

The use of cigarettes, hookahs, electronic cigarettes, and other tobacco indicators among Brazilian schoolchildren: data from National School Health Survey 2019

O uso de cigarro, narguilé, cigarro eletrônico e outros indicadores do tabaco entre escolares brasileiros: dados da Pesquisa Nacional de Saúde do Escolar 2019

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ABSTRACT: *Objective:* To describe the prevalence of smoking indicators among Brazilian students according to sociodemographic characteristics in 2019, and compare the prevalence between 2015 and 2019. *Methods:* Data from the National Survey of School Health 2015 and 2019 were used. Indicators related to tobacco use were analyzed. Indicators were compared between the 2015 and 2019 editions. Prevalence and respective 95% Confidence Interval (95%CI) were calculated for the total population and according to sex, age group and type of school. *Results:* 22.6% (95%CI 21.7–23.4) of the students had tried any cigarette and it was higher between 16 and 17 years of age (32.6%; 95% CI 31.4–33, 8) and in males (35.0%; 95%CI 33.6–36.4). The experimentation of hookah, electronic cigarette and other tobacco products are also high, with 26.9% (95%CI 26.0–27.8), 16.8% (95%CI 16.2–17.4) and 9.3% (95%CI 8.8–9.8), respectively, being higher among boys aged 16 to 17 years. It is noteworthy that there were no changes in the indicators of cigarette experimentation, smoking for the first time before the age of 13, smoking in the 30 days prior to the survey, and at least one of the smoking parents. *Conclusion:* Although smoked tobacco indicators are stable between 2015 and 2019, the high prevalence of experimentation with products such as hookah and electronic cigarettes is highlighted, drawing attention to the need for new regulatory measures.

Keywords: Students. Cigarette. Hookah. Cigarette; electronic. Health promotion. Regulatory measures.

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Conflict of interests: nothing to declare – **Financial support:** Fundo Nacional de Saúde, Secretaria de Vigilância em Saúde, Ministério da Saúde (TED: 66/2018).

RESUMO: *Objetivo:* Descrever a prevalência de indicadores do tabagismo entre escolares brasileiros segundo características sociodemográficas em 2019 e comparar as prevalências entre 2015 e 2019. *Métodos:* Utilizaram-se dados da Pesquisa Nacional de Saúde do Escolar de 2015 e 2019. Foram analisados os indicadores referentes ao uso do tabaco, que foram comparados entre as edições de 2015 e 2019. Foram calculadas as prevalências e os respectivos intervalos de confiança de 95% (IC95%) para a população total e segundo sexo, faixa etária e tipo de escola. *Resultados:* Dos escolares, 22,6% (IC95% 21,7–23,4) já experimentaram cigarro alguma vez, porcentagem mais elevada entre os de 16 a 17 anos de idade (32,6%; IC95% 31,4–33,8) e no sexo masculino (35,0%; IC95% 33,6–36,4). A experimentação de narguilé, cigarro eletrônico e outros produtos do tabaco também se mostra elevada, com 26,9% (IC95% 26,0–27,8), 16,8% (IC95% 16,2–17,4) e 9,3% (IC95% 8,8–9,8), respectivamente, sendo mais alta entre os escolares do sexo masculino de 16 a 17 anos. Destaca-se que não houve mudanças nos indicadores “experimentação do cigarro”, “fumar pela primeira vez antes dos 13 anos”, “fumar nos 30 dias anteriores à pesquisa” e “ter ao menos um dos pais fumantes” entre os anos indicados. *Conclusão:* Embora os indicadores de tabaco fumado estejam estáveis entre 2015 e 2019, destacam-se as elevadas prevalências de experimentação de produtos como narguilé e cigarro eletrônico, que chamam a atenção para a necessidade de novas medidas regulatórias. *Palavras-chave:* Estudantes. Cigarro. Narguilé. Cigarro eletrônico. Promoção da saúde. Medidas de regulação.

INTRODUCTION

Tobacco is an important avoidable risk factor for several types of cancer, and cardiovascular and respiratory diseases^{1,2}. Health risks arise from both direct consumption of tobacco and exposure to secondhand smoke¹⁻⁴.

Tobacco use among adolescents is a global problem, as it is highly addictive and has health consequences⁵. A study found that all-cause mortality in adulthood was higher by 151, 83, and 56%, respectively, among individuals who started smoking at ages 5–9, 10–14, and 15–19, compared with those who have never smoked⁶.

Brazil has signed national (Strategic Action Plan for Combating Noncommunicable Chronic Diseases [NCD] in Brazil [2011–2022])⁷ and global commitments (Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020² and Sustainable Development Goals — SDG⁸) which set the goal of reducing the prevalence of tobacco use by 30%. This goal was reiterated in the launch of the new Plan to Combat Noncommunicable Diseases and Disorders (2021–2030)⁹.

Studies indicate that the prevalence of tobacco use in adults is decreasing globally and in Brazil^{10,11}; however, among adolescents, this issue continues to be a public health concern, given the emergence of the use of other tobacco products, such as hookah and others, among Brazilian schoolchildren^{12,13}.

Research in 143 countries between 2012 and 2018 showed that the global prevalence of smoking was 11.3% in boys and 6.1% in girls aged 13 to 15 years¹⁴. The use of other tobacco products, such as chewing tobacco, snuff, cigars, pipes and electronic cigarettes, was similar

to that of cigarettes and has been increasing, which reveals a worrying habit among adolescents^{10,14}. In Brazil, a study by the Global Youth Tobacco Survey 2009 (GYTS), carried out in three capital cities (Campo Grande, São Paulo, and Vitória) with students aged 13 to 15 years, also indicated high frequencies for the use of other tobacco products, predominantly the hookah¹⁵.

