

# *Perception of pro and anti-tobacco product content on the internet according to sexual orientation in the Brazilian population*

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**Abstract:** Smoking prevalence is higher among LGBTQIAPN+ individuals. Little is known about the reach of tobacco control measures within this group in Brazil. This study aims to assess perceptions of pro- and anti-tobacco internet content, according to sociodemographic and tobacco use variables, stratified by sexual orientation. Data from the 2019 National Health Survey were used to estimate the proportions of perception of pro- and anti-tobacco information, along with their respective 95% confidence intervals, among heterosexual and homosexual/bisexual groups. These estimates were analyzed based on sociodemographic characteristics, use of smoked tobacco products, use of electronic smoking devices, exposure to secondhand smoke, and screen time. Homosexual and bisexual individuals perceived more frequently both pro- and anti-tobacco media on the internet compared to heterosexual individuals. Moreover, 38.6% of homosexual and bisexual smokers reported perceiving anti-tobacco messages online — a significantly higher percentage than that reported by heterosexual smokers (16.8%). Our findings suggest greater exposure of homosexual and bisexual individuals to smoking prevention and cessation content in digital environments. Data that allow for a more detailed characterization of both exposure to and perception of anti-tobacco messages are essential to guide future actions and reduce the high prevalence of smoking within this group.

► **Keywords:** Sexual and gender minorities. Tobacco use. Internet. Tobacco advertising. Anti-smoking campaigns.

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## Introduction

The way smoking manifests across populations is unequal. Several factors affect its prevalence, including both social determinants and so-called commercial determinants of health, which relate to the actions of large tobacco corporations (Gilmore *et al.*, 2023).

The prevalence of smoking in Brazil has been declining over the years (GBD, 2015; Monteiro *et al.*, 2007). This fact is related to tobacco control actions and measures that have been carried out in an articulated manner since the end of the 1980s. With the ratification of the World Health Organization Framework Convention on Tobacco Control (FCTC), the first global public health treaty, which included broad and effective measures for tobacco control, Brazil strengthens the work already developed in this area. The implementation of FCTC measures by the Brazilian State is configured in the Política Nacional de Controle do Tabaco [National Tobacco Control Policy] (Portes *et al.*, 2018). However, little or nothing is known about the effectiveness of the impact of these measures on the prevalence of smoking among sexual and gender minorities, as well as regarding the reach of tobacco control measures among this population.

Several risk factors may be related to the higher prevalence of smoking expected in the LGBTQIAPN+ population (Carvalho *et al.*, 2023; Gomes; Lopes, 2023; Fontanari *et al.*, 2019). Among them are the higher prevalence of other risk factors associated with smoking, such as alcohol and other drug use, depression and anxiety; greater difficulty in accessing adequate health care; and tobacco industry strategies aimed at this group to promote their products (Carvalho; Fonseca; Deslandes, 2023; Blosnich; Lee; Horn, 2013). In any case, the association of all of them with the greater vulnerability of this population is evident.

It is important to highlight that this is a population made vulnerable by a series of factors related to a long and continuous process of historical, social, cultural, political, and economic construction. This group, by deviating from a supposed imposed standard of sexual orientation (heterosexual) and gender identity (cisgender), is subject to a series of discriminatory, marginalizing, and violent mechanisms. The hegemony of a standard based on heterosexuality and bodies that should fit into a rigid male and female binary ends up excluding those who do not fit into it. Thus, society and institutions maintain and actively contribute to constant processes

of vulnerability (Bento, 2018; Bento; Pelúcio, 2012; Butler, 2003; Louro, 2018; Miskolci; Pereira, 2022; Miskolci; Campana, 2017).

Educational and communication actions regarding the harmful effects of smoking are among the measures recommended by the FCTC and implemented in Brazil. These can occur in various ways, whether through continuous actions – such as including the topic in schools, dissemination in different media, training of health professionals – or through campaigns on dates related to the topic (INCA, 2022c). In addition, another fundamental measure already implemented by the country was the prohibition of advertising, promotion and sponsorship of tobacco products (INCA, 2022b). Thus, it is understood that, on the one hand, the population is informed about the harmful effects of smoking and the benefits of quitting the use of tobacco products, while at the same time the power of large tobacco companies to promote their products is reduced. However, tobacco products continue to be promoted, directly or indirectly (Perez; Veloso; Viegas, 2024; Pinho *et al.*, 2020).

The internet, especially social media, has proven to be an important vehicle for disseminating information, particularly among young people, both regarding content on tobacco control and content that promotes the use of tobacco products (Kong *et al.*, 2024).

Another challenge that intertwines with the others faced in tobacco control was the emergence of so-called Electronic Smoking Devices, whose manufacture, import, marketing, distribution, storage, transport, and advertising are prohibited in Brazil (Anvisa, 2024), but which end up being found on the illicit market and having their use promoted, especially on the internet. Although their prevalence of use is still at much lower levels compared to countries where their marketing is permitted, they exert greater attraction on younger people, among whom higher consumption is observed (Bertoni; Szklo, 2021).

Given this scenario, this article aims to evaluate the perception of pro- and anti-tobacco product content on the internet, according to sociodemographic and tobacco use variables, stratified by sexual orientation. To the authors' knowledge, this is the first study on the subject using Brazilian data.

## Methods

Data from the 2019 National Health Survey (Pesquisa Nacional de Saúde - PNS), a comprehensive and representative survey of the Brazilian population conducted by

the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística - IBGE), were used. The PNS used a stratified and weighted probability sample with four selection stages (municipalities, census tracts, households, and individuals aged 15 or older). All 90,846 individuals aged 15 or older who participated in the survey answered questions about tobacco use. Considering only those aged 18 or older (who answered the question about sexual orientation), the sample size was 88,531. More detailed methodology for this survey can be found in specific publications (Stopa *et al.*, 2021; IBGE, 2020). For this study, a subset of the population aged 18 or older who answered the question about sexual orientation was used, as described below.

