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Risk and protective factors for noncommunicable chronic diseases in adolescents by race/skin color: National Adolescent School-Based Health Survey

Fatores de risco e proteção de doenças e agravos não transmissíveis em adolescentes segundo raça/cor: Pesquisa Nacional de Saúde do Escolar

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ABSTRACT: ***Introduction:*** The race/skin color is an important predictor of health status of the population, as well as a marker of social inequalities. ***Objective:*** The aim of this paper was to describe the prevalence of the main risks and the protective factors for chronic diseases in schoolchildren, according to race/skin color differences. ***Methods:*** Data from the National Adolescent School-Based Health Survey (2012) were used. This is a cross-sectional study carried out in public and private schools. Prevalences were calculated according to the distribution by race/skin color. Prevalence ratios adjusted for age and maternal schooling were analyzed. ***Results:*** White adolescents were younger, studied more frequently in private schools and had mothers with higher levels of education in comparison to the other students. Consumption of beans and fruits was higher among black, brown, and indigenous participants. Physical activity was more frequent among indigenous people. Experimentation with alcohol was higher among white adolescents. Indigenous students reported greater physical violence. Asian and black adolescents reported experiencing greater bullying. ***Conclusion:*** Minimizing racial and ethnic disparities in health is necessary to disease prevention and health promotion among adolescents.

Keywords: Adolescents. Chronic disease. Risk factors. Race or ethnic group distribution. Health surveys. Epidemiological surveillance.

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RESUMO: ***Introdução:*** A raça/cor da pele é um importante preditor do estado de saúde da população, assim como um marcador de desigualdades sociais. ***Objetivo:*** O objetivo deste estudo foi descrever as prevalências dos principais fatores de risco e proteção para as doenças crônicas e agravos não transmissíveis em escolares, segundo as diferenças de raça/cor da pele. ***Métodos:*** Foram utilizados dados da Pesquisa Nacional de Saúde do Escolar (PeNSE) de 2012 e calculadas as prevalências ajustadas por idade e escolaridade materna, segundo distribuição por raça/cor da pele. ***Resultados:*** Adolescentes brancos são mais novos, estudam em escolas privadas, têm mães mais escolarizadas. O consumo de feijão e frutas foi maior em pretos, pardos e indígenas. A prática de atividade física foi maior em indígenas. A experimentação de bebidas alcoólicas foi maior em brancos. Indígenas relataram sofrer maior violência física. Amarelos e pretos relataram sofrer mais *bullying*. ***Conclusão:*** Os dados sugerem iniquidades na distribuição por raça/cor, sendo necessário minimizar as disparidades raciais e étnicas na saúde a fim de contribuir mais efetivamente para a prevenção de doenças e a promoção da saúde dos adolescentes.

Palavras-chave: Adolescentes. Doença crônica. Fatores de risco. Distribuição por raça ou etnia. Inquéritos epidemiológicos. Vigilância epidemiológica.

INTRODUCTION

Race/skin color is an important predictor of health status of the population, as well as a marker of social inequalities[1]. In recent decades, a considerable increase in its use in several epidemiological studies has been observed[2-5]. A systematic review that addressed the use of the variables such as race, color, and ethnicity in Brazilian epidemiological studies, also found an increasing use of these variables as predictors of health outcomes, such as in research on the epidemiology of noncommunicable diseases (NCDs), infectious and parasitic diseases, nutritional epidemiology, among others[3-5].

Among adults, studies using race/skin color as an explanatory variable have been carried out more frequently. Those studies show higher illiteracy rates, poorer working conditions, and health inequities in black populations, with greater morbidity and mortality. This mortality is especially higher owing to violence and murders. However, although this is less frequent among adolescents, some studies also indicate differences by race/skin color[1,6-9]. Worse health conditions in black population have been described as a public health problem and lead to increased social disparities[2,9]. It is worth noting that, in Brazil, black people account for nearly half of the population[10]. However, some authors claim that racial differences in health indicators, in most cases, are due to socioeconomic and cultural factors, among others[11,12].

Adding to this social determinant of health, early exposure to risk factors for health in adolescence, such as the use of tobacco, alcohol, poor diet, and physical inactivity, is associated with NCDs, accidents, and violence[13-15].