Adolescence is a phase of initiation of new social behaviors, which can be determinant for health during adulthood, such as the development of NCDs. The high prevalence of smoking and the introduction of new tobacco products among adolescents become a worrying scenario, so it is necessary to monitor the consumption of tobacco products in this population, in order to support national and global agendas and commitments. In this sense, this study aimed to describe the prevalence of smoking indicators among Brazilian students according to sociodemographic characteristics in 2019 and compare the prevalence between 2015 and 2019.

METHODS

Data from the National School Health Survey (*Pesquisa Nacional de Saúde do Escolar – PeNSE*) for the years 2015 and 2019 were used. PeNSE is a periodic survey, carried out since 2009 and every three years by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística – IBGE*) in partnership with the Ministry of Health. Its objective is to know and measure the risk and protective factors for the health of adolescents¹⁶.

The research is carried out by sampling, using as a reference for selection the register of public and private schools of the National Institute of Educational Studies and Research Anísio Teixeira (*Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira – INEP*). The sampling plan is a conglomerate in two stages, in which the schools correspond to the first stage and the classes of students enrolled to the second. In the selected classes, all students were invited to answer the survey questionnaire¹⁶.

In 2015, two different sampling plans were used, which included, respectively, schoolchildren who attended the 9th grade of elementary school (sample 1) and schoolchildren aged 13 to 17 who attended the 6th to 9th grade of elementary school (former 5th to 8th grades, in Brazil) and from 1st to 3rd grades of high school, in the reference year of the research (sample 2). In sample 2, we investigated 10,926 Brazilian students enrolled and attending 371 schools and 653 classes, in the five main geographic regions of the country, and the general total for Brazil in public and private schools¹⁷. In 2019, IBGE used a single sample of students aged 13 to 17, from public and private schools, for the following geographic levels: Brazil, Major Regions, Federation Units, Capital Cities, and the Federal District. Samples were collected in 4,242 schools, 6,612 classes, and among 159,245 students¹⁶. Considering enrolled students and non-respondents, the sample loss was approximately 2.4% in 2015 and 15.4% in 2019. More details on the sample can be found in other publications^{16,17}.

Students, using smartphones, answered the structured and self-administered questionnaire, which included information on socioeconomic status, family context, experimentation and use of cigarettes, alcohol, and other drugs, violence, safety, accidents, and other living conditions of these adolescents who attend the school¹⁶.

The following indicators referring to tobacco use in 2019 were used:

1. Cigarette use ever— assessed by the “yes” answer to the question: “Have you ever smoked cigarettes, even if a puff or two?”.
2. Cigarette use for the first time at age 13 or under — according to the question: “How old were you when you first smoked cigarettes?”.
3. Smokers in the 30 days prior to the survey — we considered those who answered “one day” or “more days” to the question: “In the last 30 days, on how many of them did you smoke cigarettes?”.
4. Hookah experimentation at some point in your life — according to the positive answer to the question: “Have you ever tried hookah (water pipe)?”.
5. Electronic cigarette experimentation (e-cigarette) at some point in your life — according to the positive answer to the question: “Have you ever tried an electronic cigarette (e-cigarette)?”.
6. Other tobacco products experimentation, not including hookah and electronic cigarettes — positive answer to the question: “Have you ever tried other tobacco products, not including hookah and electronic cigarettes?”.
7. Smoking by parents or guardians — positive answer to the question: “Does your mother, father, or guardian smoke?”.
8. Secondhand smoke at home — according to the ‘one or more days’ response to the following question: “In the last seven days, in how many of them people have smoked in your presence in your home?”
9. Cigarette use by friends in the 30 days prior to the survey — according to a positive response to the following question: “In the last 30 days, did any of your friends smoke in your presence?”.

Similar indicators in the 2015 and 2019 editions were compared:

1. cigarettes experimentation;
2. Cigarette use for the first time at age 13 or under;
3. Smokers in the 30 days prior to the survey;
4. Smoking by parents or guardians.

The prevalence and respective 95% confidence intervals (95%CI) of tobacco use indicators were estimated for the total population of adolescents and according to gender (female and male), age groups (13–17, 13–15, and 16–17 years old) and administrative dependency (public and private school). In addition, indicators referring to smokers in the last 30 days and experimentation with hookah and electronic cigarettes were presented according to Federative Units (FU). Finally, the local where the cigarette was obtained was analyzed. Differences between groups were considered significant when there was no overlap in the 95%CI.

Data analysis was performed using STATA software, version 14.0, and the sampling structure and post-stratification weights were considered for all analyses. The databases are public and available on the IBGE website.

The research was preceded by contact with the State and Municipal Departments of Education and with the direction of the selected schools in each municipality. Students were informed about the research and their free participation and warned that they could withdraw if they did not feel comfortable answering the questions. PeNSE complies with the Regulatory Guidelines and Norms for Research Involving Human Beings and was approved by the National Commission for Ethics in Research of the Ministry of Health (*Comissão Nacional de Ética em Pesquisa do Ministério da Saúde – CONEP/MS*), under the Certificates of Presentation for Ethical Assessment (*Certificados de Apresentação para Apreciação Ética – CAAE*) No. 1.006.487 (PeNSE 2015) and 3.249.268 (PeNSE 2019).

RESULTS

The PeNSE 2015 sample consisted of 10,926 schoolchildren aged 13 to 17 years, 50.3% male and 49.7% female. In 2019, 159,245 schoolchildren aged 13 to 17 years were evaluated, of which 49.3% were male.