The perception of content for or against tobacco products was measured using the following questions:

- a- "In the last thirty days, have you seen any cigarette advertisements or announcements on the Internet, including social media (Facebook, Instagram, Twitter, WhatsApp, YouTube, Snapchat, etc.)?"
- b- "In the last thirty days, have you seen or heard information about the risks of smoking cigarettes or that encourages people to quit smoking in the following media – on the Internet, including social media (Facebook, Instagram, Twitter, WhatsApp, YouTube, Snapchat, etc.)?"

The results are presented for the general adult population and according to sexual orientation, which was assessed using the question "What is your sexual orientation?", with the answer options "heterosexual", "homosexual", "bisexual", "other", "don't know" and "refused to answer". For analysis, the categories "heterosexual" and "homosexual/bisexual" were defined. The grouping of homosexual and bisexual categories was necessary due to the low prevalence rates found for these groups (IBGE, 2022).

The following variables were used for the analysis: sex; age, classified as 18 to 24 years, 25 to 34 years, and 35 or more; race/color, classified as white, black, brown, other; education level, classified as up to incomplete elementary school, complete elementary school up to incomplete high school, complete high school or more; per capita household income, classified as up to 1 minimum wage, more than 1 up to 2 minimum wages, more than 2 minimum wages; exposure to passive smoking at home; screen/internet use during leisure time, classified as yes or no; use of

smoked tobacco, classified as current smoker, former smoker, and never smoker; use of electronic smoking devices (ENDS), classified as current user, former user, and never user.

The heterosexual and homosexual/bisexual populations included in the study were characterized according to the variables described above. Pearson's chi-square test with Rao-Scott correction was used to obtain the p-values for the comparisons analyzed. Subsequently, the proportions of perceived pro- and anti-tobacco information and their respective 95% confidence intervals (95% CI) were estimated in the heterosexual and homosexual/bisexual groups for each of the sociodemographic variables, smoked tobacco use and DEF, exposure to secondhand smoke, and screen use.

All analyses were performed in *R* v.4.3.2 using the “survey” and “srvyr” packages to consider the complex sampling design when generating prevalence estimates.

This study uses public data (IBGE, 2019). The 2019 National Health Survey was approved by the National Research Ethics Committee for Human Beings of the Ministry of Health (CAAE 11713319.7.0000.0008 - Opinion No. 3,529,376).

## Results

### Characterization of the study population

The study population consists of 1.8% (95% CI 1.7-2.0) who identify as homosexual or bisexual and 94.8% (95% CI: 94.5-95.0) who identify as heterosexual. The majority are women (53.2%, 95% CI 53.2-53.2), a trend observed in both the heterosexual and homosexual/bisexual populations (53.2%, 95% CI 53.0-53.3 and 51.4%, 95% CI 46.8-56.0, respectively). Regarding age, 67.4% of homosexual/bisexual individuals are between 18 and 34 years old, while in the heterosexual population, 69.2% are 35 or older (Table 1).

In both groups, the majority self-identified as Black or mixed-race, totaling 56.4% among homosexuals/bisexuals and 55.1% among heterosexuals.

Most of the homosexual/bisexual population has at least a high school education (71.6%, 95% CI: 66.8-76.4), and the same is true among heterosexuals, although with a statistically lower percentage (50.6%, 95% CI: 49.9-51.4). Regarding per capita household income, 51.1% (95% CI: 50.3-51.9) of heterosexuals and 40.4% (95% CI: 36.0-44.9) of homosexuals were in the income bracket of up to 1 minimum wage.

Screen use during leisure time was significantly higher among homosexual/bisexual individuals compared to heterosexual individuals, at 94.1% (95% CI: 92.5-95.8) and 72.3% (95% CI: 71.8-72.8), respectively.

**Table 1.** Characterization of the population of individuals aged 18 years or older. PNS, 2019, Brazil

| Product                                       | Heterosexual |      |       | Homosexual/<br>Bisexual |      |       | p-value <sup>1</sup> | General* |      |       |
|-----------------------------------------------|--------------|------|-------|-------------------------|------|-------|----------------------|----------|------|-------|
|                                               | %            |      | CI95% | %                       |      | CI95% |                      | %        |      | CI95% |
|                                               | LI           | LS   |       | LI                      | LS   |       |                      | LI       | LS   |       |
| <b>Total</b>                                  | 94.8         | 94.5 | 95.0  | 1.8                     | 1.7  | 2.0   | -                    | 100.0    | -    | -     |
| <b>Sex</b>                                    |              |      |       |                         |      |       |                      |          |      |       |
| Male                                          | 46.8         | 46.7 | 47.0  | 48.6                    | 44.0 | 53.2  | 0.464                | 46.8     | 46.8 | 46.8  |
| Female                                        | 53.2         | 53.0 | 53.3  | 51.4                    | 46.8 | 56.0  |                      | 53.2     | 53.2 | 53.2  |
| <b>Age group</b>                              |              |      |       |                         |      |       |                      |          |      |       |
| 18-24 years                                   | 12.9         | 12.8 | 13.1  | 41.4                    | 36.6 | 46.2  | <0.001               | 13.9     | 13.9 | 13.9  |
| 25-34 years                                   | 17.9         | 17.6 | 18.2  | 26.0                    | 22.4 | 29.5  |                      | 18.1     | 17.8 | 18.4  |
| 35 or mote                                    | 69.2         | 68.8 | 69.5  | 32.6                    | 28.7 | 36.6  |                      | 68.0     | 67.7 | 68.3  |
| <b>Color/race</b>                             |              |      |       |                         |      |       |                      |          |      |       |
| White                                         | 43.5         | 42.8 | 44.2  | 41.9                    | 37.2 | 46.5  | 0.856                | 43.3     | 42.6 | 44.0  |
| Black                                         | 11.5         | 11.1 | 11.9  | 11.7                    | 8.6  | 14.7  |                      | 11.5     | 11.1 | 11.9  |
| Mixed-race                                    | 43.6         | 42.9 | 44.3  | 44.7                    | 40.1 | 49.2  |                      | 43.8     | 43.1 | 44.5  |
| Other                                         | 1.5          | 1.3  | 1.6   | 1.8                     | 0.8  | 2.8   |                      | 1.5      | 1.3  | 1.6   |
| <b>Schooling</b>                              |              |      |       |                         |      |       |                      |          |      |       |
| Up to incomplete Elementary education         | 35.2         | 34.5 | 35.8  | 8.5                     | 6.3  | 10.6  | <0.001               | 34.8     | 34.1 | 35.4  |
| Complete Elementary up to Secondary education | 14.2         | 13.8 | 14.6  | 19.9                    | 15.2 | 24.7  |                      | 14.5     | 14.1 | 14.9  |
| Complete Secondary education or more          | 50.6         | 49.9 | 51.4  | 71.6                    | 66.8 | 76.4  |                      | 50.8     | 50.0 | 51.5  |