In Brazil, the National Adolescent School-Based Health Survey (acronym in Portuguese – PeNSE)[13,14] was the first nationwide survey that investigated the risk and protective factors

for the health of adolescents. Studies based on PeNSE on risk factors for health in adolescence indicate higher prevalence of outcomes such as alcohol consumption among white population[16] and bullying among the black population[1].

Knowing the distribution of risk factors among adolescents by race/skin color is still a knowledge gap in the country. Therefore, this study aimed at describing the prevalence of key risk and protective factors for NCDs in schoolchildren, according to the differences of race/skin color.

METHODS

The PeNSE 2012[14] is a cross-sectional study, carried out in a partnership among the Ministry of Health (MS), the Brazilian Institute of Geography and Statistics (IBGE), and the Ministry of Education (MEC). This survey is triennial and two editions of the survey were carried out in 2009 and 2012. PeNSE is carried out with students from the 9th year of elementary school in public and private Brazilian schools. The sample of PeNSE 2012 was representative of Brazil, the 5 regions, and 26 state capitals, and the Federal District.

For sampling plan, 27 geographic areas corresponding to all state capitals and Federal District were defined. Other municipalities were selected in addition to the state capitals, to represent the five major regions of Brazil, forming five geographic strata. The sample of each geographic stratum was allocated proportionally to the number of schools, according to the type of administration of the school (private and public)[14].

The sampling procedure was performed in three stages: primary sampling units – homogeneous groups considering neighboring municipalities; secondary sampling units – schools; and tertiary sampling units – classes. Students from selected classes, who were present on the day of data collection, composed the sample and were invited to participate in the survey[14]. The survey was carried out in 3,004 schools and 4,288 classes, and 109,104 students answered the survey questionnaire (83% of those attending classes). The interview was carried out using a self-administered structured questionnaire, which was uploaded in smartphones in 2012.

Prevalence and respective 95% confidence intervals of the following blocks of variables, according to differences in race/skin color, were compared for this study, considering the five race/skin color categories used by the IBGE (white, black, brown, yellow, and indigenous):

1. Demographic and socioeconomic variables:
   - age ≤ 13, 13, 14, 15, and 16 years and over;
   - sex;
   - maternal education – none, incomplete/complete elementary school, incomplete/complete high school, incomplete/complete college degree;

- type of administration – public or private schools;
- working – no or yes.

2. Lifestyle and behavior:
   - frequent food intake of beans, fruits, candies (sweets, candies, chocolate, chewing gum, bonbon, or lollipops), and soft drinks. These indicators were calculated based on the percentage of students who reported the consumption of the food in at least five of the seven days prior to the data collection.
3. Body image: self-perception of body image as fat and very fat.
4. Physical activity: physical activity (percentage of students who reported one hour of daily physical activity on five or more days in the week prior to the survey).
5. Smoking:
   - cigarette use in the past 30 days (percentage of students who reported smoking at least once in the 30 days preceding the survey, regardless of the frequency and intensity);
   - use of cigarettes in their lifetime (experimentation) (percentage of student who reported smoking experimentation sometime in their lives).
6. Drinking:
   - alcohol intake in the last 30 days (percentage of students who reported having consumed alcohol at least once in the 30 days prior to the survey);
   - experimentation with alcohol (percentage of student who reported having experimented with alcohol at least once in life).
7. Experimentation with illicit drugs: percentage of students who mentioned experiment with illicit drugs such as marijuana, cocaine, crack, glue, inhalant substances, ecstasy, *oxi,* among others, ever in life.
8. Violence:
   - physical violence (percentage of students who reported having been involved in fights in the 12 months preceding the survey);
   - family violence (percentage of students who reported having experienced domestic violence in the last 30 days prior to data collection)[17];
   - being bullied (percentage of students who reported having experienced bullying – was reproached, mocked, threatened, teased – in the last 30 days prior to the survey).

