ORIGINAL ARTICLE

# Individual and contextual variables associated with smoking and alcohol consumption during pregnancy

*Variáveis individuais e contextuais associadas ao tabagismo e consumo de bebidas alcoólicas durante a gravidez*

*Variables individuales y contextuales asociadas con el fumo y el consumo de bebidas alcohólicas durante el embarazo*

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**ABSTRACT**
**Objective:** to analyze the association between individual characteristics and housing context with smoking and alcohol consumption during pregnancy. **Methods:** a cross-sectional study with a probabilistic sample of 3,580 pregnant women who underwent prenatal care in the Unified Health System in 2019. The outcomes were firsthand, secondhand smoke and alcohol consumption during pregnancy. Individual characteristics and the living environment were used as exploratory variables. **Results:** living in a neighborhood with episodes of violence, without social cohesion and without urban elements that encourage physical activity was associated with smoking. Alcohol consumption during pregnancy was associated with living in environments that do not encourage physical activity. Smoking was also associated with lower income and education. **Conclusions:** individual characteristics and the living environment are associated with smoking, secondhand smoke and alcohol consumption during pregnancy.
**Descriptors:** Tobacco Use Disorder; Tobacco Smoke Pollution; Alcoholic Beverages; Pregnancy; Epidemiology.

**RESUMO**
**Objetivo:** analisar a associação entre características individuais e contexto de moradia ao tabagismo e consumo de bebidas alcoólicas durante a gestação. **Métodos:** estudo transversal, com amostra probabilística de 3.580 gestantes que realizaram pré-natal no Sistema Único de Saúde em 2019. Os desfechos foram fumo ativo, passivo e consumo de bebidas alcoólicas durante a gestação. Utilizaram-se como variáveis exploratórias características individuais e do ambiente de moradia. **Resultados:** Residir em vizinhança com episódios de violência, sem coesão social e sem elementos urbanos que estimulem atividade física esteve associado com o fumo. O consumo de bebidas alcoólicas durante a gravidez esteve associado com residir em ambientes que não estimulam a atividade física. O fumo também foi associado com renda e escolaridade mais baixas. **Conclusão:** características individuais e do ambiente de moradia estão associadas ao tabagismo, fumo passivo e ingestão de bebidas alcoólicas durante a gestação.
**Descritores:** Tabagismo; Poluição por Fumaça de Tabaco; Bebidas Alcoólicas; Gravidez; Epidemiologia.

**RESUMEN**
**Objetivo:** analizar la asociación entre características individuales y contexto habitacional con el tabaquismo y el consumo de alcohol durante el embarazo. **Métodos:** estudio transversal con una muestra probabilística de 3580 gestantes que se sometieron a atención prenatal en el Sistema Único de Salud en 2019.Los resultados fueron tabaquismo activo, pasivo y consumo de bebidas alcohólicas durante el embarazo. Las características individuales y el entorno de vida se utilizaron como variables exploratorias. **Resultados:** vivir en un barrio con episodios de violencia, sin cohesión social y sin elementos urbanos que incentiven la actividad física se asoció con el tabaquismo. El consumo de bebidas alcohólicas durante el embarazo se asoció con vivir en ambientes que no estimulan la actividad física. El tabaquismo también se asoció con menores ingresos y educación. **Conclusiones:** las características individuales y el entorno de vida se asocian con el tabaquismo, el tabaquismo pasivo y el consumo de alcohol durante el embarazo.
**Descriptores:** Tabaquismo; Contaminación por Humo de Tabaco; Bebidas Alcohólicas; Embarazo; Epidemiología.

## INTRODUCTION

Tobacco and alcohol consumption still represent, at the beginning of the 21st century, two of the main risk factors for human health. There is evidence of its negative effects throughout people's lives, including during pregnancy. Both products cause damage to the fetus in the womb and in all its life cycles after birth, in addition to having negative repercussions on women's health[1-2].