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| Product                           | Heterosexual |       |      | Homosexual/<br>Bisexual |       |      | p-value <sup>1</sup> | General* |       |      |
|-----------------------------------|--------------|-------|------|-------------------------|-------|------|----------------------|----------|-------|------|
|                                   | %            | CI95% |      | %                       | CI95% |      |                      | %        | CI95% |      |
|                                   |              | LI    | LS   |                         | LI    | LS   |                      |          | LI    | LS   |
| Per capita household income       |              |       |      |                         |       |      |                      |          |       |      |
| Up to 1 minimum wage              | 51.1         | 50.3  | 51.9 | 40.4                    | 36.0  | 44.9 | <0.001               | 51.2     | 50.4  | 52.0 |
| More than 1 up to 2 minimum wages | 28.3         | 27.7  | 28.9 | 26.8                    | 22.8  | 30.8 |                      | 28.2     | 27.6  | 28.8 |
| More than 2 minimum wages         | 20.6         | 19.8  | 21.3 | 32.7                    | 28.4  | 37.1 |                      | 20.6     | 19.9  | 21.3 |
| Passive exposure at home          |              |       |      |                         |       |      |                      |          |       |      |
| Yes                               | 16.1         | 15.6  | 16.6 | 25.5                    | 21.0  | 30.0 | <0.001               | 16.3     | 15.8  | 16.8 |
| No                                | 83.9         | 83.4  | 84.4 | 74.5                    | 70.0  | 79.0 |                      | 83.7     | 83.2  | 84.2 |
| Screen/internet leisure use       |              |       |      |                         |       |      |                      |          |       |      |
| Yes                               | 72.3         | 71.8  | 72.8 | 94.1                    | 92.5  | 95.8 | <0.001               | 72.7     | 72.2  | 73.3 |
| No                                | 27.7         | 27.2  | 28.2 | 5.9                     | 4.2   | 7.5  |                      | 27.3     | 26.7  | 27.8 |
| Smoked tobacco use status         |              |       |      |                         |       |      |                      |          |       |      |
| Current smoker                    | 12.5         | 12.1  | 12.9 | 22.3                    | 18.4  | 26.2 | <0.001               | 12.6     | 12.2  | 13.0 |
| Ex-smoker                         | 26.7         | 26.2  | 27.3 | 27.0                    | 22.8  | 31.2 |                      | 26.6     | 26.1  | 27.1 |
| Never smoker                      | 60.8         | 60.2  | 61.4 | 50.7                    | 46.1  | 55.3 |                      | 60.8     | 60.2  | 61.4 |
| ENDS user status                  |              |       |      |                         |       |      |                      |          |       |      |
| Current user                      | 0.5          | 0.4   | 0.5  | 2.9                     | 1.3   | 4.6  | <0.001               | 0.5      | 0.4   | 0.6  |
| Ex-user                           | 0.9          | 0.7   | 1.0  | 3.6                     | 1.8   | 5.4  |                      | 0.9      | 0.8   | 1.1  |
| Never user                        | 98.7         | 98.5  | 98.8 | 93.4                    | 91.1  | 95.7 |                      | 98.6     | 98.4  | 98.7 |

Notes: \*Includes people who declared another sexual orientation, or answered "don't know" or "refused to answer," that is, the general population aged 18 or older. <sup>1</sup>Pearson's chi-square test with Rao-Scott correction.

## **Tobacco use and passive exposure to tobacco smoke**

The proportion of current use of smoked tobacco products (excluding e-cigarettes) among homosexual/bisexual individuals was 22.3% (95% CI 18.4-26.2), while among heterosexuals it was 12.5% (95% CI 12.1-12.9). Regarding the use of e-cigarettes, 2.9% (95% CI 1.3-4.6) of homosexual/bisexual individuals were current users and 3.6% (95% CI 1.8-5.4) were former users; among heterosexuals, these percentages were statistically lower, being 0.5% (95% CI 0.4-0.5) and 0.9% (95% CI 0.7-1.0), respectively (Table 1).

Among homosexual/bisexual individuals, 25.5% (95% CI 21.0-30.0) were exposed to secondhand smoke at home, and 16.1% (95% CI 15.6-16.6) of heterosexual individuals.

## **Perception of pro- and anti-tobacco content**

Table 2 presents data on the perception of internet content with pro- and anti-tobacco information in the general population, and also for homosexual/bisexual and heterosexual groups according to different variables. In the general population, there are more reports of perceived exposure to anti-tobacco content (15%, 95% CI: 14.5-15.6) than pro-tobacco content (7.4%, 95% CI: 6.9-7.9). It was observed that homosexuals/bisexuals report a higher perception of pro- (10.5%, 95% CI 7.7-13.3) and anti-tobacco content (28.8%, 95% CI 24.2-33.3) than heterosexuals (7.2%, 95% CI 6.7-7.6 and 14.7%, 95% CI 14.2-15.2, respectively).



