Original article

Simultaneity of risk behaviors for sexually transmitted infections in Brazilian adolescents, 2012

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Abstract

Objective: to analyze the simultaneity of two groups of risk behaviors for sexually transmitted infections in Brazilian adolescents. **Methods:** cross-sectional study with data from the National Adolescent School-based Health Survey 2012; the outcomes were (1) simultaneous consumption of alcohol, tobacco and drugs (at least two), and (2) no use of condom and having two or more sexual partners. **Results**: simultaneity of consumption of alcohol, tobacco and drugs was present in 14.7% of the boys and 21.5% of the girls, and was more prevalent among white individuals, with more educated mothers, and who did not live with their parents; approximately 12.0% of the adolescents presented simultaneity of no use of condom and having two or more sexual partners; this was more common among younger boys, not white (PR=1.22; 95%CI 1.10;1.36), and who did not live with their parents (PR=1.78; 95%CI 1.48;2.16), whilst among girls, this outcome was associated with higher age. **Conclusion**: both outcomes were associated with different characteristics, depending on the sex of the adolescent.

Keywords: Adolescent Behavior; Sexually Transmitted Diseases; Cross-Sectional Studies; Sexual Behavior; School Health.

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Introduction

Adolescence is a period of physical, psychological, behavioral and social changes, which can impact the individuals over their lives.[1] The development of sexual characteristics and the beginning of sex life are among the main changes that happen during adolescence.[2] Literature points to a decrease in puberty age, thus adolescents are exposed to vulnerability contexts at earlier ages, including getting infected by causative agents of sexually transmitted infections (STI).[3]

The STI are considered a Public Health issue worldwide.[1] Since the 1990s, some important changes in society regarding sexual education have been observed, such as the availability of books and materials for adolescents, as well as more freedom to get information and to discuss about this subject.[4] In spite of all this, adolescents still show little knowledge about the transmission of STI.[5] Oliveira et al.,[6] in a study conducted in the municipality of Rio de Janeiro in 2003, with adolescents enrolled at high school, observed that 10.8% of those adolescents believed that the use of contraceptive pills and 16.9% believed that having sex only with their boyfriend or girlfriend, prevented from STI.

> *Adolescents are exposed to vulnerability contexts at earlier ages, including getting infected by causative agents of sexually transmitted infections (STI).*

The chances of contracting STI tend to increase as the age of beginning of sex life decreases, for both sexes.[7] According to a study by Lee et al.[7] conducted in South Korea in 2015, male adolescents who begin their sex lives in the fifth year of schooling have 6.32 more chances of contracting STI than those at the twelfth year. In turn, girls who begin their sex life in the fifth year of schooling have 3.98 more chances of getting STI when comparing to those at the twelfth year.

According to the Brazilian Ministry of Health, the incidence of the acquired immunodeficiency syndrome (AIDS) among Brazilian adolescents aged 15 to 24, in 2012, was of 11.8 per 100 thousand inhabitants.[8] There are few data available on the occurrence of other STI, due to some difficulties in obtaining these data and to the big number of diseases. Among the STI, we could highlight the human immunodeficiency virus (HIV),[9,10] important cause of disability-related years of life lost among adolescents worldwide.[11,12]

Number of partners, unsafe sex, use of alcohol and illicit drugs and smoking have stood out in literature as risk behaviors for the occurrence of STI.[13,14] Although the use of alcohol/drugs and smoking are not considered direct causes, these factors are believed to represent a behavior pattern of adolescents, given the association between them and STI.[3,13] From the social point of view, factors as low socioeconomic level, sex, and intrafamily violence may contribute to the occurrence of STI.[13]

The isolated prevalences of consumption of alcohol, drugs and tobacco and no use of condom in sexual intercourse among adolescents are not known.[3,15-17] Studies conducted with students who participated in the National Adolescent School-based Health Survey (*PeNSE*) in 2012 showed that 75.3% of the adolescents used condoms in their last sexual intercourse,[15] 26.1% consumed alcohol in the last 30 days,[16] 22.6% had already smoked – and about one third of them (27.2%) smoked regularly[18] – and 7.3% reported having used illicit drugs at least once in their lives.[17]

However, these factors tend to influence sexual behavior interrelatedly, not in an isolate way. Thus, understanding the simultaneous influence of these risk behaviors for STI may contribute to a broader and more effective approach towards health public policies. Notwithstanding, there are few studies that explore the prevalence of simultaneity of these factors and the profile of adolescents.