Tobacco use is associated with high rates of maternal and fetal morbidity and mortality, increases in the risk of ectopic pregnancy, placental displacement, placenta previa, prematurity and low birth weight, in addition to impairing lung development and increase the likelihood of miscarriage, stillbirth and neonatal apnea[1,3-6]. Alcohol is teratogenic, which can lead to growth restrictions, birth defects, functional problems in the central nervous system, in addition to increased risks of miscarriage, prematurity and all development-related negative outcomes due to fetal alcohol syndrome[7-9].

It is estimated that 1.7% of pregnant women in the world smoke, with wide variation in prevalence in different regions worldwide[10]. Ireland (38.4%), Uruguay (29.7%) and Bulgaria (29.4%) are the countries with the highest prevalence of smoking during pregnancy. Large regional variation is also observed in alcohol consumption, whose average global prevalence is approximately 9.8%[11]. In both cases, it is estimated that prevalence in Brazil is higher than the world average values (14.7% and 15.2% for smoking and alcohol consumption, respectively)[10-11].

Some individual characteristics have been associated with the habit of drinking alcohol and smoking during pregnancy. Alcohol consumption was identified as higher among pregnant women with depression, with less social support, whose pregnancy was not planned and without knowledge about the negative effects of alcohol on the fetus[12-14]. As for tobacco consumption, a higher prevalence has been identified among women with less education and income, with black skin color, with depression and among adolescents and multiparous women[15-16]. Most studies conducted in Brazil, however, do not include a probabilistic population sample[16]. Additionally, in the international scientific literature, there are few studies that have investigated the exposure of pregnant women to secondhand smoke[17-19], none of which conducted in Brazil explored exposure to it at home and at work. Thus, research on these exposures needs to be expanded, so that the phenomenon can be better understood, monitored and health actions structured.

Another limitation in the study on factors associated with alcohol and tobacco consumption among pregnant women is analysis restricted to individual characteristics. In other areas of research on human health, there is already robust evidence on the effect of the region of work and residence on health levels of populations[20]. Thus, in order to design more effective public policies that consider multiple aspects that influence tobacco and alcohol consumption among pregnant women, it is necessary to expand knowledge about neighborhood contexts associated with these outcomes.

## OBJECTIVE

This study aims to analyze the association between individual characteristics and housing context with smoking and alcohol consumption during pregnancy.

## METHODS

### Ethical aspects

This research was approved by the Research Ethics Committee with Human Beings (RECHB) of *Universidade Federal de Santa Catarina* (UFSC). All study participants signed an Informed Consent Form, and the ethical precepts described in Resolution 510/2016 of the Brazilian National Health Council (*Conselho Nacional de Saúde*) were followed.

### Study design, period and location

This is a cross-sectional study guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE). Data collection took place between January and August 2019 at 31 hospitals in 30 municipalities in the state of Santa Catarina, which, in 2016, had 500 or more births by the Unified Health System (SUS – *Sistema Único de Saúde*). This set of institutions concentrated 86.1% of all births via SUS in the state in that period.

### Study protocol

Study participants were puerperal women who met the following inclusion criteria: (i) performed their delivery and all prenatal consultations at SUS or did not perform prenatal care; (ii) were residents of the state of Santa Catarina in the entire pregnancy; (iii) they had children born alive or stillborn with 500 g or more and at least 22 weeks of gestation. Women were interviewed in hospitals within 48 hours after delivery.

Sample calculation considered as parameters 95% confidence level, population of 50 thousand (according to total SUS deliveries in the state, in 2016), margin of error of 1.6 percentage points, estimated prevalence of 50% and 5% for recompose losses, totaling a final sample of 3,665 women. The number of interviews carried out in each hospital took place according to the proportional distribution of births observed, in 2016.

Fieldwork took place after training 35 interviewers who had at least incomplete higher education and with complete or ongoing training in the health field. A questionnaire was composed of validated instruments, questions from other surveys that had similar objectives and questions built for this research according to their objectives. Previously to the field itself, there was a pre-test of the questionnaire and a pilot study with 5% of the sample, whose interviews were not included in the final sample. The interviews were conducted one-to-one with support of tablets, to record the information. The data were stored on the REDCap platform and sent daily from the municipalities where data were collected to the central research server.