The statistical package Stata 11.0, in the module survey, which considers effects of complex sample, was used. First, prevalences were calculated according to the distribution by race/skin color. Second, the adjusted prevalence ratios for age and maternal education were calculated to compare the distributions by race/skin color. The reference for the analysis was the white race/skin color. The study was approved by the Research Ethics Committee of the Ministry of Health (CONEP/MS), under the opinion number 192/2012, concerning the Registration number 16805 of CONEP/MS on 03/27/2012.

RESULTS

In 2012, 109,104 students were interviewed. Among the interviewed students, 42.2% of them self-reported as brown, 36.8% of them self-reported as white, 13.4% as black, 4.1% as yellow, and 3.5% as indigenous. Of the students interviewed, 85.9% were aged between 13 and 15 years. Among the black students who were enrolled in 9th grade of elementary school, 17.7% were aged 16 years or older, whereas among white students this percentage was 9.8%. In addition, 52.1% of students reported being female and 47.9% being male (Table 1).

With regard to maternal education of the participants, 7.3% of white and 12.6% of black students mentioned no degree of maternal education, whereas the incomplete/complete higher education was reported by 15.8% of white, 7.8 % of black, and 7.6% of brown adolescents.

Regarding the type of administration of the schools, 88.5% of black and 88.1% of brown adolescents studied in public schools, and among white and yellow individuals, this percentage was 75.3% and 77%, respectively. It was observed that 13.1% of adolescents reported working, and indigenous (15.5%) and yellow students (15.2%) were those who reported this practice more frequently (Table 1).

The consumption of beans was more frequent among black (72.8%), brown (71.2%), and indigenous adolescents (70.5%). Prevalence of fruits intake was 29.7% among brown students, which was less frequent than among white students. Consumption of candies was lower among indigenous (38.2%) and white students (40.1%), and consumption of soft drinks showed similar prevalence between the groups, but was lower among brown individuals – 32.3%. The prevalence of students who reported feeling fat or very fat was 18.5% among white students. The prevalence of physical activity was lower among brown adolescents (19.6%) and higher among indigenous adolescents (22.5%) (Table 2).

With regard to smoking, the prevalence of cigarette smoking in the last 30 days was 6.3% among indigenous and 6.1% among black students. The prevalence of cigarette use at least once during their lifetime was 20.4% for black, 20.1% for indigenous, and 20.0% for yellow students. As for alcohol intake in the last 30 days, the prevalence was 27.7% among black and indigenous individuals. Experimentation with alcohol had higher prevalence rates among white and yellow individuals, with 68.9% and 68.7%, respectively. The prevalence of experimentation with illicit drugs was 8.6% among black, yellow, and indigenous adolescents. With regard to suffering family violence, the prevalence among indigenous students was 13.0%, and among black students was 12.1%. Bullying victims had prevalence of 8.3% among yellow and 8.1% among black individuals (Table 2).

After adjusting for age and maternal education and when compared with white adolescents, black and brown students showed higher consumption of beans (PR = 1.06; 95%CI 1.04 – 1.09, and PR = 1.03; 95%CI 1.02 – 1.05, respectively), and black adolescents consumed more fruits (PR = 1.05; 95%CI 1.01 – 1.09). Black, brown, and yellow students showed higher consumption of candies (PR = 1.06; 95%CI 1.03 – 1.1; PR = 1.08; 95%CI 1.05 – 1.1 and PR = 1.07; 95%CI 1.02 – 1.13, respectively), and brown students showed lower consumption of soft

Table 1. Distribution of the study population by age, sex, maternal education, type of administration of the school, and workforce condition, according to race/skin color among schoolchildren from the 9th grade of elementary school in Brazil. PeNSE 2012.