In 2019, the percentage of schoolchildren who had ever tried cigarettes was 22.6% (95%CI 21.7–23.4), higher among 16-17 year olds (32.6%; 95%CI 31.4–33.8) and in males (35.0; 95%CI 33.6–36.4). Cigarette experimentation before 13 years of age was 11.1% (95%CI 10.5–11.7). Hookah, electronic cigarettes, and other tobacco products experimentation was also high, with 26.9% (95%CI 26.0–27.8), 16.8% (95%CI 16.2–17.4), and 9.3% (95%CI 8.8–9.8), respectively, being higher among male students aged 16 to 17 years. Regarding living with people who smoke, 24.3% (95%CI 23.6–24.9) reported that at least one parent smokes, 29.2% (95%CI 28.3–30.1) that one of their friends smokes, and 27.6% (95%CI 27.0–28.2) that they are passive smokers at home (Table 1).

When analyzing the indicators according to the type of school, it appears that the prevalence of all indicators were higher in public schools, except for cigarettes experimentation between 16 and 17 years old and electronic cigarettes experimentation in all age groups, which were higher in private schools. Experimentation with other tobacco products in the 13 to 17 and 16 to 17 age groups had no significant difference (Supplementary Table 1).

The percentage of students who smoked in the 30 days prior to the survey in Brazil was 6.8% (95%CI 6.3–7.3). The state of Acre leads, with 10.9% (95%CI 9.0–12.8), followed by Mato Grosso do Sul and Roraima, with 9.7% (95%CI 8.5–10.9) and 9.2% (95%CI 7.8–10.6), respectively. Sergipe and Bahia are the states with the lowest percentages (3.2%; 95%CI 2.4–4.1 and 3.7%; 95%CI 2.6–4.7, respectively) (Figure 1).

The prevalence of hookah experimentation in Brazil was 26.9% (95%CI 26.0–27.8), being higher in Paraná (52.4%; 95%CI 48.5–56.2), followed by the Federal District (50.6%; 95%CI 47.6–53.5), Mato Grosso do Sul (48.9%; 95%CI 45.8–52.1), and São Paulo (45.9%; 95%CI 42.7–49.1). The states with the lowest percentage were Pará (8.6%; 95%CI 5.9–11.4) and Maranhão (8.7%; 95%CI 6.8–10.6) (Figure 2).

Table 1. Prevalence of tobacco indicators in schoolchildren, by age group and gender — National School Health Survey, 2019.

Indicators		Total	Gender	
			Male	Female
		% (95%CI)	% (95%CI)	% (95%CI)
Cigarette experimentation	13 to 17 years	22.6 (21.7–23.4)	22.5 (21.6–23.3)	22.6 (24.5–23.8)
	13 to 15 years	17.0 (16.1–18.0)	15.6 (14.6–16.6)	18.4 (17.1–19.8)
	16 to 17 years	32.6 (31.4–33.8)	35.0 (33.6–36.4)	30.3 (28.8–31.9)
Cigarette experimentation before age 13	13 to 17 years	11.1 (10.5–11.7)	11.1 (10.5–11.7)	11.1 (10.3–11.9)
	13 to 15 years	11.6 (10.8–12.4)	10.7 (9.9–11.4)	12.5 (11.4–13.6)
	16 to 17 years	10.1 (9.4–10.9)	11.8 (10.8–12.7)	8.5 (7.6–9.4)
Smoking in the last 30 days	13 to 17 years	6.8 (6.3–7.3)	7.1 (6.6–7.6)	6.5 (5.8–7.2)
	13 to 15 years	5.0 (4.4–5.6)	4.5 (4.0–4.9)	5.6 (4.6–6.5)
	16 to 17 years	10.0 (9.3–10.8)	11.9 (10.9–12.9)	8.2 (7.3–9.2)
Experimentation with hookah	13 to 17 years	26.9 (26.0–27.8)	27.8 (26.9–28.8)	26.1 (24.9–27.2)
	13 to 15 years	23.3 (22.2–24.4)	23.4 (22.1–24.6)	23.2 (21.8–24.6)
	16 to 17 years	33.6 (32.1–35.0)	36.0 (34.4–37.6)	31.3 (29.3–33.2)
Experimentation with electronic cigarette	13 to 17 years	16.8 (16.2–17.4)	19.1 (18.3–19.9)	14.6 (13.9–15.3)
	13 to 15 years	13.6 (13.0–14.2)	14.8 (13.9–15.7)	12.5 (11.7–13.2)
	16 to 17 years	22.7 (21.7–23.7)	27.0 (25.7–28.3)	18.5 (17.3–19.8)
Experimentation with other tobacco products	13 to 17 years	9.3 (8.8–9.8)	10.1 (9.5–10.7)	8.6 (7.9–9.3)
	13 to 15 years	6.8 (6.3–7.3)	7.0 (6.3–7.6)	6.7 (5.9–7.5)
	16 to 17 years	13.9 (13.1–14.8)	15.8 (14.6–17.0)	12.1 (11.1–13.1)
Smoking parents/guardians	13 to 17 years	24.3 (23.6–24.9)	23.0 (22.1–23.8)	25.6 (24.7–26.4)
	13 to 15 years	23.9 (23.1–24.7)	22.6 (21.6–23.5)	25.2 (24.2–26.1)
	16 to 17 years	25.0 (24.0–26.0)	23.7 (22.3–25.1)	26.3 (24.8–27.8)
Secondhand smoking at home	13 to 17 years	27.6 (27.0–28.2)	26.7 (25.9–27.4)	28.5 (27.7–29.4)
	13 to 15 years	27.4 (26.7–28.2)	26.4 (25.5–27.3)	28.4 (27.4–29.4)
	16 to 17 years	28.0 (26.9–29.0)	27.1 (25.8–28.4)	28.8 (27.3–30.3)
Smoking friends in the last 30 days	13 to 17 years	29.2 (28.3–30.1)	30.0 (29.0–31.0)	28.5 (27.4–29.5)
	13 to 15 years	25.2 (24.2–26.2)	24.4 (23.2–25.6)	25.9 (24.6–27.2)
	16 to 17 years	36.6 (35.2–37.9)	40.2 (38.6–41.8)	33.1 (31.5–34.7)

Regarding electronic cigarettes, 16.8% (95%CI 16.2–17.4) of adolescents in Brazil have tried this substance at some point in their lives. The Federal District, followed by Paraná and Mato Grosso do Sul, are the states with the highest prevalence, with 30.8% (95%CI 27.6–34.0), 27.6% (95%CI 24.2–30.9), and 25.2% (95%CI 22.8–27.7), respectively. Maranhão (8.3%; 95%CI 6.4–10.2) and Piauí (8.7%; 95%CI 6.9–10.5) are the states with the lowest percentage (Figure 3).