**Table 2.** Perception of pro- and anti-tobacco content on the internet, by sexual orientation, according to selected variables. Population aged 18 years or older, PNS, 2019, Brazil

| Product           | Heterosexual |      |       |              |      |       | Homosexual/ Bisexual |     |       |              |      |       | Geral*      |      |       |              |      |       |
|-------------------|--------------|------|-------|--------------|------|-------|----------------------|-----|-------|--------------|------|-------|-------------|------|-------|--------------|------|-------|
|                   | Pro tobacco  |      |       | Anti-tobacco |      |       | Pro tobacco          |     |       | Anti-tobacco |      |       | Pro tobacco |      |       | Anti-tobacco |      |       |
|                   | %            |      | CI95% | %            |      | CI95% | %                    |     | CI95% | %            |      | CI95% | %           |      | CI95% | %            |      | CI95% |
|                   | LI           | LS   |       | LI           | LS   |       | LI                   | LS  |       | LI           | LS   |       | LI          | LS   |       | LI           | LS   |       |
| <b>TOTAL</b>      | 7.2          | 6.7  | 7.6   | 14.7         | 14.2 | 15.2  | 10.5                 | 7.7 | 13.3  | 28.8         | 24.2 | 33.3  | 7.4         | 6.9  | 7.9   | 15.0         | 14.5 | 15.6  |
| <b>Sex</b>        |              |      |       |              |      |       |                      |     |       |              |      |       |             |      |       |              |      |       |
| Male              | 7.2          | 6.5  | 7.8   | 15.0         | 14.3 | 15.8  | 12.4                 | 8.0 | 16.8  | 27.3         | 21.4 | 33.2  | 7.4         | 6.7  | 8.1   | 15.4         | 14.6 | 16.1  |
| Female            | 7.1          | 6.6  | 7.7   | 14.4         | 13.7 | 15.0  | 8.8                  | 5.4 | 12.2  | 30.1         | 23.4 | 36.8  | 7.3         | 6.8  | 7.8   | 14.7         | 14.1 | 15.4  |
| <b>Age group</b>  |              |      |       |              |      |       |                      |     |       |              |      |       |             |      |       |              |      |       |
| 18-24 years       | 12.1         | 10.7 | 13.5  | 23.6         | 21.8 | 25.4  | 11.5                 | 7.0 | 16.1  | 35.5         | 27.0 | 44.1  | 12.2        | 10.9 | 13.5  | 24.2         | 22.5 | 25.9  |
| 25-34 years       | 9.4          | 8.4  | 10.4  | 20.0         | 18.7 | 21.4  | 12.3                 | 7.6 | 17.1  | 29.1         | 22.4 | 35.9  | 9.6         | 8.6  | 10.5  | 20.2         | 18.9 | 21.5  |
| 35 ou years       | 5.6          | 5.2  | 6.1   | 11.6         | 11.1 | 12.1  | 7.8                  | 2.7 | 12.9  | 19.9         | 13.8 | 26.0  | 5.8         | 5.3  | 6.3   | 11.8         | 11.3 | 12.3  |
| <b>Color/race</b> |              |      |       |              |      |       |                      |     |       |              |      |       |             |      |       |              |      |       |
| White             | 6.7          | 6.1  | 7.4   | 15.5         | 14.7 | 16.3  | 5.3                  | 2.7 | 8.0   | 23.5         | 17.3 | 29.8  | 6.9         | 6.2  | 7.6   | 15.8         | 14.9 | 16.6  |
| Black             | 8.4          | 7.2  | 9.5   | 15.0         | 13.6 | 16.5  | 20.7                 | 6.9 | 34.5  | 42.8         | 28.4 | 57.2  | 8.8         | 7.7  | 10.0  | 15.7         | 14.3 | 17.1  |
| Mixed-race        | 7.3          | 6.8  | 7.9   | 14.0         | 13.2 | 14.7  | 12.6                 | 8.5 | 16.7  | 29.6         | 22.6 | 36.5  | 7.6         | 7.0  | 8.1   | 14.3         | 13.6 | 15.1  |
| Other             | 4.6          | 3.1  | 6.1   | 9.7          | 7.3  | 12.1  | 15.3                 | 0.0 | 33.4  | 39.3         | 12.6 | 66.0  | 4.8         | 3.3  | 6.3   | 10.6         | 8.1  | 13.0  |