Daily, data consistency was verified in all interviews, and 10% of the sample was contacted again by telephone, for the application of a reduced questionnaire and quality control. Good reproducibility of the calculated measures was observed, with Kappa coefficient ranging from 0.680 to 1,000.

The outcomes analyzed were (1) firstly, pregnant women's smoking, considered positive, when women reported having smoked during pregnancy in any trimester of pregnancy; (2) secondhand smoke, considered present when the pregnant

woman reported that her partner or other resident of her household smoked in the same environment as she was in or when she reported that co-workers smoked in her presence in the places where she stayed; (3) alcohol consumption, which was positive when reporting the habit of drinking alcohol regularly (at least once a week) in any trimester during pregnancy.

Exploratory variables were the woman's age at the time of delivery (13-19 years; 20-35; 36-46), joint residence with a partner (yes, no), pregnancy planning (yes, no), color of skin/race (black, mixed-race, white), education in years of study (≥13; 10-12; ≤9), per capita household income in tertiles, residence in an area with social cohesion (yes, no) , in an area that encourages physical activity (yes, no) and in an area with episodes of violence (yes, no). Social cohesion in the neighborhood was considered, when the puerperal women answered positively to two questions: "In your neighborhood, are people willing to help the neighbors?" and "Is your neighborhood very close, that is, are people able to unite around common interests?". Was the housing environment considered to encourage physical activity when mothers answered yes to questions "Does your neighborhood offer many conditions for people to be physically active (for instance, they can go hiking, cycling, etc.)?" and "Is it pleasant to go hiking in your neighborhood?". Finally, the neighborhood was considered to be violent, when the puerperal woman reported not feeling safe walking day or night in her neighborhood or if there was frequent theft or assault in the past six months. All information on outcomes and exploratory variables were self-reported.

## Analysis of results and statistics

For each category of exploratory variables, the prevalence of the three outcomes was calculated, with their respective 95% confidence intervals (95% CI). Then, using logistic regression, Odds Ratio was calculated with its 95% CI in raw models. All variables were included for adjustment in the adjusted models, and those with a p-value less than 0.05 were considered associated with the outcome in the final model. The p values were calculated using the Wald test. All analyzes were performed using Stata 15.1 statistical.

## RESULTS

This study's response rate was 97.7%, with 3,580 women being interviewed. Approximately three out of four women were between 20 and 35 years old, 80.5% lived with a partner, 40.0% planned their pregnancies, 63.4% were white and two out of three had at least high school education complete (Table 1).

**Table 1 –** Sample distribution and prevalence of smoking, secondhand smoke and alcohol consumption during pregnancy, Santa Catarina, Brazil, 2019