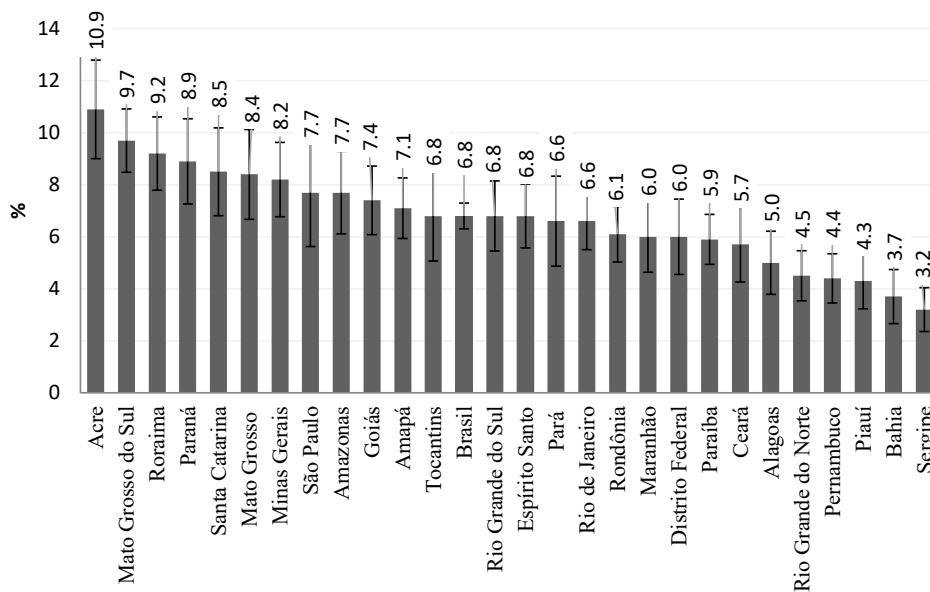


Figure 1. Prevalence (95% confidence interval) of schoolchildren (13–17 years old) who smoked in the 30 days prior to the survey, according to Federative Units. National School Health Survey, 2019.

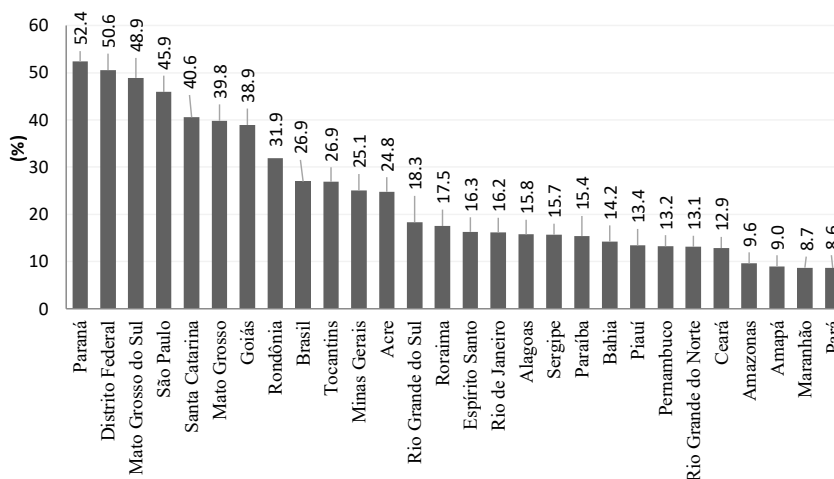


Figure 2. Prevalence (95% confidence interval) of schoolchildren (13–17 years old) who tried hookah according to Federative Units. National School Health Survey, 2019.

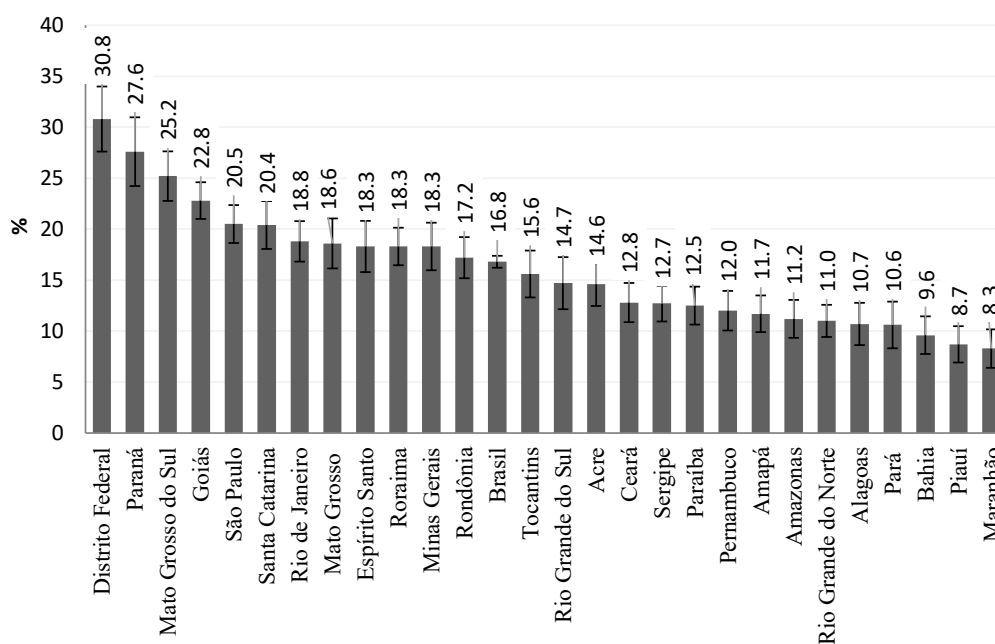


Figure 3. Prevalence (95% confidence interval) of schoolchildren (13–17 years old) who have tried electronic cigarettes at some point in their lives, according to Federative Units. National School Health Survey, 2019.

