 (0.61, 1.50)	0.97 (0.60, 1.58)
Cancer beliefs					
Everything causes cancer	582 (60.0)	74 (57.8)	508 (60.3)	0.90 (0.62, 1.31)	0.98 (0.65, 1.47)
There is not much you can do to lower your chances of getting cancer	387 (39.9)	43 (34.1)	344 (40.8)	0.75 (0.51, 1.12)	1.15 (0.75, 1.76)
There are so many recommendations about preventing cancer, it is hard to know which ones to follow	691 (70.2)	81 (64.8)	610 (71.0)	0.75 (0.51, 1.12)	0.93 (0.61, 1.42)
Cancer is most often caused by behavior or lifestyle	546 (55.7)	68 (54.8)	478 (55.8)	0.96 (0.66, 1.41)	1.23 (0.81, 1.87)
When I think about cancer, I think about death	632 (63.7)	79 (61.7)	553 (63.9)	0.91 (0.62, 1.33)	0.92 (0.61, 1.39)

	All participants, n = 1027	SGM, n = 130	Non- SGM, n = 897	Unadjusted a	Adjusted ab
Boldface in estimates indicates statistical significance ($p < 0.05$).					
^a Reference group: Non-SGM					
^b Models adjusted for age, sex at birth, education and race/ethnicity					
^c Everyday/weekly/monthly use of alcohol; reference group: non-use/once-a-year use					
^d Did not exercise during last month in activities such as running, golf, gardening, walking, not work; reference group: exercised in last month					
SGM: Sexual and gender minorities					

A similar pattern in the acceptance of the five cancer beliefs was observed in SGM and non-SGM. These were the percentages in descending order of popularity among all participants: “There are so many recommendations about preventing cancer that it is hard to know which ones to follow” (70%); “When I think about cancer, I think about death” (64%); “Everything causes cancer” (60%); “Cancer is most often caused by behavior or lifestyle” (56%); and “There is not much you can do to lower your chances of getting cancer” (40%). Higher percentages of participants answering affirmatively to all these statements were observed in non-SGM, but no differences were observed by SGM status in regression models.

In Table 3 we present the results of the relationship between SGM status and health information-seeking preferences, behaviors and perceptions. Eighty-percent of study participants reported having looked for health information or medical topics in their lives, with similar frequency in SGM and non-SGM. When evaluating sources for getting health information, we found participants’ most preferred choice was the internet, followed by healthcare provider, family/friend/coworker and written materials (either brochures/pamphlets or books/magazines/newspapers). The same pattern of preferences was observed in all participants irrespective of SGM status, but their use was more prevalent among SGM, particularly internet. In unadjusted analysis, the odds of reporting internet use in SGM were two times as high as in non-SGM (OR = 2.13, 95% CI = 1.47, 3.09). In adjusted analysis SGM still had higher odds of reporting internet use, but results were not statistically significant (OR = 1.40, 95% CI = 0.92, 2.12).

Table 3

Relationship between sexual orientation and gender identity and health information seeking in the San Francisco Health Information National Trends Survey

	All participants, n = 1027	SGM, n = 130	Non-SGM, n = 897	Unadjusted a	Adjusted ab
	n (%)	n (%)	n (%)	OR (95% CI)	OR (95% CI)
Have ever looked for health information/medical topics	801 (80.4)	111 (86.1)	690 (79.6)	1.58 (0.94, 2.67)	1.57 (0.90, 2.74)
Preferred source of health information					
Internet	402 (39.1)	72 (55.4)	330 (36.8)	2.13 (1.47, 3.09)	1.40 (0.92, 2.12)
Healthcare provider	369 (35.9)	56 (43.1)	313 (34.9)	1.41 (0.97, 2.05)	1.28 (0.85, 1.92)
Family/Friend/Coworker	251 (24.4)	37 (28.5)	214 (23.9)	1.27 (0.84, 1.91)	1.31 (0.84, 2.04)
Brochure/Pamphlet	211 (20.6)	31 (23.9)	180 (20.1)	1.25 (0.81, 1.93)	1.45 (0.91, 2.32)
Book/Magazine/Newspaper	217 (21.1)	23 (17.7)	194 (21.6)	0.78 (0.48, 1.26)	0.83 (0.50, 1.40)
Preferences for getting health information from provider					
Email	425 (41.4)	67 (51.5)	358 (39.9)	1.60 (1.11, 2.32)	0.96 (0.63, 1.46)
Brochure/Pamphlet	409 (39.8)	48 (36.9)	361 (40.3)	0.87 (0.59, 1.27)	1.06 (0.70, 1.61)
Text message	271 (26.4)	44 (33.9)	227 (25.3)	1.51 (1.02, 2.24)	1.23 (0.80, 1.88)
Patient portal	120 (11.7)	16 (12.3)	104 (11.6)	1.07 (0.61, 1.88)	1.05 (0.57, 1.92)