Variables	Race/skin color					Total
	White	Black	Yellow	Brown	Indigenous	
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
Age in years						
<13	0.7 (0.5 – 1)	0.7 (0.5 – 1.1)	0.7 (0.4 – 1.2)	0.8 (0.6 – 1.2)	0.8 (0.6 – 1.1)	0.8 (0.7 – 0.8)
13	25.8 (24.3 – 27.5)	16.9 (15.6 – 18.2)	21.2 (19.5 – 23.1)	20.9 (19.6 – 22.3)	18.8 (17.6 – 20.1)	22.1 (21.9 – 22.4)
14	48.3 (46.6 – 49.9)	42.4 (40.6 – 44.1)	45.7 (43.5 – 47.8)	44.3 (42.7 – 45.9)	44.5 (43 – 46.1)	45.5 (45.2 – 45.8)
15	15.5 (14.4 – 16.6)	22.4 (20.9 – 23.9)	17.8 (16.2 – 19.4)	19.4 (18.2 – 20.7)	21.1 (19.9 – 22.5)	18.3 (18.1 – 18.6)
16 and older	9.8 (8.9 – 10.6)	17.7 (16.3 – 19.1)	14.6 (13.2 – 16.2)	14.5 (13.4 – 15.7)	14.7 (13.6 – 15.8)	13.2 (13 – 13.4)
Sex						
Female	49.7 (48 – 51.3)	44.4 (42.7 – 46.1)	56.2 (54.1 – 58.3)	56.4 (54.8 – 58.1)	51.7 (50.2 – 53.3)	52.1 (51.9 – 52.4)
Male	50.3 (48.7 – 52)	55.6 (53.9 – 57.3)	43.8 (41.7 – 45.9)	43.6 (41.9 – 45.2)	48.3 (46.7 – 49.8)	47.9 (47.6 – 48.1)
Maternal education						
None	7.3 (6.6 – 8.2)	12.6 (11.3 – 14)	9.1 (7.9 – 10.5)	11.6 (10.5 – 12.9)	11.8 (10.7 – 13)	10.1 (9.9 – 10.3)
Incomplete/complete elementary school	36.5 (34.8 – 38.3)	43.8 (41.9 – 45.8)	39.3 (37 – 41.6)	45.9 (44.1 – 47.7)	43.5 (41.8 – 45.3)	41.8 (41.5 – 42.2)
Incomplete/complete high school	40.3 (38.5 – 42.2)	35.7 (33.9 – 37.6)	41 (38.7 – 43.4)	34.8 (33.1 – 36.5)	34.6 (32.9 – 36.2)	37.2 (36.9 – 37.5)
Incomplete/complete college degree	15.8 (14.3 – 17.4)	7.8 (6.9 – 8.9)	10.5 (9.1 – 12.1)	7.6 (6.8 – 8.5)	10.1 (9.1 – 11.2)	10.9 (10.7 – 11.1)
School						
Public	75.3 (73.7 – 76.9)	88.5 (87.5 – 89.5)	77 (75 – 78.9)	88.1 (87.2 – 89)	82.6 (81.3 – 83.8)	82.8 (82.6 – 83.1)
Private	24.7 (23.1 – 26.3)	11.5 (10.5 – 12.5)	23 (21.1 – 25)	11.9 (11 – 12.8)	17.4 (16.2 – 18.7)	17.2 (16.9 – 17.4)
Working						
No	87.4 (86.3 – 88.4)	85.7 (84.5 – 86.9)	84.8 (83.2 – 86.3)	87.1 (86.1 – 88.1)	84.5 (83.3 – 85.6)	86.9 (86.6 – 87.1)
Yes	12.6 (11.6 – 13.7)	14.3 (13.1 – 15.5)	15.2 (13.7 – 16.8)	12.9 (11.9 – 13.9)	15.5 (14.4 – 16.7)	13.1 (12.9 – 13.4)
Total	36.8 (36.5 – 37)	13.4 (13.2 – 13.6)	4.1 (4 – 4.2)	42.2 (42 – 42.5)	3.5 (3.4 – 3.6)	

Table 2. Frequency (%) of risk and protective factor for schoolchildren's health, according to race/skin color among schoolchildren from the 9th grade of elementary school in Brazil. PeNSE 2012.