The objective of this present study was to analyze the simultaneity of two groups of risk behaviors for STI in Brazilian adolescents.

Methods

This cross-sectional study used data from the National Adolescent School-based Health Survey – *PeNSE* –, which is a national school-based survey, conducted in in 2012. A total of 109,104 students enrolled at the 9th grade of Primary School all over Brazil, from both public and private institutions, were interviewed. *PeNSE* was carried by the Brazilian Institute of Geography and Statistics (*IBGE*), in a partnership with the Ministry of Health.[19]

The survey covered the 26 capitals of Brazilian states and the Federal District (FD). The sample of each one of the 27 geographic strata (state capitals + FD) was allocated

proportionally to the number of schools, according to their type of management (public or private). For each stratum, a two-stage cluster sampling was selected, in which the first were the schools and the second were the eligible classes, representing an equiprobability selection. All the students of the selected classes were invited to join the study. For data collection, researchers used smartphones with a self-administered questionnaire. Besides the sociodemographic characteristics of the adolescents, other aspects regarding the youngsters were also investigated: behavioral, environmental and disease-related. More details regarding the sampling can be found in another publication.[19]

Simultaneity of risk behaviors for STI was approached from two behavior groups, resulting in two different outcomes. The first outcome considered as simultaneity the presence of two or more of the following behaviors:

- alcohol consumption in the last thirty days
  "In the last 30 days, in how many days did you take at least a glass or a dose of alcoholic beverage? (One dose correspond to one can of beer or one glass of wine or one dose of cachaça or whiskey, etc.)"
- smoking in the last thirty days
  "In the last 30 days, in how many days did you smoke cigarette?"; and
- having tried any drug at least once
  "Have you ever used any drug, such as: marijuana, cocaine, crack, solvents mix (*cola*, *loló*, *lança perfume*), ecstasy, oxy, etc.?"

The second outcome considered as simultaneity the presence of the two following behaviors:

- having had more than one sexual partner
  "In your life, how many people did you have sexual intercourse (had sex) with?"; and
- having had sexual intercourse without using condom
  "In the last time you had sexual intercourse (had sex), did you or your partner use condom?"

Simultaneity of the five behaviors was not assessed, because the variables 'alcohol consumption', 'smoking', and 'drugs use' may influence on the number of sex partners and the use of condoms.[3,15] For this study, the sample involved only adolescents who had already had sexual intercourse.

The exposition variables were:

- age (in years: 13 or less; 14; 15; 16 or over);
- self-referred ethnicity/skin color (white, not white [black, brown, Asian or indigenous]);
- mother's education level (no schooling; incomplete Primary School; complete Primary School; complete High School; Higher Education degree);
- living with parents (living with the father and the mother; living with the father or the mother; not living with the parents); and
- administrative dependence of the school (public; private)

All the analyses were stratified by sex, since there is a consensus in literature regarding the difference on the risk behavior pattern between boys and girls.[3,13,20,21]

The analyses were conducted using the program Stata 12.1 (StataCorp, College Station, Texas, USA), and the survey function (svy) to consider the sample design. First, we described the sample according to the exposition variables and the risk behaviors for STI. For association analyses, Poisson regression was used, which is suitable for estimating prevalence in cross-sectional studies, through the use of the hierarchical model.[22] The variables 'age', 'ethnicity/skin color'; 'maternal education level' and 'living with the parents' were included in the first hierarchical level. The variable 'administrative dependence of the school' was included in the second hierarchical level. To select the variables, we adopted the backward procedure per levels, considering a p-value <0.20. The magnitude of associations was determined by the prevalence ratio (PR) and the 95% confidence intervals (95%CI) were presented. All associations with p<0.05 were considered as statistically significant.