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| Product                                       | Heterosexual |       |      |              |       |      | Homosexual/ Bisexual |       |      |              |       |      | Geral*      |       |      |              |       |      |
|-----------------------------------------------|--------------|-------|------|--------------|-------|------|----------------------|-------|------|--------------|-------|------|-------------|-------|------|--------------|-------|------|
|                                               | Pro tobacco  |       |      | Anti-tobacco |       |      | Pro tobacco          |       |      | Anti-tobacco |       |      | Pro tobacco |       |      | Anti-tobacco |       |      |
|                                               | %            | CI95% |      | %            | CI95% |      | %                    | CI95% |      | %            | II95% |      | %           | CI95% |      | %            | CI95% |      |
|                                               |              | LI    | LS   |              | LI    | LS   |                      | LI    | LS   |              | LI    | LS   |             | LI    | LS   |              | LI    | LS   |
| Schooling                                     |              |       |      |              |       |      |                      |       |      |              |       |      |             |       |      |              |       |      |
| Up to incomplete Elementary education         | 3.9          | 3.5   | 4.3  | 6.5          | 6.0   | 7.0  | 8.0                  | 0.3   | 15.7 | 17.5         | 7.0   | 28.0 | 3.9         | 3.5   | 4.3  | 6.6          | 6.1   | 7.1  |
| Complete Elementary up to Secondary education | 8.3          | 7.1   | 9.5  | 16.4         | 15.1  | 17.7 | 14.9                 | 6.0   | 23.8 | 39.2         | 24.9  | 53.4 | 8.8         | 7.7   | 10.0 | 17.1         | 15.8  | 18.4 |
| Complete Secondary education or more          | 9.1          | 8.4   | 9.7  | 19.9         | 19.0  | 20.7 | 9.6                  | 6.8   | 12.5 | 27.2         | 22.8  | 31.6 | 9.3         | 8.6   | 10.0 | 20.3         | 19.4  | 21.1 |
| Per capita household income                   |              |       |      |              |       |      |                      |       |      |              |       |      |             |       |      |              |       |      |
| Up to 1 minimum wage                          | 7.4          | 6.8   | 8.0  | 12.8         | 12.2  | 13.5 | 14.8                 | 9.5   | 20.1 | 29.7         | 22.8  | 36.6 | 7.6         | 7.0   | 8.2  | 13.2         | 12.6  | 13.8 |
| More than 1 up to 2 minimum wages             | 7.1          | 6.4   | 7.7  | 15.5         | 14.5  | 16.5 | 7.8                  | 3.3   | 12.3 | 27.3         | 19.8  | 34.8 | 7.4         | 6.7   | 8.1  | 16.0         | 15.0  | 17.0 |
| More than 2 minimum wages                     | 6.7          | 6.0   | 7.4  | 18.1         | 17.0  | 19.2 | 7.5                  | 3.5   | 11.4 | 28.8         | 19.9  | 37.6 | 6.8         | 6.1   | 7.5  | 18.4         | 17.3  | 19.4 |
| Passive exposure at home                      |              |       |      |              |       |      |                      |       |      |              |       |      |             |       |      |              |       |      |
| Yes                                           | 8.8          | 7.4   | 10.3 | 16.6         | 15.3  | 17.9 | 14.4                 | 6.7   | 22.2 | 39.0         | 27.7  | 50.3 | 9.2         | 7.8   | 10.6 | 17.4         | 16.1  | 18.7 |
| No                                            | 6.8          | 6.4   | 7.2  | 14.3         | 13.8  | 14.9 | 9.2                  | 6.6   | 11.8 | 25.2         | 20.8  | 29.7 | 7.0         | 6.6   | 7.4  | 14.6         | 14.0  | 15.1 |
| Screen/internet leisure use                   |              |       |      |              |       |      |                      |       |      |              |       |      |             |       |      |              |       |      |
| Yes                                           | 9.1          | 8.5   | 9.8  | 19.5         | 18.8  | 20.2 | 10.9                 | 8.0   | 13.8 | 30.2         | 25.5  | 35.0 | 9.4         | 8.7   | 10.0 | 19.9         | 19.2  | 20.6 |
| No                                            | 2.0          | 1.7   | 2.3  | 2.1          | 1.8   | 2.4  | 4.7                  | 0.0   | 11.3 | 5.3          | 0.0   | 11.9 | 2.1         | 1.8   | 2.4  | 2.1          | 1.9   | 2.4  |

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| Product                              | Heterosexual |      |       |              |      |       | Homosexual/ Bisexual |      |       |              |      |       | Geral*      |      |       |              |      |       |
|--------------------------------------|--------------|------|-------|--------------|------|-------|----------------------|------|-------|--------------|------|-------|-------------|------|-------|--------------|------|-------|
|                                      | Pro tobacco  |      |       | Anti-tobacco |      |       | Pro tobacco          |      |       | Anti-tobacco |      |       | Pro tobacco |      |       | Anti-tobacco |      |       |
|                                      | %            |      | CI95% | %            |      | CI95% | %                    |      | CI95% | %            |      | CI95% | %           |      | CI95% | %            |      | CI95% |
|                                      | LI           | LS   |       | LI           | LS   |       | LI                   | LS   |       | LI           | LS   |       | LI          | LS   |       | LI           | LS   |       |
| <b>Smoked Tobacco use status</b>     |              |      |       |              |      |       |                      |      |       |              |      |       |             |      |       |              |      |       |
| Current smoker                       | 8.7          | 7.6  | 9.7   | 16.8         | 15.5 | 18.2  | 15.3                 | 6.7  | 24.0  | 38.6         | 27.8 | 49.5  | 8.9         | 7.9  | 10.0  | 17.5         | 16.2 | 18.8  |
| Ex-smoker                            | 5.9          | 5.3  | 6.5   | 13.2         | 12.4 | 14.1  | 7.7                  | 4.1  | 11.4  | 26.6         | 18.6 | 34.5  | 6.0         | 5.4  | 6.6   | 13.7         | 12.8 | 14.5  |
| Never smoker                         | 7.4          | 6.9  | 7.9   | 14.9         | 14.2 | 15.5  | 9.9                  | 6.6  | 13.2  | 25.6         | 19.6 | 31.6  | 7.6         | 7.1  | 8.2   | 15.1         | 14.5 | 15.8  |
| <b>ENDS use status</b>               |              |      |       |              |      |       |                      |      |       |              |      |       |             |      |       |              |      |       |
| Current user                         | 18.2         | 9.9  | 26.5  | 40.5         | 30.0 | 51.0  | 0.6                  | 0.0  | 1.5   | 29.6         | 1.9  | 57.3  | 16.0        | 9.0  | 23.0  | 37.4         | 28.0 | 46.9  |
| Ex-user                              | 11.2         | 6.3  | 16.0  | 30.4         | 23.1 | 37.7  | 6.4                  | 0.3  | 12.5  | 20.2         | 7.0  | 33.4  | 10.7        | 6.3  | 15.1  | 30.1         | 23.3 | 36.9  |
| Never user                           | 7.1          | 6.6  | 7.5   | 14.4         | 13.9 | 15.0  | 11.0                 | 8.0  | 14.0  | 29.1         | 24.4 | 33.7  | 7.3         | 6.8  | 7.8   | 14.8         | 14.3 | 15.3  |
| <b>Pro-tobacco media perception</b>  |              |      |       |              |      |       |                      |      |       |              |      |       |             |      |       |              |      |       |
| Yes                                  | -            |      |       | 72.0         | 69.3 | 74.7  | -                    |      |       | 86.7         | 79.9 | 93.5  | -           |      |       | 72.5         | 70.0 | 75.0  |
| No                                   |              |      |       | 10.3         | 9.8  | 10.7  |                      |      |       | 21.9         | 17.4 | 26.5  |             |      |       | 10.5         | 10.0 | 10.9  |
| <b>Anti-tobacco media perception</b> |              |      |       |              |      |       |                      |      |       |              |      |       |             |      |       |              |      |       |
| Yes                                  | 35.1         | 33.1 | 37.0  | -            |      |       | 31.7                 | 23.1 | 40.3  | -            |      |       | 35.5        | 33.6 | 37.5  | -            |      |       |
| No                                   | 2.3          | 2.0  | 2.7   |              |      |       | 2.0                  | 1.0  | 3.0   |              |      |       | 2.4         | 2.1  | 2.7   |              |      |       |