Variables	Race/skin color				
	White	Black	Yellow	Brown	Indigenous
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
Regular food consumption (≥ 5 times per week)					
Beans	67.6 (67 – 68.2)	72.8 (72 – 73.5)	68.4 (67 – 69.8)	71.2 (70.7 – 71.7)	70.5 (69 – 72)
	ref.	**<0.001**	0.286	**<0.001**	**<0.001**
Fruits	30.6 (30 – 31.2)	30.7 (29.9 – 31.5)	29.8 (28.5 – 31.2)	29.7 (29.1 – 30.2)	30.8 (29.3 – 32.3)
	ref.	0.834	0.274	**0.003**	0.786
Candies	40.1 (39.5 – 40.7)	41.6 (40.7 – 42.4)	42.5 (41.1 – 44)	42.3 (41.8 – 42.9)	38.2 (36.6 – 39.8)
	ref.	**0.002**	**0.002**	**<0.001**	**0.021**
Soft drinks	34.1 (33.6 – 34.7)	33.9 (33.1 – 34.7)	32.9 (31.5 – 34.4)	32.3 (31.7 – 32.9)	32.7 (31.2 – 34.2)
	ref.	0.579	0.112	**<0.001**	0.060
Body image					
Fat or very fat	18.5 (17.2 – 19.9)	14.8 (13.6 – 16.1)	13.5 (12.2 – 15)	15.1 (14 – 16.3)	15.7 (14.6 – 16.9)
	ref.	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Physical activity	20.5 (19.2 – 21.8)	20.5 (19.1 – 21.9)	20.1 (18.5 – 21.9)	19.6 (18.4 – 20.8)	22.5 (21.2 – 23.9)
	ref.	0.992	0.557	**0.001**	**0.003**
Smoking in the last 30 days	4.8 (4.2 – 5.5)	6.1 (5.3 – 7)	5.3 (4.5 – 6.3)	4.8 (4.2 – 5.5)	6.3 (5.6 – 7.1)
	ref.	**<0.001**	0.131	0.913	**<0.001**
Smoking at least once during the lifetime	19.3 (18.1 – 20.6)	20.4 (19 – 21.9)	20 (18.3 – 21.8)	19.4 (18.2 – 20.7)	20.1 (18.8 – 21.3)
	ref.	**0.005**	0.284	0.733	0.280
Alcohol intake in the last 30 days	26.3 (24.8 – 27.7)	27.7 (26.1 – 29.3)	26.9 (25 – 28.8)	25.3 (23.9 – 26.7)	27.7 (26.3 – 29.1)
	ref.	**0.001**	0.372	**0.001**	0.051
Experimentation with alcohol	68.9 (67.4 – 70.4)	64.1 (62.3 – 65.8)	68.7 (66.7 – 70.7)	65.1 (63.5 – 66.7)	67.5 (66 – 68.9)
	ref.	**<0.001**	0.781	**<0.001**	0.067
Experimentation with illicit drugs	7.2 (6.5 – 8.1)	8.6 (7.6 – 9.6)	8.6 (7.5 – 9.9)	6.1 (5.5 – 6.9)	8.6 (7.7 – 9.5)
	ref.	**<0.001**	**0.001**	**<0.001**	**0.002**
Physical violence	20.8 (19.5 – 22.2)	23.7 (22.2 – 25.3)	21.2 (19.6 – 23)	19.3 (18.1 – 20.6)	22.6 (21.3 – 24)
	ref.	**<0.001**	0.503	**<0.001**	**0.010**
Suffered family violence	9.8 (8.9 – 10.7)	12.1 (11 – 13.3)	11.7 (10.4 – 13.1)	10.5 (9.6 – 11.5)	13 (11.9 – 14.1)
	ref.	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Was bullied	7.3 (6.5 – 8.2)	8.1 (7.2 – 9.1)	8.3 (7.2 – 9.6)	6.6 (5.9 – 7.4)	7.9 (7 – 8.8)
	ref.	**0.002**	**0.014**	**<0.001**	0.195

drinks (PR = 0.95; 95%CI 0.93 – 0.97) compared with white adolescents. As for body image, all the students perceived themselves as less fat than white adolescents. It is worth noting that yellow students had lower PR compared with the others (PR = 0.71; 95%CI 0.65 – 0.78).