This study was conducted exclusively with secondary data from *PeNSE* 2012, with no individuals identification. *PeNSE* 2012 was approved by the National Ethics in Research Committee – Conep (Record No. 16.805).

Results

The sample was formed of 32,835 adolescents who reported having already had sex at least once, which represented one third of the total sample (28.7%). With regard to the sample characteristics, most of the participants were male (65.0%), studied in public schools (89.1%), were 14 years old (36.4%), were black/brown/Asian/indigenous – not white – (67.1%), had mothers with incomplete Primary School (34.3%) and lived with both parents (53.4%) (Table 1).

Concerning the risk behavior for STI among boys, 10.3% reported having smoked in the last 30 days and 41.5% reported having drunk alcoholic beverages in

Table 1 – Description of the sample, total and stratified by sex, of adolescents who reported having had sexual intercourse at least once, according to independent variables, and prevalences of risk behaviors for sexually transmitted infections, National Adolescent School-based Health Survey, Brazil, 2012

Variables	Total (n= 32,835)	Male (n= 16,715)	Female (n= 9,289)
	n (%) [a]	n (%) [a]	n (%) [a]
Age (in years)			
≤13	3,021 (10.9)	1,971 (10.8)	1,050 (11.1)
14	11,961 (36.4)	7,610 (35.3)	4,351 (38.3)
15	9,145 (26.9)	6,047 (27.4)	3,098 (26.0)
≥16	8. 708 (25.8)	5,718 (26.5)	2,990 (24.6)
Ethnicity/skin color			
White	9,936 (32.9)	6,609 (33.3)	3,327 (32.1)
Not white	22,880 (67.1)	14,725 (66.7)	8,155 (67.9)
Maternal education level			
No schooling	2,729 (11.4)	1,689 (11.0)	1,040 (12.1)
Incomplete Primary School	8,688 (34.3)	5,193 (32.5)	3,495 (38.0)
Complete Primary School	5,142 (19.2)	3,296 (18.9)	1,846 (19.8)
Complete High School	8,204 (27.0)	5,634 (28.5)	2,570 (24.1)
Higher Education degree	2,937 (8.1)	2,191 (9.1)	746 (6.0)
Living with parents			
Both	16,609 (53.4)	11,725 (57.5)	4,884 (45.1)
One of them	13,070 (38.2)	8,039 (36.3)	5,031 (42.2)
None	3,112 (8.4)	1,553 (6.2)	1,559 (12.7)
Administrative dependence of the school			
Public	28,594 (89.1)	18,267 (87.9)	10,327 (91.5)
Private	4,241 (10.9)	3,079 (12.1)	1,162 (8.5)
Smoking			
No	28,641 (87.6)	18,921 (89.7)	9,720 (83.4)
Yes	4,160 (12.4)	2,397 (10.3)	1,763 (16.6)
Alcohol			
No	18,055 (54.4)	12,548 (58.5)	5,507 (46.2)
Yes	14,691 (45.6)	8,726 (41.5)	5,965 (53.8)
Drugs			
No	27,201 (83.8)	17,893 (85.0)	9,308 (81.5)
Yes	5,621 (16.2)	3,443 (15.0)	2,178 (18.5)
Use of condom			
No	6,790 (21.4)	4,017 (19.1)	2,773 (25.8)
Yes	24,282 (78.6)	15,982 (80.9)	8,300 (74.2)
Number of partners			
One	13,291 (42.0)	6,960 (33.9)	6,331 (58.1)
Two or more	18,827 (58.0)	13,913 (66.1)	4,914 (41.9)

a) Absolute number and sample weighted proportion.