When analyzing tobacco indicators in 2015 and 2019, it was observed that there were no changes in cigarette experimentation, smoking for the first time before age 13, smoking in the 30 days prior to the survey, and having at least one of the parents who smoked (Figure 4).

Supplementary Figure 1 reveals the way of purchasing cigarettes among those who smoked 30 days before the interview, with the most common purchase being in stores, bars and the like, corresponding to 37.5% (95%CI 35.2–39.9) in students aged 13 to 17 years and 43% (95%CI 39.7–46.4) among those aged 16 to 17 years. The second most frequent way was to “ask someone” (19.9%; 95%CI 18.1–21.7, in students aged 13 to 17 years).

DISCUSSION

The results of the present study indicate that cigarette experimentation occurred in one-fifth of the adolescents. Cigarette use in the last 30 days was 6.8%, and there was a higher prevalence in one-tenth of older adolescents (16–17 years). It can be seen that other tobacco products experimentation is high: a quarter have already tried hookah, 16.8% electronic cigarettes, and a tenth of the students have tried other tobacco products, for which experimentation among older adolescents was higher. A quarter of the adolescents reported that at least one of their parents smoked, a third of their friends smoked, and being a passive

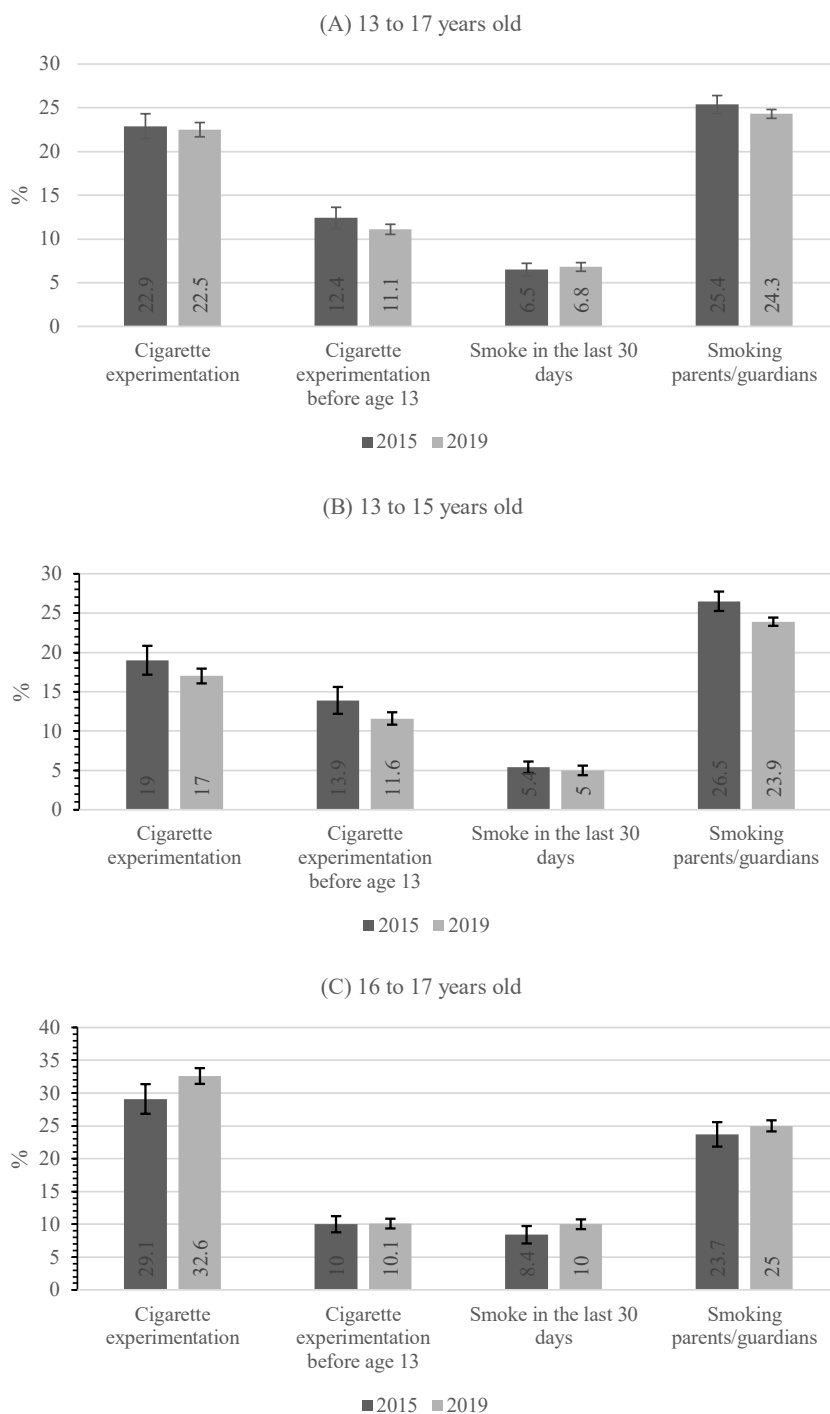


Figure 4. Prevalence and 95% confidence interval of tobacco indicators in schoolchildren, by age group. National School Health Survey, 2015 and 2019.

smoker at home occurred in a third of the students. The local where tobacco was obtained were shops, bars, and the like, with 37.5%. Comparing with 2015, there were no changes in the prevalence of: cigarette experimentation, smoking for the first time before the age of 13, smoking in the 30 days prior to the survey, and having at least one of the parents who smoked. Data from the current study also showed that tobacco use increases with age, both for cigarettes and for other products.