Indigenous people were those who practiced more physical activity (PR = 1.12; 95%CI 1.04 – 1.2). Brown students reported less cigarette use in the past 30 days (PR = 0.89; 95%CI 0.84 – 0.95), whereas black (PR = 0.95; 95%CI 0.91 – 1.00) and brown adolescents (PR = 0.94; 95%CI 0.91 – 0.97) reported the lowest smoking experimentation during their lifetime. The≈lowest alcohol intake in the last 30 days was observed among brown adolescents, when compared with white students (PR = 0.91; 95%CI 0.88 – 0.93), as well as the lowest experimentation with illicit drugs (PR = 0.8; 95%CI 0.76 – 0.85). However, experimentation with illicit drugs was higher among black (PR = 1.08; 95%CI 1.01 – 1.16), yellow (PR = 1.16; 95%CI 1.04 – 1.3), and indigenous students (PR = 1.12; 95%CI 1.00 – 1.26), when compared with white students. Experimentation with alcohol during lifetime was lower among black (PR = 0.92%; 95%CI 0.9 – 0.94) and brown students (PR = 0.93; 95%CI 0.92 – 0.95). Indigenous and black students were more frequently involved in physical violence (PR = 1.09; 95%CI 1.02 – 1.17 and PR = 1.08; 95%CI 1.04 – 1.13, respectively) and family violence (PR = 1.3; 95%CI 1.17 – 1.43). Yellow students were the ones who suffered bullying more frequently (PR = 1.17; 95%CI 1.04 – 1.31) (Table 3).

DISCUSSION

In this study, the following socioeconomic differences were observed: white adolescents were younger, had mothers with higher levels of education, and studied in private schools. Yellow and indigenous students reported working more often than white students. These results suggest possible inequalities in the distribution by race/skin color. Such differences have been observed previously in studies among students[18].

For the four food indicators, consumption of beans was higher among black, brown, and indigenous adolescents in comparison with white students; the higher fruit consumption was found among brown students. Candies were consumed more frequently by black, yellow, and brown students. White adolescents felt fat or very fat more frequently, and physical activity was more prevalent among indigenous individuals. Black students showed higher regular use of cigarettes and smoking experimentation. The experimentation with alcohol, ever in life, was lower among black and brown adolescents. Experimentation with illicit drugs at some time in life was higher among black, yellow, and indigenous students. Black and indigenous students reported more involvement in physical fights. Family violence was lower among white students. Self-declared black or yellow adolescents were those who reported being bullied more frequently.

White students had the lowest prevalence of beans consumption (compared with black and brown students) and candies consumption (compared with black, brown, and indigenous adolescents). The consumption of beans was higher among the black population. Telephone surveys with adults also indicated these differences[19]. Lower consumption of beans among white schoolchildren may be explained by the less time devoted to food preparation in

Table 3. Adjusted prevalence ratio for age and maternal education of risk and protective factors, according to race/skin color, Brazil. PeNSE 2012.