| | Sample | Prevalence % (95% Confidence Interval) | | |
|---|---|---|---|---|
| | n (%) | Firsthand smoke | Secondhand smoke | Alcohol consumption |
| The whole sample | 3,580 (100.0) | 9.3 (8.4-10.3) | 16.4 (15.3-17.7) | 7.2 (6.4-8.1) |
| Age group (years) | | | | |
| 13-19 | 472 (13.4) | 6.8 (4.8-9.5) | 23.4 (19.7-23.4) | 8.0 (5.9-10.9) |
| 20-35 | 2,653 (75.3) | 9.3 (8.3-10.5) | 15.6 (14.3-17.0) | 6.8 (5.9-7.9) |
| 36-46 | 399 (11.3) | 12.1 (9.3-15.8) | 12.0 (9.2-15.6) | 7.9 (5.6-11.0) |
| Living with a partner | | | | |
| Yes | 2,864 (80.5) | 8.1 (7.2-9.2) | 14.5 (13.6-16.2) | 6.4 (5.5-7.3) |
| No | 695 (19.5) | 13.7 (11.3-16.5) | 22.9 (19.9-26.2) | 10.2 (8.1-12.7) |
| Planned pregnancy | | | | |
| Yes | 1,421 (40.0) | 5.9 (4.8-7.2) | 13.9 (12.2-15.8) | 6.1 (4.9-7.4) |
| No | 2,130 (60.0) | 11.4 (4.8-7.2) | 18.2 (16.6-19.9) | 7.9 (6.8-9.1) |
| Skin color/race | | | | |
| White | 2,205 (63.4) | 7.3 (6.3-8.5) | 15.0 (13.6-16.6) | 6.7 (5.7-7.8) |
| Black | 330 (9.5) | 16.9 (13.2-21.4) | 18.8 (15.0-23.4) | 9.8 (7.0-13.5) |
| Parda | 941 (27.1) | 11. 1 (9.2-13.2) | 18.7 (16.3-21.3) | 7.6 (6.0-9.4) |
| Education (years of study) | | | | |
| ≥13 | 458 (13.0) | 4.4 (2.8-6.7) | 9.4 (7.0-12.4) | 7.7 (5.6-10.5) |
| 10-12 | 1,853 (52.5) | 6.6 (5.6-7.9) | 13.6 (12.2-15.3) | 6.8 (5.7-8.0) |
| ≤9 | 1,218 (34.5) | 15.2 (13.2-17.3) | 23.6 (21.3-26.0) | 7.6 (6.2-9.2) |
| Per capita income | | | | |
| Richest Tercil | 1,114 (32.8) | 4.4 (3.4-5.1) | 10.5 (8.8-12.4) | 7.5 (6.1-9.2) |
| Intermediate tertile | 1,147 (33.8) | 8.4 (7.0-10.2) | 15.5 (13.5-17.7) | 6.6 (5.3-8.2) |
| Poorest Tercil | 1,134 (33.4) | 14.8 (12.8-17.0) | 22.3 (20.0-24.8) | 8.1 (6.6-9.8) |
| Living in neighborhood with violence | | | | |
| No | 2,897 (84.0) | 8.7 (8.0-9.8) | 15.6 (14.3-17.0) | 7.0 (6.1-7.9) |
| Yes | 553 (16.0) | 12.0 (9.6-15.0) | 20.8 (17.6-24.4) | 8.7 (6.6-11.4) |
| Living in neighborhood with social cohesion | | | | |
| Yes | 2,809 (82.9) | 8.3 (7.3-9.4) | 15.6 (14.3-17.0) | 6.4 (5.5-7.4) |
| No | 581 (17.1) | 13.2 (10.7-16.3) | 20.3 (17.2-23.8) | 9.5 (7.4-12.2) |
| Living in a neighborhood that encourages physical activity | | | | |
| Yes | 2,305 (66.0) | 8.5 (7.4-9.8) | 15.1 (13.7-16.7) | 6.0 (5.1-7.0) |
| No | 1,189 (34.0) | 10.8 (9.1-12.7) | 19.1 (17.0-21.4) | 9.3 (7.7-11.1) |

The prevalence of smoking during pregnancy was 9.3%, higher than that observed for regular alcohol consumption (7.2%) (Table 1). Exposure to secondhand smoke was even higher, with one in six women reporting it (16.4%). Among the categories of variables analyzed, the highest smoking prevalence was observed among women who reported having black skin color/ race (16.9%) and among those with less education (15.2%) and lower income (14.8%). It is noteworthy that prevalence was also high in all categories of worst living environment. A similar setting was observed when analyzing exposure to secondhand smoke. It was referred by one in five women who lived in the neighborhood with violence, in those without social cohesion and who do not encourage physical activity. Moreover, it was significantly more common among pregnant adolescents (23.4%), with low education (23.6%) and in the lower income group (22.3%).

Alcohol consumption, on the other hand, showed less variation between the categories analyzed, with differences also being of lesser magnitude. It is noteworthy, however, that the prevalence of alcohol consumption reached 10.2% among women who did not live with a partner and 9.8% among women of black color/race.

In crude analysis, it was found that the prevalence of smoking and exposure to secondhand smoke were higher among the most economically disadvantaged groups, among women who did not live with a partner, who did not plan their pregnancy and who lived in more violent environments, with less social cohesion and less encouragement to physical activity (Table 2). In the case of alcohol consumption, the only variables associated with the outcome were living with a partner, social cohesion in the neighborhood and encouraging physical activity in the neighborhood.