	All participants, n = 1027	SGM, n = 130	Non-SGM, n = 897	Unadjusted ^a	Adjusted ^{ab}
DVD mailed to home	99 (9.6)	18 (13.9)	81 (9.0)	1.62 (0.94, 2.80)	1.58 (0.87, 2.86)
Source used for getting health information from provider last year					
Email	318 (31.0)	52 (40.0)	266 (29.7)	1.58 (1.08, 2.31)	0.93 (0.60, 1.43)
Text message/Instant message application	254 (24.7)	39 (30.0)	215 (24.0)	1.36 (0.91, 2.04)	1.21 (0.78, 1.87)
Other application on smartphone	136 (13.2)	28 (21.5)	108 (12.0)	2.01 (1.26, 3.19)	1.40 (0.85, 2.31)
Video conference	41 (4.0)	8 (6.2)	33 (3.7)	1.72 (0.78, 3.80)	0.96 (0.39, 2.33)
Fax	29 (2.8)	6 (4.6)	23 (2.6)	1.84 (0.73, 4.60)	2.02 (0.73, 5.59)
Perceptions most recent health information search					
Lot of effort getting information	466 (49.2)	60 (48.8)	406 (49.2)	0.98 (0.67, 1.44)	1.34 (0.89, 2.01)
Felt frustrated getting information	413 (42.9)	62 (49.2)	351 (41.9)	1.34 (0.92, 1.95)	1.71 (1.14, 2.56)
Had concerns about quality of information	550 (57.0)	81 (64.3)	469 (55.9)	1.42 (0.96, 2.10)	1.37 (0.90, 2.08)
Information was hard to understand	414 (43.6)	47 (39.5)	367 (44.2)	0.83 (0.56, 1.22)	1.19 (0.78, 1.81)
<p>Boldface in estimates indicates statistical significance ($p < 0.05$).</p> <p>^a Reference group: Non-SGM</p> <p>^b Models adjusted for age, sex at birth, education and race/ethnicity</p> <p>SGM: Sexual and gender minorities</p>					

In terms of preferences for getting health information from providers, the favorite option for both SGM and non-SGM was email, followed by brochure/pamphlet, text message, patient portal and visual recorded material sent to their homes. In unadjusted models, SGM had significantly higher odds of reporting preferences for email (OR = 1.60, 95% CI = 1.11, 2.32) and text message (OR = 1.51, 95% CI = 1.02, 2.24) than non-SGM, but in adjusted analyses estimates were not statistically significant (OR = 0.96, 95% CI = 0.63, 1.46; and OR = 1.23, 95% CI = 0.80, 1.88, respectively).

When asked about last year use of sources for exchanging medical information with providers, the same pattern was reported by SGM and non-SGM. Email was the most used source, followed by text message/instant message applications, other applications on smartphones, video conference and fax. Although significantly higher odds of email (OR = 1.58, 95% CI = 1.08, 2.31) and non-instant messaging applications use (OR = 2.01, 95% CI = 1.26, 3.19) were reported by SGM in unadjusted analyses, these results were not statistically significant in multivariable models (OR = 0.93, 95% CI = 0.60, 1.43, for email; and OR = 1.40, 95% CI = 0.85, 2.31, for other applications). Finally, perceptions regarding the most recent search of health information was assessed and a high proportion of participants reported concerns with the following: quality of information (57%), lot of effort getting the information (49.2%), hard to understand information (43.6%) and frustration while getting the information (42.9%). When comparing these by SGM status, significantly greater odds of feeling frustration were reported by SGM in adjusted analyses (OR = 1.71, 95% CI = 1.14, 2.56).

Discussion

In this study, we evaluated the relationship between SGM status and cancer risk behaviors, cancer beliefs, and health information seeking behaviors, preferences and perceptions in a multiethnic urban population. A total of 130 participants identified themselves as SGM, allowing us to contribute to the limited but growing body of health research in this underrepresented group. Overall, we found that SGM were more likely than non-SGM to be current smokers and to report frustration while searching health information. We also found no evidence of differences between SGM and non-SGM regarding health information seeking behaviors and preferences, and cancer beliefs.

In this setting, a high prevalence of health information seeking was observed ($\geq 80\%$). Also, internet was the preferred source of information, and email was the preferred method for getting information from providers. These findings confirm a trend documented in other studies, and suggest that irrespective of SGM status, participants relied on using technology for accessing and exchanging health information, over other in-person, less private and less instantaneous methods [34, 35]. These results also represent challenges and opportunities for healthcare providers and public health organizations. Having multiple sources of health information on the internet, including options not necessarily guided by science, can create confusion and misunderstandings on how SGM and the population in general use the information and deal with health-related issues [36]. On the other hand, having information that people can access whenever they need, in different media (e.g., audio, video, text), and free of cost, can be beneficial for people, especially for those belonging to the most disadvantaged social groups. Thus, in order to improve

the quality of health information that SGM and other vulnerable populations receive on the internet, efforts should be directed to make sure they participate in the development of content and their preferences are considered in strategies for message dissemination (e.g., what websites and social media they prefer to look for health information, what organizations they trust and follow on social media).