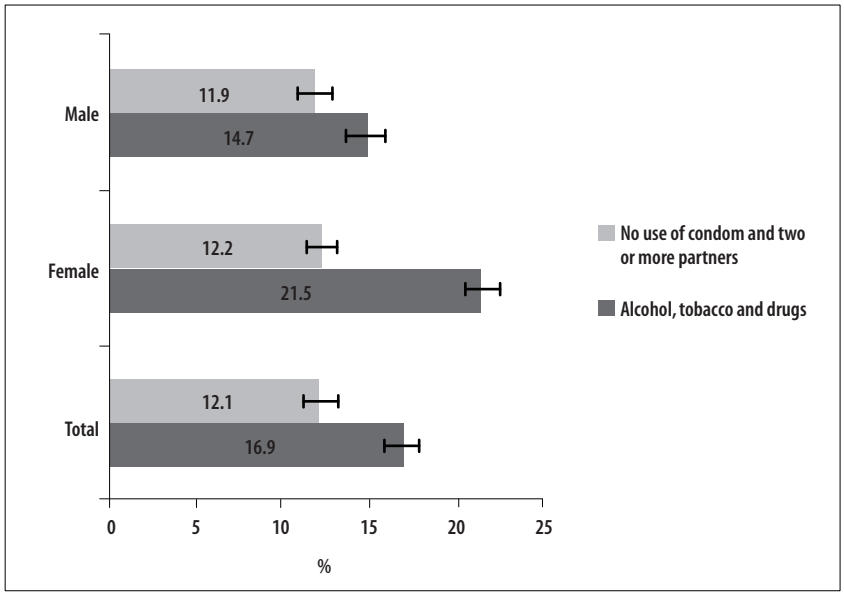
the last 30 days; 15.0% have tried illicit drugs at least once,19.1% did not use condom in their last sexual intercourse and 66.1% reported having had two or more sexual partners. Among girls, 16.6% had smoked and 53.8% had drunk in the last 30 days, 18.5% have tried illicit drugs at least once, 25.8% did not use condom in their last sexual intercourse and 41.9% affirmed having had two or more sexual partners (Table 1).

Simultaneity of two or more risk behaviors, between consumption of alcohol, tobacco and drugs, was present in 14.7% of boys and 21.5% of girls, whilst the prevalence of no use of condom and having two or more sexual partners was of approximately 12.0% for both sexes (Figure 1).

Table 2 presents the prevalences, crude and adjusted analysis of the association between the simultaneity for each risk behavior group for STI (alcohol, tobacco and drugs; number of partners and no use of condom) and the independent variables for boys. The adjusted analysis shows that the variables 'age', 'ethnicity/skin color', 'maternal education level' and 'living with the parents' were associated to the simultaneity of the group consumption of alcohol, tobacco and drugs. With regard to age, we observed an increasing trend in the risk of having two or more behaviors for STI as age increased. Not white skinned boys showed prevalence 16% lower of two or more behaviors. Adolescents whose mothers had a Higher Education degree showed an occurrence 1.45 times higher of having two or more behaviors, when compared to those whose mothers had no schooling. Boys who did not live with their parents presented prevalence 39% higher of simultaneity of behaviors, when compared to those who lived with both parents.

Concerning simultaneity in the group of number of partners and no use of condom, the variables 'age', 'ethnicity/skin color' and 'living with the parents' were associated with the presence of two behaviors after adjusted analysis. With regard to age, boys aged 16 or older showed an occurrence 11% lower of two risk behaviors when comparing to those aged 13 or less. Not white skinned boys showed prevalence 1.22 times higher for those two behaviors. Boys who did not live with their parents presented prevalence 78% higher of simultaneity of behaviors, when compared to those who lived with both their parents (Table 2).

Table 3 presents the prevalences, crude and adjusted analysis of the association between the simultaneity for each risk behavior group for STI (consumption of alcohol, tobacco and drugs; number of partners and no



Note: The stems show the 95% confidence intervals

Figure 1 – Prevalences and 95% confidence intervals of simultaneity of risk behaviors in two groups (no use of condom and two or more sexual partners; alcohol, tobacco and drugs use) for sexually transmitted infections, National Adolescent School-based Health Survey, Brazil, 2012 (n= 32,835)

Table 2 – Prevalences, crude and adjusted analysis of the association between simultaneity of risk behaviors for sexually transmitted infections and independent variables in male adolescents, National Adolescent School-based Health Survey, Brazil, 2012 (n=16,715)