The increase in the prevalence of tobacco use with increasing age found in the present study can be explained by: the search for new experiences and exposure to risk, part of the transition process from childhood to adulthood¹⁸; peer pressure^{19,20}, which is also very worrying in this study, given that around 30% reported that their friends smoke, which can be a stimulus for use; greater access to money among older adolescents, which can increase the ability to buy cigarettes^{19,20}; by the pressure of the industry and the different formats of tobacco advertising, which are attractive and portray smoking as a sign of maturity, of reaching adulthood, of freedom, and transgression²¹. These results are consistent with international^{22,23} and national^{12,24} studies. The GTYS showed an increase in smoking according to age for both cigarettes and other tobacco products, being about twice as high at age 15 when compared to age 13²⁵. In a study with data from the Global School-Based Student Health Survey (GSHS)²⁶, it was observed that the prevalence of use of any tobacco product increased by 61% at the age of 14 to 15 years compared to that of 12-13 years.

The present investigation found that female students aged between 13 and 15 have experimented with cigarettes more than male students. Girls tend to be more mature than boys at this stage of life, which can temporarily increase the habit, although, between the ages of 16 and 17 and in adulthood, men smoke more²⁷. Monitoring should be continued to identify new trends, as has been the case with alcohol use, indicating a progressive increase among young women, which tends to converge in this consumption in adult life¹¹.

It is noteworthy that a quarter of the students reported that their parents were smokers. This indicator should be viewed with concern, as studies demonstrate the relationship of cigarette use by adolescents with smoking among their parents or other close people¹², which can be explained by the theory of social learning²⁸ and by the naturalization of the habit.

The results of the present study serve as a warning because, although the prevalence of smoked cigarettes is not so high, other tobacco products, such as hookah, electronic cigarettes and others are quite frequent. The rise of new tobacco products has reflected a global trend²⁹ for such products to be attractive to young people³⁰. Similar results have been described in several countries, such as Europe, the Mediterranean, and Eastern European regions^{31,32}. Products such as hookah and electronic cigarettes can be the gateway to establishing the habit and dependence of smoking^{33,34}. This evidence is important to guide policies to combat smoking. The hookah contains a high amount of nicotine, and its use involves important health risks. Hookah smoke contains the same substances as tobacco (nicotine, carbon monoxide, others)²⁹. A 1-2-hour hookah session can equate to smoking between 100 and 150 cigarettes³⁰.

A study with data from PeNSE 2015¹² already drew attention to the increase in the use of other tobacco products among adolescents, which was 27% between 2012 and 2015.

The current survey included new questions, which makes it difficult to compare it with that of 2015; however, the prevalence of hookah experimentation was higher than that of smoking cigarettes in 2019. The high experimentation of electronic cigarettes is also noteworthy. Thus, new tobacco products must be a major concern today, and the introduction of new regulatory measures for these products as well as the use of clear messages about their harm must be a priority for managers, particularly at the federal level. Some countries have adopted measures to regulate hookah use, banning flavors added to tobacco in alternative products or devices³⁵. In Brazil, the 2014 presidential decree included a ban on the use of hookah in closed environments, which may have contributed to this increase not being even more expressive³⁶.

The National Health Surveillance Agency (*Agência Nacional de Vigilância Sanitária – Anvisa*), in 2009, prohibited the sale of electronic cigarettes, however these products have been widely used and sold in the country, not being affected by adequate inspection³⁷. Brazilian legislation also prohibits the sale, offer or availability of any tobacco product to persons under 18 years of age³⁶.

As for secondhand smoke, the question in the 2015 edition was different: “In the last seven days, in how many of them people smoked in your presence?” — that is, the act of smoking could have taken place at home, at work, at school or in other environments. In 2015, half of adolescents were exposed to secondhand smoke¹². In 2019, the question was specific about passive smoking at home and showed a prevalence of 27.4%. Secondhand smoke causes as many harms as active smoking and must be addressed as a target of regulatory measures. Globally, research in 142 countries showed that the prevalence of secondhand smoke at home was 33.1% (95%CI 32.1–34.1), slightly higher than in Brazil³⁸. A study with adults shows that the frequency of secondhand smoke at home has decreased over the years³⁹, which may be a result of the regulatory measures adopted³⁶. Furthermore, it is observed that secondhand smoke at home has higher prevalence among women, low-income populations, and younger people³⁹. We emphasize that more vulnerable populations tend to suffer more from the problem of secondhand smoke.

Among the limitations of the present study, it should be noted that the data obtained were based on the students’ reports, which may have led to information bias. Although most Brazilian adolescents are in school (97%), it is known that those who are outside the school environment present greater health risks, as well as more risk behaviors, which would tend to underestimate the prevalence found. This is a descriptive study, without covariate adjustment. Furthermore, the changes to several questions in the 2019 questionnaire limit the comparison with the 2009, 2012, and 2015 editions of PeNSE. Another limitation refers to the changes in the sampling process, and the 2019 sample is comparable only with sample 2 of 2015. However, a comparison with 2009 and 2012 is not yet possible.

There is stability in the indicators of tobacco smoked between 2015 and 2019, however the prevalence of experimentation with cigarettes and other tobacco products such as hookah and electronic cigarettes are high. These results highlight the need for new regulatory measures for tobacco in Brazil.

ACKNOWLEDGMENTS

Malta DC and Alves FTA thank the National Council for Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq*).