These findings about health information seeking behaviors are particularly important in the present context of a pandemic. The COVID-19 pandemic interrupted all healthcare services, and thanks to technology patients and providers re-established communication and some clinical activities resumed [37, 38]. Also, the internet (i.e., websites and social media) has been one of the primary sources of health information used by people, and it has helped governments and public health departments to convey their messages [39]. Therefore, having reliable voices and sources of information, with clear and culturally sensitive communication that serve the needs of vulnerable populations as SGM, is essential now and will be in the future with the likely emergence of other potential stresses on the healthcare system.

The finding that SGM engage more than non-SGM in cancer risk behaviors such as smoking, has been described previously. Using data from the 2012–2013 National Adult Tobacco Survey, Johnson et al. reported that SGM had higher prevalence of current cigarette smoking than non-SGM [16]. Also, Gonzalez et al. analyzed data from the National Health Interview Survey for years 2013 and 2014, and found that SGM reported higher prevalence of both moderate and heavy current smoking than non-SGM [21]. The presence of several factors have been proposed as possible explanations to the higher prevalence of smoking among SGM, including stress, depression, alcohol use and low socioeconomic status [40]. In our analysis, smoking remained significantly elevated even after adjustment for education as a proxy for socioeconomic status. Recent research also found that SGM are more likely than non-SGM to be exposed to tobacco-related marketing and social media, and exposure to these messages was associated with tobacco use [41]. With the high use of internet and preferences for communicating with providers observed in this study (i.e., email, text messaging apps, video conference), smoking cessation interventions that incorporate these strategies should be explored in this community.

In the evaluation of participants' perceptions during the most recent health information search, we found that SGM reported higher odds of frustration than non-SGM. To our knowledge no other studies have described this in the past. Frustration might be a barrier for SGM obtaining the information they need and follow recommendations, as these feelings tend to discourage people from further searches [42]. This finding made us consider a set of key questions that remain unanswered. What are the drivers of frustration among SGM while seeking health information? Do SGM have difficulties in accessing the information? Do SGM find the information they need? Do the information that SGM look for exist? Is the content on the material found inclusive to all? Do SGM consider the information they found suit their needs? Is it trustworthy? Qualitative research methods are better equipped to obtain answers to these questions, and should be considered as a next step for studies on this topic.

This study has several limitations. First, misclassification of SOGI could be present in this study. Although participants had the opportunity of completing the survey on their own, and minimize the likelihood of underreported SGM status, all questionnaires were not self-administered. Misclassification of the different outcomes is also possible, especially for questions that people can feel that an answer is more acceptable than others (e.g., social desirability bias on cancer risk behaviors questions). Second, we recognize the importance of documenting differences within SGM subgroups (e.g., in this study, bisexual individuals reported higher prevalence of cancer risk behaviors and cancer fatalistic views than other subgroups; see Supplemental Table), but we consolidated all SGM in only one group to increase statistical power. Third, despite these efforts, we believe our analyses were still underpowered, as evidenced in the wide confidence intervals of some estimates. Fourth, in our interest to study a hard-to-reach population, we employed a non-probabilistic sampling method, but we did not include important information throughout the process (i.e., seeds, connections) that would allow us to use a more appropriate analytic strategy for this type of sampling design (as in respondent-driven sampling) [43]. Lastly, these results may not be generalizable to other settings.

Conclusions

In this diverse urban population, a preference in the use of technology for accessing and exchanging health information was reported, irrespective of SGM status. Tobacco cessation interventions targeting SGM should be promoted in this setting, and the use of internet and instantaneous messaging applications should be considered. Also, drivers of feeling frustration while seeking health information and its implications for SGM health and care merit further evaluation. Finally, although progress has been made in collecting SOGI data and including SGM in studies, sustained efforts are needed until all datasets, and research endeavors include this information regularly.

Abbreviations

SGM
Sexual and gender minorities; SOGI:Sexual orientation and gender identity; NIH:National Institutes of Health; SF-HINTS:San Francisco Health Information National Trends Survey; REDCap:Research Electronic Data Capture; CI:Confidence intervals; ER:Emergency room; HS:High school

Declarations

Ethics approval and consent to participate

The Internal Review Board of the University of California San Francisco approved this study (number: 16-20707). Study methods were carried out in accordance with relevant ethical guidelines and regulations. All study participants provided informed consent after being briefed on study purpose and procedures.

Consent for publication

Not applicable.

Availability of data and materials

The dataset used and analyzed during the current study is available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

EJS was responsible for data analysis, interpretation of results, and drafting of the manuscript. NAR collected the data, provided critical feedback and edited the manuscript. MAD provided critical feedback and edited the manuscript. US and RAH obtained funding, conceived the study, acquired the data, contributed to interpretation of results, and reviewed and edited the manuscript. All authors read and approved the final manuscript.

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