Variables	Use of alcohol, tobacco, drugs			Number of partners and no use of condom		
	Prevalence (95%CI[a])	Crude analysis PR[b] (95%CI[a])	Adjusted analysis PR[b] (95%CI[a])	Prevalence (95%CI[a])	Crude analysis PR[b] (95%CI[a])	Adjusted analysis PR[b] (95%CI[a])
Age (in years)[c]						
≤13	12.4 (8.4;16.3)	1.00[f]	1.00	13.2 (11.7;14.7)	1.00[g]	1.00[g]
14	12.1 (8.3;16.0)	0.98 (0.83;1.16)	0.93 (0.75;1.15)	11.4 (10.5;12.3)	0.86 (0.79;0.94)	0.84 (0.76;0.92)
15	15.8 (12.1;19.5)	1.28 (1.04;1.57)	1.23 (0.99;1.53)	11.6 (10.8;12.4)	0.88 (0.77;1.00)	0.84 (0.73;0.96)
≥16	18.0 (14.6;21.3)	1.45 (1.11;1.91)	1.46 (1.04;2.05)	12.5 (11.2;13.8)	0.95 (0.81;1.11)	0.89 (0.75;1.05)
Ethnicity/skin color[c]						
White	16.1 (12.1;20.1)	1.00[f]	1.00[f]	10.3 (9.5;11.2)	1.00[g]	1.00[g]
Not white[d]	14.0 (11.4;16.6)	0.87 (0.78;0.97)	0.84 (0.74;0.97)	12.7 (11.8;13.6)	1.23 (1.10;1.38)	1.22 (1.10;1.36)
Maternal education level[c]						
No schooling	14.3 (10.7;17.9)	1.00[h]	1.00[i]	13.2 (11.1;15.3)	1.00[f]	1.00
Incomplete Primary School	13.4 (9.8;17.0)	0.94 (0.73;1.20)	0.96 (0.76;1.22)	12.6 (11.0;14.1)	0.95 (0.75;1.22)	0.97 (0.77;1.23)
Complete Primary School	14.9 (11.0;18.8)	1.04 (0.78;1.39)	1.08 (0.82;1.44)	11.8 (10.5;13.0)	0.89 (0.74;1.08)	0.90 (0.74;1.08)
Complete High School	15.8 (13.2;18.4)	1.10 (0.86;1.41)	1.17 (0.89;1.53)	12.1 (10.8;13.4)	0.92 (0.77;1.09)	0.94 (0.79;1.12)
Higher Education degree	19.3 (14.7;23.8)	1.35 (1.17;1.56)	1.45 (1.22;1.73)	9.7 (8.0;11.5)	0.74 (0.55;0.99)	0.77 (0.58;1.01)
Living with the parents[c]						
Both	13.1 (10.1;16.1)	1.00[h]	1.00[h]	10.7 (9.8;11.6)	1.00[h]	1.00[h]
One of them	16.4 (12.7;20.1)	1.25 (1.16;1.34)	1.21 (1.10;1.34)	12.7 (11.4;13.9)	1.19 (1.03;1.36)	1.19 (1.03;1.37)
None	19.4 (15.8;23.0)	1.48 (1.16;1.89)	1.39 (1.18;1.65)	19.2 (16.3;22.0)	1.80 (1.51;2.14)	1.78 (1.48;2.16)
Administrative dependence of the school[e]						
Public	14.5 (11.4;17.6)	1.00	1.00	11.9 (11.1;12.8)	1.00	1.00
Private	16.3 (11.8;20.7)	1.12 (0.92;1.38)	1.03 (0.79;1.36)	12.0 (9.0;14.9)	1.00 (0.76;1.33)	1.06 (0.80;1.40)

) 95%CI: 95% confidence interval
b) PR: prevalence ratio
c) 1st level
d) black/brown/Asian/indigenous
e) 2nd level
f) Heterogeneity Wald test (p<0.05)
g) Heterogeneity Wald test (p<0.001)
h) Wald test for linear trend (p<0.001)
i) Wald test for linear trend (p<0.05)

use of condom) and the independent variables for girls. The adjusted analysis shows that the variables 'ethnicity/skin color', 'maternal education level' and 'living with the parents' were associated to the simultaneity of the group alcohol, tobacco and drugs use. Not white skinned girls presented 14% lower occurrence of two or more risk behaviors. Concerning maternal education level, those girls whose mothers had Higher Education degree showed prevalence 1.29 times higher of simultaneity of behaviors when comparing to those whose mothers had no schooling. Girls who lived with one of the parents presented an occurrence of simultaneity 25% higher, when compared to those who lived with both parents.