Notes: \* This includes people who declared a different sexual orientation, or answered "don't know" or "refused to answer", meaning the general population aged 18 and over.

Regarding age range, younger people perceive both types of media more readily. Among heterosexuals, 12.1% (95% CI 10.7-13.5) and 23.6% (95% CI 21.8-25.4) of people aged 18 to 24 perceived pro- and anti-tobacco media, respectively, compared to individuals aged 35 or older, where 5.6% (95% CI: 5.2-6.1) perceived pro-tobacco information and 11.6% (95% CI: 11.1-12.1) perceived anti-tobacco information. Among homosexual/bisexual individuals, a higher proportion of perceived anti-tobacco media was observed in the 18-24 age group (35.5%, 95% CI: 27.0-44.1) and among those over 35 years of age (19.9%, 95% CI: 13.8-26.0), than among heterosexual individuals of the same age group.

Regarding race/color, Black people reported a higher perception of pro- and anti-tobacco media in the homosexual/bisexual group (20.7%, 95% CI: 6.9-34.5 and 42.8%, 95% CI: 28.4-57.2, respectively) and also among heterosexuals (8.4%, 95% CI: 7.2-9.5 and 15.0%, 95% CI: 13.6-16.5), when compared to white, brown, and other people.

Among heterosexual individuals, the proportion of awareness of content from both types of media increases with higher levels of education. Regarding pro-tobacco information, awareness is reported by 3.9% (95% CI: 3.5-4.3) of individuals with incomplete primary education, 8.3% (95% CI: 7.1-9.5) with complete primary education up to incomplete secondary education, and 9.1% (95% CI: 8.4-9.7) with complete secondary education or higher. Anti-tobacco content on the internet was perceived by 6.5% (95% CI: 6.0-7.0) of heterosexual individuals with incomplete primary education up to incomplete secondary education, 16.4% (95% CI: 15.1-17.7) with complete primary education up to incomplete secondary education, and 19.9% (95% CI: 19.0-20.7) with complete secondary education. Among homosexuals/bisexuals, this pattern is not observed, and higher percentages are seen among those with complete primary education up to incomplete secondary education, both for pro-tobacco media (14.9%, 95% CI: 6.0-23.8) and for anti-tobacco media (39.2%, 95% CI: 24.9-53.4).

Regarding per capita household income among homosexuals/bisexuals, higher perception of pro-tobacco media was observed in people with lower incomes (14.8%, 95% CI: 9.5-20.1). Among heterosexuals, perception of anti-smoking content increases with higher family income, reaching 12.8% (95% CI: 12.2-13.5) for those earning up to 1 minimum wage, and 18.1% (95% CI: 17.0-19.2) among those earning more than 2 minimum wages.

The perception of both media is higher among people exposed to passive smoking at home in both sexual orientation groups. Among heterosexuals exposed to passive smoking, 8.8% (95% CI: 7.4-10.3) and 16.6% (95% CI: 15.3-17.9) reported perceiving pro- and anti-smoking content on the internet, respectively, versus 6.8% (95% CI: 6.4-7.2) and 14.3% (95% CI: 13.8-14.9). Among homosexual/bisexual individuals, higher proportions of pro-tobacco (14.4%, 95% CI: 6.7-22.2) and anti-tobacco (39.0%, 95% CI: 27.7-50.3) media perceptions were also observed among those exposed to secondhand smoke than among those not exposed (9.2%, 95% CI: 6.6-11.8 and 25.2%, 95% CI: 20.8-29.7, respectively), although without statistical significance.

Regarding screen use during leisure time, the proportion of people who report perceiving pro- and anti-tobacco information is higher among those who use screens, being 9.1% (95% CI: 8.5-9.8) and 19.5% (95% CI: 18.8-20.2) among heterosexuals and 10.9% (95% CI: 8.0%-13.8%) and 30.2% (95% CI: 25.5-35.0) among homosexuals, for pro- and anti-tobacco media, respectively, when compared to those who do not use screens during leisure time.

Among homosexuals/bisexuals, the perception of pro-tobacco content on the internet was higher among individuals who had never used e-cigarettes than among those who currently use them (11.0%, 8.0-14.0 versus 0.6%, 95% CI: 0.0-1.5, respectively). Among heterosexuals, this relationship was reversed, that is, there was a greater report of perceived pro-tobacco media among current e-cigarette users than among never-users (18.2%, 95% CI: 9.9-26.5 versus 7.1%, 95% CI: 6.6-7.5, respectively).