In the adjusted model, there were variations in the magnitudes of the prevalence ratios; however, few of them lost statistical significance when compared to crude analyzes (Table 3). It was observed that women over 36 years had a prevalence of smoking 167% higher than adolescents, a value that reached 68% among those who did not plan the pregnancy, compared to those who planned. The greatest relative difference was observed when analyzing women's education degree, with prevalence of the outcome 218% higher in those with less than ten years of study, compared to those who reported thirteen or more. Expressive differences were also observed between the different income tertiles, with the lowest income tertile having 2.47 times greater chance of having smoked during pregnancy, when compared to higher tertile and according to color/race (2.54 greater chance among those who reported having black color/race, compared to those who reported having white color/race). Finally, housing characteristics were clearly associated with the outcome, with the prevalence of smoking being 48% higher in neighborhoods without social cohesion, 42% higher in those with episodes of violence and 35% higher in those that did not encourage physical activity.

**Table 2 -** Gross model of factors associated with smoking, secondhand smoke and alcohol consumption during pregnancy, Santa Catarina, Brazil, 2019

| | Firsthand smoke Odds Ratio (95%CI) | p value | Secondhand smoke Odds Ratio (95%CI) | p value | Alcohol consumption Odds Ratio (95%CI) | p value |
|---|---|---|---|---|---|---|
| Age group (years) | | 0.007 | | <0.001 | | 0.848 |
| 13-19 | 1.00 | | 1.00 | | 1.00 | |
| 20-35 | 1.41 (0.96-2.96) | | 0.61 (0.48-0.77) | | 0.84 (0.58-1.20) | |
| 36-46 | 1.89 (1.18-3.03) | | 0.45 (0.31-0.65) | | 0.98 (0.59-1.60) | |
| Living with a partner | | | | | | |
| Yes | 1.00 | <0.001 | 1.00 | <0.001 | 1.00 | 0.001 |
| No | 1.79 (1.39-2.32) | | 1.70 (1.39-2.09) | | 1.66 (1.25-2.22) | |
| Planned pregnancy | | | | | | |
| Yes | 1.00 | <0.001 | 1.00 | 0.001 | 1.00 | |
| No | 2.06 (1.59-2.67) | | 1.38 (1.14-1.66) | | 1.32 (1.01-1.73) | |
| Skin color/race | | | | | | |
| White | 1.00 | <0.001 | 1.00 | 0.008 | 1.00 | 0.257 |
| Black | 2.57 (1.85-3.58) | | 1.31 (0.97-1.77) | | 1.51 (1.01-2.26) | |
| Parda | 1.58 (1.22-2.04) | | 1.30 (1.06-1.59) | | 1.15 (0.85-1.54) | |
| Education (years of study) | | | | | | |
| ≥13 | 1.00 | <0.001 | 1.00 | <0.001 | 1.00 | 0.802 |
| 10-12 | 1.55 (0.95-2.51) | | 1.53 (1.08-2.14) | | 0.88 (0.60-1.30) | |
| ≤9 | 3.89 (2.42-6.25) | | 2.98 (2.11-4.19) | | 0.99 (0.66-1.48) | |
| Per capita income | | | | | | |
| Richest tercil | 1.00 | <0.001 | 1.00 | <0.001 | 1.00 | 0.602 |
| Intermediate tertile | 1.99 (1.39-2.83) | | 1.56 (1.22-2.01) | | 0.87 (0.63-1.20) | |
| Poorest tercil | 3.73 (2.68-5.20) | | 2.45 (1.93-3.10) | | 1.08 (0.79-1.48) | |
| Living in neighborhood with violence | | | | | | |
| No | 1.00 | 0.013 | 1.00 | 0.003 | 1.00 | 0.146 |
| Yes | 1.44 (1.08-1.92) | | 1.42 (1.13-1.78) | | 1.28 (0.92-1.77) | |
| Living in neighborhood with social cohesion | | | | | | |
| Yes | 1.00 | <0.001 | 1.00 | 0.005 | 1.00 | 0.008 |
| No | 1.69 (1.28-2.23) | | 1.38 (1.10-1.73) | | 1.54 (1.12-2.11) | |
| Living in a neighborhood that encourages physical activity | | | | | | |
| Yes | 1.00 | 0.032 | 1.00 | 0.003 | 1.00 | <0.001 |
| No | 1.29 (1.02-1.64) | | 1.32 (1.10-1.59) | | 1.61 (1.24-2.10) | |