With regard to simultaneity in the group of number of partners and no use of condom, only the variable 'age' was associated to the presence of two behaviors after adjusted analysis, with a linear increasing trend as age increased ($p<0.001$) (Table 3).

Discussion

In this study, we observed that more than one fifth of the girls presented two or more risk behaviors – alcohol, tobacco and drugs – for STI. White-skinned adolescents, with more educated mothers and who did not live with the parents presented higher occurrence of the outcome alcohol, tobacco and drugs. No use of condom and having had two or more sexual partners was more frequent among younger boys, not white, and who did not live with the parents, whilst for girls, this outcome was associated to higher age.

The high frequency of simultaneity of risk behaviors for STI among the adolescents surveyed is worrisome from the Public Health point of view, because school has also the roles to educate, inform and encourage the adoption of healthy practices.[23]

With regard to the outcome alcohol, tobacco and drugs, for both sexes, adolescents whose mothers had Higher Education degree presented higher prevalence of two or more behaviors. By using socioeconomic proxy, other studies conducted with adolescents found results pointing to the same direction: a study of *PeNSE* 2009,[20] observed higher consumption of alcohol among students from private schools; another study, by Horta et al.,[24] conducted in 2002, with a sample of the population from Pelotas, a municipality in the South of Brazil, found higher prevalence in the consumption of alcoholic beverages among those who belong to economic classes A-B. Adolescents have tried alcohol too early, and individuals with better socioeconomic conditions – and higher purchase power – can have more access to these products. Due to the fact that alcohol is a licit drug, which is socially accepted, it is easy to buy it in parties, bars and stores, and have it at home; and this can be the gateway to other drugs.[21]

As boys got older, the occurrence of two or more behaviors increased, which can be explained by the higher number of opportunities of being exposed to environments with easier access to those drugs. These results are similar to those found by Horta et al.:[24] adolescents aged 15 presented prevalence of alcohol consumption 25% lower and of smoking 47% lower than those aged 18.

Results regarding ethnicity/skin color and simultaneity of alcohol, tobacco and drugs also comply with the results found above. Both boys and girls, not white, presented less occurrence of two or more risk behaviors. Considering that maternal ethnicity/skin color and education level can be a socioeconomic proxy, the results of the present study suggest that adolescents with better socioeconomic conditions present higher risk of having two or more risk behaviors in the group alcohol, tobacco and drugs.

On the other hand, when it comes to no use of condom and having had two or more partners, the ethnicity/skin color not white presented higher occurrence of simultaneity for these behaviors. This finding suggests that the studied behaviors should have different approaches concerning public policies. Based on the results observed, considering maternal ethnicity/skin color and education level, the findings suggest that adolescents with higher risk of simultaneity for alcohol, tobacco and drugs are those with better socioeconomic level, whereas the highest risk of no use of condom and number of partners was associated to lower socioeconomic levels. These latter are possibly connected to education issues, both at school and at home.[25] However, a study that investigated the behavior in the beginning of sex life found that adolescents with lower socioeconomic indicators had higher prevalence of early sexual initiation, and that sexual activity during adolescence is strongly related to risk behaviors, such as not using condom.[21]

With regard to living with the parents, when we consider the outcome alcohol, tobacco and drugs among boys, those who did not live with their parents or who

Table 3 – Prevalences, crude and adjusted analysis of the association between simultaneity of risk behaviors for sexually transmitted infections and independent variables in female adolescents, National Adolescent School-based Health Survey, Brazil, 2012 (n=9,289)