REFERENCES

1. World Health Organization. Tobacco: Key Facts [Internet]. Geneva: World Health Organization; 2020 [cited on May 16, 2021]. Available at: <https://www.who.int/news-room/fact-sheets/detail/tobacco>
2. World Health Organization. Global action plan for the prevention and control of NCDs 2013-2020. Geneva: World Health Organization; 2013.
3. GBD 2015 Tobacco Collaborators. Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2015: a systematic analysis from the Global Burden of Disease Study 2015. *Lancet* 2017; 389(10082): 1885-906. [http://dx.doi.org/10.1016/S0140-6736\(17\)30819-X](http://dx.doi.org/10.1016/S0140-6736(17)30819-X)
4. Peacock A, Leung J, Larney S, Colledge S, Hickman M, Rehm J, et al. Global statistics on alcohol, tobacco and illicit drug use: 2017 status report. *Addiction* 2018; 113(10): 1905-26. <https://doi.org/10.1111/add.14234>
5. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. Preventing tobacco use among youth and young adults: a report of the surgeon general. Atlanta (GA): Centers for Disease Control and Prevention (US); 2012. PMID: 22876391
6. Thomson B, Rojas NA, Lacey B, Burrett JA, Varona-Pérez P, Martínez MC, et al. Association of childhood smoking and adult mortality: prospective study of 120 000 Cuban adults. *Lancet Glob Health* 2020; 8(6): e850-e857. [https://doi.org/10.1016/S2214-109X\(20\)30221-7](https://doi.org/10.1016/S2214-109X(20)30221-7)
7. Malta DC, Morais Neto OL, Silva Junior JB. Apresentação do plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis no Brasil, 2011 a 2022. *Epidemiol Serv Saúde* 2011; 20(4): 425-38. <http://dx.doi.org/10.5123/S1679-49742011000400002>
8. United Nations. Transforming our world: the 2030 agenda for sustainable development [Internet]. 2015 [cited on Sep 24, 2021]. Available at: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>
9. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise em Saúde e Vigilância de Doenças Não Transmissíveis. Plano de ações estratégicas para o enfrentamento das doenças crônicas e agravos não transmissíveis no Brasil, 2021-2030. Brasília: Ministério da Saúde; 2021.
10. Ng M, Freeman MK, Fleming TD, Robinson M, Dwyer-Lindgren L, Thomson B, et al. Smoking prevalence and cigarette consumption in 187 countries, 1980-2012. *JAMA* 2014; 311(2): 183-92. <https://doi.org/10.1001/jama.2013.284692>
11. Malta DC, Flor LS, Machado ÍE, Felisbino-Mendes MS, Brant LCC, Ribeiro ALP, et al. Trends in prevalence and mortality burden attributable to smoking, Brazil and federated units, 1990 and 2017. *Popul Health Metr* 2020; 18(Suppl 1): 24. <https://doi.org/10.1186/s12963-020-00215-2>
12. Malta DC, Hallal ALC, Machado ÍE, Prado RR, Oliveira PPV, Campos MO, et al. Factors associated with the use of waterpipe and other tobacco products among students, Brazil, 2015. *Rev Bras Epidemiol* 2018; 21(Suppl 1): e180006. doi: 10.1590/1980-549720180006.supl.1
13. Bertoni N, Szklo AS. Dispositivos eletrônicos para fumar nas capitais brasileiras: prevalência, perfil de uso e implicações para a Política Nacional de Controle do Tabaco. *Cad Saúde Pública* 2021; 37(7): e00261920. <https://doi.org/10.1590/0102-311X00261920>
14. Ma C, Xi B, Li Z, Wu H, Zhao M, Liang Y, et al. Prevalence and trends in tobacco use among adolescents aged 13-15 years in 143 countries, 1999-2018: findings from the Global Youth Tobacco Surveys. *Lancet Child Adolesc Health* 2021; 5(4): 245-55. [https://doi.org/10.1016/S2352-4642\(20\)30390](https://doi.org/10.1016/S2352-4642(20)30390)
15. Szklo AS, Sampaio MMA, Fernandes EM, Almeida LM. Smoking of non-cigarette tobacco products by students in three Brazilian cities: should we be worried? *Cad Saude Publica* 2011; 27(11): 2271-5. <https://doi.org/10.1590/S0102-311X2011001100020>
16. Instituto Brasileiro de Geografia e Estatística. Pesquisa nacional de saúde do escolar: 2019. Rio de Janeiro: IBGE; 2021.