*Note: CI - Confidence Interval.*

**Table 3** - Adjusted model of factors associated with smoking, secondhand smoke and alcohol consumption during pregnancy, Santa Catarina, Brazil, 2019

| | Firsthand smoke<br>*Odds Ratio* (95%CI) | *p* value | Secondhand smoke<br>*Odds Ratio* (95%CI) | *p* value | Alcohol consumption<br>*Odds Ratio* (95%CI) | *p* value |
|---|---|---|---|---|---|---|
| **Age group (years)** | | 0.001 | | 0.031 | | 0.691 |
| 13-19 | 1.00 | | 1.00 | | 1.00 | |
| 20-35 | 2.09 (1.30-3.35) | | 0.90 (0.67-1.20) | | 1.05 (0.68-1.62) | |
| 36-46 | 2.67 (1.51-4.73) | | 0.59 (0.38-0.91) | | 1.11 (0.61-2.00) | |
| **Living with a partner** | | 0.093 | | 0.010 | | 0.003 |
| Yes | 1.00 | | 1.00 | | 1.00 | |
| No | 1.33 (0.97-1.83) | | 1.39 (1.09-1.78) | | 1.62 (1.16-2.26) | |
| **Planned pregnancy** | | 0.001 | | 0.178 | | 0.296 |
| Yes | 1.00 | | 1.00 | | 1.00 | |
| No | 1.68 (1.24-2.28) | | 1.16 (0.94-1.45) | | 1.18 (0.87-1.61) | |
| **Skin color/race** | | 0.007 | | 0.218 | | 0.474 |
| White | 1.00 | | 1.00 | | 1.00 | |
| Black | 2.54 (1.73-3.72) | | 1.32 (0.95-1.85) | | 1.72 (1.11-2.65) | |
| Parda | 1.42 (1.05-1.93) | | 1.14 (0.90-1.43) | | 1.08 (0.77-1.50) | |
| **Education (years of study)** | | **<0.001** | | **<0.001** | | 0.875 |
| ≥13 | 1.00 | | 1.00 | | 1.00 | |
| 10-12 | 1.54 (0.54-2.82) | | 1.25 (0.84-1.85) | | 0.99 (0.63-1.57) | |
| ≤9 | 3.18 (1.73-5.83) | | 2.05 (1.37-3.07) | | 0.97 (0.59-1.59) | |
| **Per capita income** | | **<0.001** | | **<0.001** | | 0.667 |
| Richest Tercil | 1.00 | | 1.00 | | 1.00 | |
| Intermediate tertile | 1.81 (1.20-2.74) | | 1.46 (1.10-1.94) | | 0.77 (0.53-1.11) | |
| Poorest Tercil | 2.47 (1.66-3.69) | | 1.88 (1.42-2.48) | | 0.90 (0.62-1.30) | |
| **Living in neighborhood with violence** | | 0.036 | | 0.039 | | 0.508 |
| No | 1.00 | | 1.00 | | 1.00 | |
| Yes | 1.42 (1.02-1.98) | | 1.32 (1.02-1.72) | | 1.12 (0.77-1.64) | |
| **Living in neighborhood with social cohesion** | | 0.025 | | 0.050 | | 0.245 |
| Yes | 1.00 | | 1.00 | | 1.00 | |
| No | 1.48 (1.07-2.05) | | 1.28 (1.00-1.66) | | 1.23 (0.86-1.76) | |
| **Living in a neighborhood that encourages physical activity** | | 0.041 | | 0.049 | | 0.004 |
| Yes | 1.00 | | 1.00 | | 1.00 | |
| No | 1.35 (1.01-1.79) | | 1.24 (1.00-1.54) | | 1.58 (1.17-2.14) | |

*Note: CI - Confidence Interval.*

The same occurred in the case of secondhand smoke. Pregnant women who lived in a neighborhood with violence (+ 32%), without social cohesion (+ 28%) and who do not encourage physical activity (+ 24%) were more exposed to the outcome. It was also more common among pregnant adolescents (69% higher), with lower education (105% higher) and lower income (88% higher), but there was no difference according to skin color. When analyzing alcohol consumption, just the fact of not living with a partner, having black color/race (p <0.001) and not living in a neighborhood that encourages physical activity was associated with a higher prevalence of the outcome.