Variables	Use of alcohol, tobacco, drugs			Number of partners and no use of condom		
	Prevalence (95%CI[a])	Crude analysis	Adjusted analysis	Prevalence (95%CI[a])	Crude analysis	Adjusted analysis
		PR[b] (95%CI[a])	PR[b] (95%CI[a])		PR[b] (95%CI[a])	PR[b] (95%CI[a])
Age (in years)[c]						
≤13	23.4 (16.9;29.8)	1.00	1.00	8.9 (6.2;11.6)	1.00[h]	1.00[h]
14	21.1 (15.8;26.3)	0.90 (0.69;1.18)	1.01 (0.74;1.38)	9.6 (8.3;11.0)	1.09 (0.77;1.54)	1.09 (0.77;1.54)
15	22.7 (16.8;28.6)	0.97 (0.75;1.26)	1.02 (0.71;1.44)	12.8 (8.6;17.0)	1.45 (0.84;2.50)	1.45 (0.84;2.50)
≥16	19.9 (15.3;24.5)	0.85 (0.68;1.06)	0.92 (0.72;1.18)	17.1 (15.0;19.1)	1.93 (1.38;2.69)	1.93 (1.38;2.69)
Ethnicity/skin color[c]						
White	24.1 (18.0;30.2)	1.00[f]	1.00[f]	10.4 (8.3;12.5)	1.00	1.00
Not white[d]	20.2 (15.8;24.6)	0.84 (0.74;0.95)	0.86 (0.76;0.96)	13.1 (11.9;14.3)	1.26 (0.97;1.64)	1.20 (0.90;1.61)
Maternal education level[c]						
No schooling	19.4 (14.9;23.9)	1.00[g]	1.00[f]	14.9 (11.2;18.5)	1.00	1.00
Incomplete Primary School	19.9 (14.6;25.2)	1.03 (0.84;1.25)	1.00 (0.84;1.20)	12.0 (10.3;13.6)	0.80 (0.60;1.08)	0.87 (0.65;1.17)
Complete Primary School	19.7 (15.2;24.1)	1.01 (0.82;1.25)	0.97 (0.81;1.17)	12.3 (9.8;14.8)	0.83 (0.65;1.06)	0.96 (0.75;1.22)
Complete High School	22.5 (16.6;28.5)	1.16 (0.91;1.48)	1.12 (0.91;1.37)	11.4 (10.3;12.5)	0.77 (0.58;1.01)	0.91 (0.68;1.20)
Higher Education degree	26.7 (19.5;33.8)	1.37 (1.06;1.78)	1.29 (1.03;1.63)	12.1 (9.6;14.7)	0.82 (0.60;1.11)	1.03 (0.76;1.39)
Living with the parents[c]						
Both	19.8 (15.4;24.2)	1.00[f]	1.00[f]	11.3 (9.9;12.7)	1.00[h]	1.00
One of them	23.7 (17.6;29.7)	1.19 (1.08;1.32)	1.25 (1.09;1.44)	12.2 (11.0;13.3)	1.15 (1.05;1.25)	1.01 (0.84;1.22)
None	19.8 (15.0;24.6)	1.00 (0.86;1.17)	1.04 (0.88;1.23)	15.6 (12.2;19.1)	1.60 (1.32;1.93)	1.07 (0.72;1.58)
Type of school management[e]						
Public	21.2 (16.0;26.4)	1.00	1.00	12.3 (11.6;13.0)	1.00	1.00
Private	24.5 (20.2;28.7)	1.15 (0.97;1.37)	1.07 (0.85;1.34)	11.4 (8.3;14.4)	0.92 (0.70;1.21)	1.01 (0.78;1.33)

a) 95%CI: 95% confidence interval
b) PR: prevalence ratio
c) 1st level
d) black/brown/Asian/indigenous
e) 2nd level
f) Heterogeneity Wald test ($p<0.05$)
g) Heterogeneity Wald test ($p<0.001$)
h) Wald test for linear trend ($p<0.001$)

lived with only one parent presented higher prevalence of simultaneity. Among girls, those who lived with only one parent presented higher occurrence of at least two of those behaviors. A systematic review, which aimed to assess the association between parental practices and the consumption of psychoactive substances, showed that adolescents whose parents are more attentive to the activities developed by them present less involvement with alcohol, drugs and tobacco.[26] Among boys, the prevalence of two behaviors – no use of condom and two or more partners – was 80% higher among those who did not live with any parent, whilst, for those who live with one parent, it was 19% higher. Among girls, after adjustment, living with the parents lost effect on the simultaneity risk of no use of condom and having had two or more partners.