Variables	Race/skin color				
	White*	Black	Yellow	Brown	Indigenous
	(ref.)	PR (95%CI)	PR (95%CI)	PR (95%CI)	PR (95%CI)
Regular food consumption (≥ 5 times per week)					
Beans	1.00	1.06 (1.04 – 1.09)	1.01 (0.97 – 1.05)	1.03 (1.02 – 1.05)	1.03 (0.99 – 1.07)
	ref.	**<0.001**	0.627	**<0.001**	0.189
Fruits	1.00	1.05 (1.01 - 1.09)	1 (0.94 - 1.06)	1 (0.97 - 1.03)	1.03 (0.96 - 1.09)
	ref.	**0.011**	0.945	0.954	0.399
Candies	1.00	1.06 (1.03 - 1.1)	1.07 (1.02 - 1.13)	1.08 (1.05 - 1.1)	0.97 (0.92 - 1.03)
	ref.	**<0.001**	**0.005**	**<0.001**	0.336
Soft drinks	1.00	0.99 (0.95 - 1.02)	0.97 (0.91 - 1.02)	0.95 (0.93 - 0.97)	0.96 (0.91 - 1.03)
	ref.	0.429	0.249	**<0.001**	0.249
Body image					
Gordo ou muito gordo	1.00	0.85 (0.81 – 0.89)	0.71 (0.65 – 0.78)	0.81 (0.79 – 0.84)	0.88 (0.8 – 0.96)
	ref.	**<0.001**	**<0.001**	**<0.001**	**0.024**
Fat or very fat	1.00	0.98 (0.94 – 1.02)	1.05 (0.97 – 1.12)	1.02 (0.99 – 1.05)	1.12 (1.04 – 1.2)
	ref.	0.195	0.713	0.848	**0.003**
Physical activity	1.00	1.1 (1.01 – 1.19)	1.05 (0.91 – 1.21)	0.89 (0.84 – 0.95)	1.2 (1.05 – 1.38)
	ref.	**0.047**	0.446	**0.001**	**0.010**
Smoking in the last 30 days	1.00	0.95 (0.91 – 1)	0.98 (0.91 – 1.06)	0.94 (0.91 – 0.97)	0.96 (0.89 – 1.04)
	ref.	**0.019**	0.510	**<0.001**	0.302
Smoking at least once during the lifetime	1.00	0.98 (0.94 - 1.01)	0.98 (0.92 - 1.04)	0.91 (0.88 - 0.93)	0.99 (0.93 - 1.06)
	ref.	0.291	0.790	**<0.001**	0.998
Alcohol intake in the last 30 days	1.00	0.92 (0.9 - 0.94)	0.99 (0.95 - 1.03)	0.93 (0.92 - 0.95)	0.97 (0.93 - 1.01)
	ref.	**<0.001**	0.789	**<0.001**	0.335
Experimentation with alcohol	1.00	1.08 (1.01 - 1.16)	1.16 (1.04 - 1.3)	0.8 (0.76 - 0.85)	1.12 (1 - 1.26)
	ref.	**0.004**	**0.009**	**<0.001**	**0.046**
Physical violence	1.00	1.08 (1.04 – 1.13)	1.05 (0.98 – 1.13)	0.95 (0.92 – 0.98)	1.09 (1.02 – 1.17)
	ref.	**<0.001**	0.600	**<0.001**	**0.027**
Suffered family violence	1.00	1.23 (1.16 – 1.3)	1.17 (1.06 – 1.28)	1.04 (0.99 – 1.08)	1.3 (1.17 – 1.43)
	ref.	**<0.001**	**0.001**	**0.019**	**<0.001**
Was bullied	1.00	1.13 (1.05 – 1.21)	1.17 (1.04 – 1.31)	0.92 (0.87 – 0.97)	1.07 (0.95 – 1.22)
	ref.	**<0.001**	**0.012**	**<0.001**	0.298

*Reference: White race/skin color.

families with higher educational levels and higher family income. This may also be explained by the greater consumption of processed foods, such as candies in such families[19-21]. A study that used data from the Household Budget Survey (acronym in Portuguese – POF), carried out in 2002 and 2003, showed a positive relationship between sugar consumption and having black or brown skin colors[21]. The consumption of fruits and vegetables, which is an important protective factor for chronic diseases [22], was lower among brown students.

White adolescents whose mothers had a higher educational level (a proxy for the socioeconomic class) reported more often feeling fat or very fat, in comparison to the other students. The excessive concern with weight, the distorted body image, and fear of gaining weight are symptoms of eating disorders, such as anorexia and bulimia. The prevalence of these disorders is higher among white and female adolescents, who belong to higher socioeconomic classes[23]. A survey with representative sample of schoolchildren from the city of Belo Horizonte showed that the desire to be thin was associated with white race/skin color, with those responsible who had a college degree, and with higher socioeconomic classes[24].

On the other hand, Pereira and colleagues[25], in a study with children and adolescents from public and private schools in Florianópolis, demonstrated that students with higher socioeconomic status felt dissatisfied with thinness, whereas those with lower socioeconomic status indicated overweight.

This study showed that the frequency of physical activity among adolescents was approximately 20%, and the indigenous adolescents were those who were more engaged in physical activities. This may be due to cultural habits that require intense physical activity[26,27]. Low frequencies of physical activity observed in this study may be related to the impact attributed to the use of technology in modern life, such as television, Internet, mobile phone, and video games, as well as the school physical environment unsuitable for the practice of physical activities and the poor engagement in physical education classes in schools[28,29].