17. Instituto Brasileiro de Geografia e Estatística. Pesquisa nacional de saúde do escolar: 2015. Rio de Janeiro: IBGE; 2016.
18. Wu TY, Rose SE, Bancroft JM. Gender differences in health risk behaviors and physical activity among middle school students. *J Sch Nurs* 2006; 22(1): 25-31. <https://doi.org/10.1177/10598405060220010501>
19. Waa A, Edwards R, Newcombe R, Zhang J, Weerasekera D, Peace J, et al. Parental behaviours, but not parental smoking, influence current smoking and smoking susceptibility among 14 and 15 year-old children. *Aust N Z J Public Health* 2011; 35(6): 530-6. <https://doi.org/10.1111/j.1753-6405.2011.00772.x>
20. Guindon GE, Paraje GR, Chaloupka FJ. Association of tobacco control policies with youth smoking onset in Chile. *JAMA Pediatr* 2019; 173(8): 754-62. <https://doi.org/10.1001/jamapediatrics.2019.1500>
21. Pollay RW. Targeting youth and concerned smokers: evidence from Canadian tobacco industry documents. *Tob Control* 2000; 9(2): 136-47. <https://doi.org/10.1136/tc.9.2.136>
22. Surís JC, Michaud PA, Akre C, Sawyer SM. Health risk behaviors in adolescents with chronic conditions. *Pediatrics* 2008; 122(5): e1113-8. <https://doi.org/10.1542/peds.2008-1479>
23. Griffin KW, Botvin GJ. Evidence-based interventions for preventing substance use disorders in adolescents. *Child Adolesc Psychiatr Clin N Am* 2010; 19(3): 505-26. <https://doi.org/10.1016/j.chc.2010.03.005>
24. Barreto SM, Giatti L, Casado L, Moura L, Crespo C, Malta DC. Exposição ao tabagismo entre escolares no Brasil. *Ciênc Saúde Coletiva* 2010; 15(Supl. 2): 3027-34. <https://doi.org/10.1590/S1413-81232010000800007>
25. Rachiotis G, Barbouni A, Basagiannis A, Katsioulis A, Kostikas K, Mouchtouris V, et al. Prevalence and determinants of current cigarette smoking and secondhand smoking among Greek adolescents: the Global Youth Tobacco Survey (GYTS) 2013 study. *BMJ Open* 2020; 10(2): e034760. <https://doi.org/10.1136/bmjopen-2019-034760>
26. Xi B, Liang Y, Liu Y, Yan Y, Zhao M, Ma C, et al. Tobacco use and second-hand smoke exposure in young adolescents aged 12-15 years: data from 68 low-income and middle-income countries. *Lancet Glob Health* 2016; 4(11): e795-e805. [https://doi.org/10.1016/S2214-109X\(16\)30187-5](https://doi.org/10.1016/S2214-109X(16)30187-5)
27. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise em Saúde e Vigilância de Doenças Não Transmissíveis. *Vigitel Brasil 2019: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2019*. Brasília: Ministério da Saúde; 2020.
28. Fujimoto K, Valente TW. Social network influences on adolescent substance use: disentangling structural equivalence from cohesion. *Soc Sci Med* 2012; 74(12): 1952-60. <https://doi.org/10.1016/j.socscimed.2012.02.009>
29. Maziak W, Ward KD, Afifi Soweid RA, Eissenberg T. Tobacco smoking using a waterpipe: a re-emerging strain in a global epidemic. *Tob Control* 2004; 13(4): 327-33. <https://doi.org/10.1136/tc.2004.008169>
30. O'Connor RJ. Non-cigarette tobacco products: what have we learnt and where are we headed? *Tob Control* 2012; 21(2): 181-90. <https://doi.org/10.1136/tobaccocontrol-2011-050281>
31. Jawad M, Roderick P. Integrating the impact of cigarette and waterpipe tobacco use among adolescents in the Eastern Mediterranean Region: a cross-sectional, population-level model of toxicant exposure. *Tob Control* 2017; 26(3): 323-9. <https://doi.org/10.1136/tobaccocontrol-2015-052777>
32. Jawad M, Lee JT, Millett C. Waterpipe tobacco smoking prevalence and correlates in 25 Eastern Mediterranean and Eastern European Countries: cross-sectional analysis of the global youth tobacco survey. *Nicotine Tob Res* 2016; 18(4): 395-402. <https://doi.org/10.1093/ntr/ntv101>
33. Maziak W, Jawad M, Ward KD, Eissenberg T, Asfar T. Interventions for waterpipe smoking cessation. *Cochrane Database Syst Rev* 2015; 2015(7): CD005549. <https://doi.org/10.1002/14651858.CD005549.pub3>
34. Ward KD, Eissenberg T, Gray JN, Srinivas V, Wilson N, Maziak W. Characteristics of U.S. waterpipe users: a preliminary report. *Nicotine Tob Res* 2007; 9(12): 1339-46. <https://doi.org/10.1080/14622200701705019>
35. Zaatari GS, Bazzi A. Impact of the WHO FCTC on non-cigarette tobacco products. *Tob Control* 2019; 28(Suppl 2): s104-s12. <https://doi.org/10.1136/tobaccocontrol-2018-054346>
36. Brasil. Presidência da República. Casa Civil. Subchefia para Assuntos Jurídicos. Decreto nº 8.262, de 31 de maio de 2014. Altera o Decreto nº 2.018, de 1º de outubro de 1996, que regulamenta a Lei nº 9.294, de 15 de julho de 1996. Brasília: Casa Civil, 2014.
37. Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Cigarro eletrônico [Internet]. 2020 [cited on Sep 22, 2021]. Available at: <https://www.gov.br/anvisa/pt-br/assuntos/tabaco/cigarro-eletronico>
38. Ma C, Heiland EG, Li Z, Zhao M, Liang Y, Xi B. Global trends in the prevalence of secondhand smoke exposure among adolescents aged 12-16 years from 1999 to 2018: an analysis of repeated cross-sectional survey. *Lancet Glob Health* 2021; 9(12): e1667-e1678. [https://doi.org/10.1016/S2214-109X\(21\)00365-X](https://doi.org/10.1016/S2214-109X(21)00365-X)

39. Malta DC, Gomes CS, Andrade FMD, Prates EJS, Alves FTA, Oliveira PPV, et al. Uso, cessação, fumo passivo e exposição à mídia do tabaco no Brasil: resultados da Pesquisa Nacional de Saúde 2013 e 2019. *Rev Bras Epidemiol* 2021; 24: E210006.SUPL.2. <https://doi.org/10.1590/1980-549720210006.supl.2>

Received on: 11/11/2021

Reviewed on: 03/04/2022

Accepted on: 03/07/2022

Authors' contribution: Malta, D.C.: Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing–review & editing. Gomes, C.S.: Conceptualization, Data curation, Writing – review & editing. Alves, F.T.A.: Conceptualization, Data curation, Writing – review & editing. Oliveira, P.P.V.: Conceptualization, Data curation, Writing–review & editing. Freitas, P.C.: Conceptualization, Data curation, Writing – review & editing. Andreazzi, M.: Conceptualization, Data curation, Formal analysis, Writing – review & editing.