An important issue to be discussed is the direction of the association found between no use of condom and having had two or more partners and age. Lower occurrence of these behaviors among older boys was clear, whilst among girls the frequency increased with age, being 93% higher among those aged 16 or over. A possible explanation for this association could be the age of sexual initiation and the type of relationship at the moment; however this has not been assessed in this study. Some studies[25,27] which assessed the age of sexual initiation found that this happens earlier for boys, and they usually begin their sex lives in occasional relationships, tending to use condoms.[3] Another possibility is that girls usually begin their sex lives when they are in a stable relationship, in which confidence, stability, low apparent risk and woman submission may contribute to a lower frequency in the use of condoms, leading to a risk behavior.[3,21]

The consumption of alcohol, tobacco and illicit drugs is associated to the increase in the number of sexual partners and no use of condom, and these latter are directly related to sexually transmitted infections.[28] These findings may show a connection between these factors, taking into consideration that the occurrence of at least one of these behaviors can lead adolescents to trying new things that put them into unsafe practices for their own health.[21] Still, literature shows that the use of tobacco and illicit drugs, besides contributing to sexual intercourse under alcohol influence, increases the risk of having multiple partners, for both sexes.

This study presents some limitations. Although approximately 90% of the Brazilian adolescents have access to school,[29] it is possible that those who dropout school or seldom go to classes have different risk behaviors, which may have led to an underestimate of the real prevalences for that age group. For example, the use of illicit drugs is known to be associated with the lack of school attendance.[24]

Another limitation is the fact that the population studied is composed only by adolescents who have already began their sex lives, so it is necessary to be cautious not to extrapolate the results. Besides that, *PeNSE* does not represent adolescents according to age group, since the sample is based on the school year, for day shifts. Therefore, the prevalences found cannot be used as representative of the ages included in the sample – even knowing that most adolescents in this age group study on day shifts. We cannot dismiss the possibility of residual confounding, due to the lack of a robust variable for income and/or economic bracket. The variables for alcohol, tobacco and drugs use do not reflect the weekly behavior of adolescents, but it is believed that, for this age group, the use in the last 30 days (for tobacco and alcohol) and once in their lives (for drugs) is already enough to be considered risk behavior.

The lack of variables for STI is also a limitation, since we cannot be certain if the behaviors analyzed in the present study are associated to diseases in this sample. Besides, it is important to highlight that the collection of information on behavior variables and sexual diseases is always difficult, mainly in this age group: adolescents may not reveal the truth, underestimating the estimates.

As aforementioned, we chose to work with the outcomes in separate groups in order to better explore the way they were grouped, because, when analyzing all the risk behaviors some effects were blurred (data not presented). Thus, it could be possible to think that alcohol, tobacco and drugs are more distant from sexually transmitted diseases, and can be the gateway for other behaviors; and the number of partners and no use of condom are closer. From a conceptual model, taking into consideration the STI, it would be plausible that the effect of alcohol, tobacco and drugs could be measured by the number of partners and no use of condom; however, this type of analysis was not approached, since the outcome was the simultaneity of risk behaviors for STI.

Although literature on risk factors for STI in adolescents is relatively wide, as far as we know, this

is the first study that assesses the simultaneity of these factors. This type of analysis allows a broader view on the reality and helps the development of public policies and interventions, since a risk factor hardly occurs independently from other.

School-based interventions that aim to prevent risk behaviors should be conducted or remodeled. Although some ages present higher risk, education actions should be timely conducted so the adolescent acquires the knowledge and chooses the safer option. We suggest more population-based and longitudinal studies to be conducted, so the factors associated to simultaneity of risk factors for sexually transmitted infections – STI – can be investigated, contributing with a better understanding of these relations.

Authors' contributions

Neves RG, Wendt A, Flores TR, Costa CS, Costa FS, Tovo-Rodrigues L and Nunes BP contributed to the conception, analysis and interpretation of data and manuscript writing. All the authors participated in the relevant critical review of the manuscript's intellectual content, approved its final version and declared to be responsible for all aspects of the study, ensuring its accuracy and integrity.

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