The use of cigarettes in the last 30 days preceding the survey was higher among black and indigenous students, and was lower among brown adolescents. The same situation occurred with the use of cigarettes at least once in their lifetime. A study carried out with schoolchildren in Londrina, in 2011, found no association of self-reported race/skin color by adolescents with regular tobacco use; however, only two skin color categories were analyzed (white and others)[30]. According to the National Health Survey (2013), the prevalence of cigarette smokers among adults was higher among black (17.4%; 95%CI 15.4 – 19.3) and brown individuals (15.8%; 95%CI 15.0 – 16.6) than among white people (14.5%; 95%CI 14.0 – 15.0)[31]. It is worth noting that, among adolescents, the main factors associated with smoking are age, influence of friends, smoking parents with lower educational level, and lack of family supervision[30,32].

With regard to the use of alcohol in the last 30 days and experimentation with alcohol at least once during their lifetime, white adolescents showed higher risk in comparison to brown individuals in the first behavior, and black and brown individuals in the second behavior. Another Brazilian study found no difference between alcohol consumption and race/skin color[33]. However, data from the Youth Risk Behavior Survey, which is a survey with adolescents in the United States, indicated that the experimentation with alcohol was higher among Hispanic

students (72.4%) compared with white (65.9%) and black students (63.4%). However, the consumption of alcoholic beverages in the last 30 days confirms the Brazilian data, being higher among Hispanic (37.5%) and white students (36.3%) than among black students (29.6%)[34].

One possible explanation for greater alcohol experimentation/consumption among white adolescents is belonging to more privileged social classes, which is demonstrated in this study by the higher level of maternal education. Having financial resources available and being independent influence the consumption of alcohol, tobacco, and marijuana[35]. However, it is worth noting that there is evidence of the association of alcohol consumption with violent outcomes (homicide) among black adolescents[36,37].

Experimentation with illicit drugs was higher among black, yellow, and indigenous adolescents, and lower among brown students, compared with white people, after adjusting for age and maternal education. Among African–American adolescents, experimentation with marijuana before 13 years of age was higher than among white adolescents. However, for other drugs such as heroin, cocaine, methamphetamines, and steroids, the highest rates are among white and Hispanic adolescents[34]. The family and sociocultural contexts in which the adolescent is inserted are determinants of drug use among adolescents[38].

The indicators on violence were less frequent among white adolescents. It is worth noting that black adolescents showed higher risk in the three indicators analyzed (physical violence, family violence, and bullying). A study with community-dwelling female adolescents in Rio de Janeiro found that the prevalence of being a victim or a perpetrator of violence was higher among those who considered themselves black[9]. The determinants of violence include macro determinants such as worst living conditions, exclusion in the process of urbanization, expansion of drug trafficking, and proximal determinants such as alcohol intake, other drugs use, and parental supervision[37,39]. Authors also indicate that worst health indicators among black population may be explained by socioeconomic factors, racial prejudice, among others[1,2,11].

The role of social inequalities related to race/skin color among individuals is known. This leads to vulnerabilities, especially in the health field[40]. Although studies do not indicate this perspective, the hypothesis of this study findings is that black and indigenous populations live in vulnerable social realities that leads to greater exposure to risk factors for health such as drug use[41,42]. Racial discrimination experienced by women and men, black and white, occupies different places in social networks, providing different experiences[9]. For yellow adolescents, factors associated with a behavior of challenging parental limits in a more rigid family structure in terms of education are attributed as possible explanation for health vulnerabilities.

It is worth noting that PeNSE is a cross-sectional study, and therefore the observed associations do not indicate cause–effect relationships, but suggest hypotheses to be verified. Furthermore, race/skin color is self-reported, and the data concerning indigenous and yellow adolescents should be considered with caution, owing to the small number of respondents. Moreover, another limitation related to PeNSE sample design is that this research excluded out-of-school adolescents and possibly those at higher risk, in particular, of violence and use of substances such as alcohol, tobacco, and other drugs.

CONCLUSION

The reduction of racial disparities is important to prevent diseases and disorders among adolescents. Studies that address inequalities on race/skin color should be considered in the planning of health policies. Public policies need to provide access to constitutionally guaranteed social rights, especially in health, ensuring universal and equal access to health actions and to health services, considering the peculiarities of the population.

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