## DISCUSSION

The present study found that, in addition to individual demographic and socioeconomic characteristics, the context of the environment in which the pregnant women live is associated with firsthand and secondhand smoke and alcohol consumption during pregnancy.

In Brazil, the prevalence of smoking during pregnancy has decreased over the years, just as the number of women smoking in the general population has been decreasing[21]. Analysis of three cohorts of live births conducted in Brazilian municipalities showed that the prevalence of smoking during pregnancy decreased 59% in Ribeirão Preto (São Paulo) between 1978/9 and 2010, 54% in Pelotas (Rio Grande do Sul) between 1982 and 2015

and 32% in São Luís (Maranhão) between 1997/8 and 2010[22]. The smoking prevalence among pregnant women in these cohorts was 4.1% in São Luís (2010), 11.8% in Ribeirão Preto (2010) and 16.5% in Pelotas (2015)[22]. For alcohol consumption among pregnant women in the country, the national estimate was of prevalence equal to 15.2% in 2012, higher than that observed in other countries of America[23].

The prevalence found in the present study for smoking was slightly higher than the national average estimated[21], but similar to another study with data from all over the country[24], which found 9.6% of pregnant women smoking at some point during pregnancy. Regarding the prevalence found for alcohol consumption, specific studies in different regions of the country, such as Rio Grande do Sul and Rio de Janeiro[25-26], found similar results to the present research. Other specific studies found a higher prevalence, such as 23.1% in Minas Gerais and 17.7% in Goiás[13,27]. However, it is worth mentioning that the direct comparison between prevalence of all studies in this area is limited, since the form of data collection for both smoking and alcohol consumption was not uniform, differing significantly between each survey.

The prevalence of smoking was higher among older women (especially in the age group older than 35 years), but the age group was not associated with alcohol consumption. Other subnational studies with Brazilian populations showed a higher alcohol and tobacco use in the age group from 30 years of

age[25-26]. The fact that older women have a higher chance of these habits during pregnancy can be explained by the habit already acquired throughout life, in which most women who smoke during pregnancy were already dependent on tobacco in previous periods of life, for instance. There is also a report that older age is related to higher parity, which could provide a false sense of security about the outcome of pregnancy, favoring the maintenance of risky habits during pregnancy[28-30].

Still in relation to demographic variables, not living with a partner was associated with a greater chance for the outcomes of secondhand smoke and alcohol consumption. The literature points out that partners tend to encourage women to acquire healthy habits during pregnancy, in addition to providing financial and emotional support, decreasing the chance of both smoking and alcohol consumption during pregnancy[31-32]. Skin color was associated with tobacco and alcohol consumption during pregnancy, especially in the black skin color group, when compared to the white color group, with smoking highlighted, with more than twice the chances for women who self-reported color black. A study carried out in São Paulo (SP) found a similar result regarding smoking habits among pregnant women, pointing out the social stratification between ethnic groups in the country, with differences in access to employment and education, as an explanation for this difference between the groups analyzed[33].

In the present study, socioeconomic variables were related to smoking habits, and women with less education and income were more likely to both smoke and be exposed to secondhand smoke. This result is in line with other studies with the same theme in different cities and countries with pregnant women[22, 34-35]. According to the World Health Organization (WHO), tobacco users are not usually aware of all the health risks caused by this habit, which includes their risks during pregnancy, especially the groups with less education. This could justify the fact that women with less education are those who tend to maintain smoking even after the discovery of pregnancy[36]. Brazil has a history of social inequalities in health outcomes, and the least economically favored population is the one least likely to adopt positive health interventions, including those for tobacco control instituted in the country[22]. Considering all the risks related to smoking for maternal and baby health[37], prenatal care has the role of serving as a space for guidance on the risks and doubts of women in relation to this topic[38].