Regarding anti-smoking information, there was no statistically significant difference according to the status of use of e-cigarettes among homosexuals/bisexuals. But among heterosexual e-cigarette users, the proportion that perceived anti-smoking content was statistically higher than among heterosexuals who never used e-cigarettes (40.5% 95% CI: 30.0-51.0 versus 14.4% 95% CI: 13.9-15.0, respectively).

No statistically significant differences were observed between the percentages of perception of pro- and anti-smoking content on the internet between smokers and non-smokers, both among heterosexuals and among homosexuals/bisexuals.

The proportion of those who perceived pro-smoking media is higher among those who also perceived anti-smoking media, as well as the inverse (greater perception of

anti-smoking content on the internet among those who also perceived pro-smoking media) in both sexual orientation groups. The perception of anti-tobacco media among heterosexuals who had perceived pro-tobacco media was about 7 times higher than that of those who had not perceived it (72.0%, 95% CI: 69.3-74.7 versus 10.3%, 95% CI: 9.8-10.7), and among homosexuals/bisexuals, about 4 times higher (86.7%, 95% CI: 79.9-93.5 *versus* 21.9%, 95% CI: 17.4-26.5).

## Discussion

This was the first study to assess the perception of pro- or anti-tobacco content on the internet according to sexual orientation, using data from a Brazilian population-based survey.

The study indicates that homosexual/bisexual people are more exposed to pro- and anti-tobacco media on the internet when compared to heterosexuals. The fact that they are younger and, almost entirely, use the internet for leisure, should contribute to this. A previous study found similar results in a population aged 18 or older in the United States (Emory *et al.*, 2019).

It is noteworthy that anti-tobacco media is more perceived by the homosexual/bisexual group, as smoking prevalence rates are higher among them compared to heterosexuals. However, in the absence of previous and serial studies that allow for a temporal evaluation, it is not possible to infer about the effect of tobacco control measures, including communication measures. There is a scarcity of data on the LGBTQIAPN+ population in large national health surveys (Carvalho; Vasconcelos, 2021). It is possible, therefore, that there has been a reduction in the prevalence of smoking in this population, which would explain, in part, this group's greater awareness of information about the harmful effects of smoking.

Another point is the fact that, to date, there are no tobacco control education and communication strategies in Brazil aimed at sexual and gender minorities. Nor is there any assessment of the impact of anti-smoking media on this audience. Theis *et al.* (2025) and Hoffman and Delahanty (2020) pointed out, in their findings from research conducted with LGBTQIAPN+ youth, the importance of developing anti-smoking messages specifically aimed at this audience, so that they feel represented in the proposed content. There is, therefore, an opportunity to reach this population more effectively through the internet and social networks, these platforms being

strategic channels for anti-smoking campaigns. Targeted messages with appropriate language can broaden the reach and effectiveness of smoking prevention and cessation interventions in this group, which is more vulnerable to tobacco use but has currently been reached by less than a third of anti-tobacco messages.

Another finding of this study points to a greater perception of anti-tobacco messages in the group that perceived pro-tobacco media, and vice versa, i.e., a greater perception of pro-tobacco media among those who perceived anti-tobacco media, both in heterosexual and homosexual/bisexual groups. This result can be added to the point discussed in the previous paragraph: greater perception of anti-tobacco media accompanied by greater exposure to pro-tobacco media may partially neutralize its effect. And, while communication actions about the harmful effects of tobacco do not focus on the LGBTQIAPN+ population, the tobacco industry tends to carefully target the advertising of its products to this audience (Emory *et al.*, 2019).

Another possibility is that those exposed to media coverage of a topic may be more susceptible to paying attention to that issue, whether for or against it (Delahanty *et al.*, 2020). This further corroborates the importance of focusing on interventions that can effectively engage with their audience and also raises an alert that anti-smoking communication may end up functioning as pro-tobacco propaganda. And, logically, there is also the fact that young people, with greater access to the internet, end up paying more attention to any media.

Another point to consider is that anti-smoking advertisements usually clearly communicate their messages about the harmful effects of smoking or other related issues. Pro-tobacco messages, on the other hand, are more veiled, as advertising for tobacco products is prohibited in the country (INCA, 2022b), which may lead manufacturers to find strategies to circumvent the legislation through more indirect ways to promote their products (Bertoni *et al.*, 2025).

The role of so-called “digital influencers,” highly present on different social networks and electronic media, in communicating health-related topics, especially among adolescents, can also contribute to the effect of pro- and anti-tobacco media perception (Bertoni *et al.*, 2025; Kong *et al.*, 2024). For the most part, these communicators discuss health topics (either attempting to promote health or, conversely, promoting products that harm it) with little or no scientific basis. Given their undeniable power of influence over young people, they can be important

communication partners, but beyond the need to equip them with reliable data, studies evaluating their role with vulnerable populations, such as LGBTQIAPN+ people, are scarce or nonexistent (Engel *et al.*, 2024; Phua; Jin; Hahm, 2017).

It is worth highlighting that there is room for improvement in terms of communication about the harmful effects of smoking, cessation of tobacco use, or even tobacco control in general. In all the groups examined, there is a significant portion of the population that has not been reached by messages on this topic. Brazil has two dates related to the topic, World No Tobacco Day (May 31) and the National Day Against Smoking (August 29), in which different approaches to smoking are addressed and disseminated in the media, including the internet, throughout the country (INCA, 2022a). This is an additional opportunity, but it may not be sufficient to reach a greater number of people with information against the use of tobacco products. It is essential that the topic be maintained and disseminated continuously, which requires investment, including financial investment. In this sense, it becomes important to strengthen partnerships with different actors in the health field, representatives of movements supporting the LGBTQIAPN+ population, scientific societies, and opinion leaders in general, always taking care to ensure access to and dissemination of quality and reliable information.