Secondhand smoke was the outcome analyzed with the highest prevalence, with 16.4% of the sample reporting having daily contact with cigarettes in at least one of the gestational quarters. Other studies also demonstrate a higher prevalence of secondhand smoke compared to smoking among pregnant women[17,39]. It is noteworthy that, for this outcome, unlike first-hand smoke, younger women were those who had the greatest chance of exposure, which may be due to the fact that younger women tend to be more exposed to public places and socializing with different groups, resulting in greater chances of exposure to tobacco[39]. When considering that secondhand smoke is also associated with negative health outcomes[40], analyzing the environment in which the pregnant woman lives, with exposure to tobacco at home, at work or other environments should also be discussed during prenatal care[41].

Variables related to the living environment were also associated with smoking-related outcomes among women in this study (with the exception of social cohesion in secondhand smoke). In the case of alcohol consumption, only the environment that encourages physical activity was associated with a lower chance of its consumption during pregnancy. The influence of the environment on risky habits in pregnancy is described in the literature, and community factors, such as the good quality of the neighborhood, local resources, cultural norms and social support are related to the chances of healthy habits[31]. In Brazil, a study conducted in Rio de Janeiro indicated that pregnant women with a lower social support network were 62% more likely to smoke[42], a result similar to the value of 48% found in the present study. Living in environments with high social cohesion has been described as a protective factor for smoking[43]. As it strengthens bonds with positive psychological effects, it seems to discourage smoking and is also related to the feeling of greater security inside home and in the neighborhood in which they live[44]. This also agrees with the finding that residents of more violent neighborhoods are more likely to have smoking habits, mainly due to the fact that such an environment can induce stress among their residents[45]. As for encouragement for physical activity in the living environment, which was associated with a lower chance of smoking, second-hand smoke and alcohol consumption in the present study, the result is also in agreement with other studies that indicate that lack of leisure environments also work as stressors that can lead to unhealthy lifestyle habits[46].

**Study limitations**

Among the limitations of the present study is its cross-sectional design, which prevents the establishment of causal relationships between exposure and outcome, as it is not possible to establish the temporal relationship between both. It is also necessary to consider that the variables related to prenatal care were questioned in the postpartum period. Thus, the fact that the question about alcohol and tobacco use in the different gestational trimesters is made after the child's birth may have led to a possible loss of precision due to memory bias. Finally, it is highlighted that the information was self-reported, and the answers offered by women may be those that are more socially accepted. Thus, although this is the form of research mostly employed in scientific studies in the area, one cannot rule out the underestimation of the estimated values of smoking and alcohol consumption.

**Contributions to nursing, health, and public policies**

According to the data in the present study, in order to decrease prevalence of alcohol and tobacco in pregnancy, it is necessary not only policies, programs and actions focused on individuals, but also on the living environment. Groups that still maintain tobacco and alcohol consumption during pregnancy should be the target of additional studies that can assist in the design of policies focusing on this theme. Moreover, structural actions to increase education and income of the population and aimed at the black skin color group can have a positive effect in reducing exposure to alcohol and tobacco in pregnancy. When taking into

account that prenatal care is a space for guidance and action for the cessation of alcohol and tobacco, health services should consider the most vulnerable groups for this practice. In this context, the role of nursing during prenatal consultations stands out, promoting the counseling of pregnant women and also in the leadership of collective educational actions that are effective in promoting health. Health professionals, including nurses, also have important roles in health councils, locally and nationally, in the search for collective actions that improve people's objective living conditions and the equitable offer of health services. Such initiatives are important, according to the data in this study, for the control of smoking and alcohol consumption during pregnancy.

## CONCLUSION

This study identified that alcohol and tobacco consumption during pregnancy is unevenly distributed among pregnant women. Individual factors, in particular socioeconomic markers, and those related to the living environment were independently associated with the outcomes.

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