An additional point that caught our attention was the percentage of homosexual/bisexual people who have never used e-cigarettes (more than 90%) and who have perceived pro-tobacco media (higher than other categories), which may indicate that, in some way, the promotion of these products may be successful with the target audience. As already mentioned, with Brazilian legislation restricting the advertising of tobacco products, including electronic cigarettes, which are already prohibited from being sold (INCA, 2022b), the internet becomes a privileged place to promote a product, given the difficulty in monitoring its content.

Furthermore, further research is needed focusing on the LGBTQIAPN+ population regarding the reach of tobacco control measures, especially those aimed at risk communication and prevention of tobacco use. Data that allow for a more qualified understanding of this exposure, perception, and interpretation of anti-tobacco messages, including those obtained through qualitative methods, are fundamental to guiding future actions aimed at reversing the high prevalence of tobacco use observed in this group.



## Limitations

The population grouped under the acronym LGBTQIAPN+ has significant differences in characteristics and experiences. The study grouped homosexual and bisexual people of both sexes, which may mask characteristics or effects of certain subgroups, both in the pattern of tobacco use and in the various other variables investigated.

The categories "other," "doesn't know," and "didn't want to answer" represent 3.4% of the population. However, they were not considered in the analysis as separate categories, nor were they grouped with the categories "heterosexual" or "homosexual/bisexual," as it was not possible to attribute such information to them. These were analyzed when evaluating the general population as a whole. Data not presented in a table do not clearly indicate a relationship between these three categories and any of the groups analyzed, regarding the perception of pro- or anti-tobacco content on the internet. IBGE (2022) itself reports that there is a higher percentage of "don't know" and "didn't want to answer" responses among people with lower levels of education, and that this can impact the understanding of terms such as "sexual orientation," "heterosexual," "homosexual" etc., making it difficult for them to correctly identify themselves, in addition to issues of social stigma. Therefore, it is important that future research finds a more accessible language for this type of question.

The question about sexual orientation is considered sensitive, given the stigma still associated with being homosexual or bisexual in our social context. It is possible, therefore, that due to social desirability bias, people from these two subgroups may have declared themselves heterosexual or refused to answer.

What respondents understand as a pro- or anti-tobacco message is subjective. There is a strong possibility that some of the pro-tobacco content will not be perceived as easily as an advertisement or promotion, as it may be more veiled or at least supposedly spontaneous (such as a digital influencer using the product in their daily life), which could impact the classification of outcome variables.

It is important to highlight that some of the estimates presented have wide confidence intervals, resulting from the low prevalences observed in certain groups and variables. Therefore, caution is recommended in interpreting the results.

It should also be considered that the study was conducted in 2019, before the Covid-19 pandemic, when the use of digital media was transformed and intensified.

## Conclusion

The study highlighted the significant importance of message transmission via the internet among the population under 35 years of age, especially among homosexual and bisexual individuals. It was also observed that 38.6% of homosexual and bisexual smokers perceived anti-smoking messages online, a significantly higher percentage than that recorded among heterosexual smokers (16.8%).

This data indicates greater exposure of this group to content on smoking prevention/cessation in the digital environment. However, this greater perception does not seem to be directly reflected in behavioral changes, since the prevalence of smoking is higher among homosexuals/bisexuals. This may impose limitations in current strategies, which may not be adequate to the sociocultural context and specific vulnerabilities of this public. Furthermore, considering that almost all homosexuals/bisexuals use the internet, even as a space for socialization and leisure, social networks are strategic channels for smoking prevention/cessation campaigns. In this sense, the development of cross-cutting messages that engage other issues of interest to the LGBTQIAPN+ community and more inclusive and representative language can increase the effectiveness of these interventions in the digital environment.

Given the unprecedented nature of the topic in the country, this work presents elements that can contribute to the National Tobacco Control Policy, as it seeks to include the LGBTQIAPN+ population in its agenda, and consequently, minimizes the potential inequality in the reach of tobacco control measures among the Brazilian population.<sup>1</sup>

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## Note

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## Resumo

### *Percepção de conteúdos pró e contra produtos de tabaco, veiculados na internet, de acordo com orientação sexual na população brasileira*

A prevalência do tabagismo é maior entre pessoas LGBTQIAPN+. Pouco se sabe sobre o alcance de medidas de controle do tabaco sobre este grupo no Brasil. O objetivo deste estudo é avaliar a percepção de conteúdos pró- e contra produtos de tabaco, na internet, de acordo com variáveis sociodemográficas e de uso de tabaco, estratificada por orientação sexual. Foram utilizados dados da Pesquisa Nacional de Saúde de 2019, estimadas proporções de percepção de informações pró e antitabaco, respectivos intervalos de confiança de 95%, nos grupos de heterossexuais e homossexuais/bissexuais. Essas estimativas foram analisadas com base em variáveis sociodemográficas, de uso de tabaco fumado, uso de Dispositivos Eletrônicos para Fumar, exposição ao tabagismo passivo e uso de tela. Pessoas homossexuais/bissexuais perceberam mais mídias pró- e antitabaco na internet quando comparadas às heterossexuais. Ademais, 38,6% dos participantes homossexuais e bissexuais fumantes perceberam mensagens antitabaco na internet, percentual significativamente maior que o registrado entre heterossexuais fumantes (16,8%). Nossos achados sugerem maior exposição desse grupo a conteúdos de prevenção/ cessação do tabagismo no ambiente digital. Dados que permitam uma maior qualificação desta exposição e percepção às mensagens antitabaco são fundamentais para direcionar ações futuras e reverter as altas prevalências de tabagismo neste grupo.

► **Palavras-chave:** Minorias sexuais e de gênero. Uso de tabaco. Internet. Propaganda de cigarros. Campanhas antitabaco.