DOI: 10.1590/1413-81232021267.08912021

Study of Cardiovascular Risks in Adolescents (ERICA): factors associated with work in adolescence

Elisa Brosina de Leon (https://orcid.org/0000-0002-2559-6897) [1]
Bruno Mendes Tavares (https://orcid.org/0000-0003-0956-6484) [2]
Tiótrefis Gomes Fernandes (https://orcid.org/0000-0002-8563-9529) [1]
Roberta Lins Gonçalves (https://orcid.org/0000-0003-4976-0716) [1]
Fernanda Figueiroa Sanchez Franco (https://orcid.org/0000-0002-6362-4617) [1]
Marina Batista Chaves Azevedo de Souza (https://orcid.org/0000-0003-0704-0534) [3]
Frida Marina Fischer (https://orcid.org/0000-0001-9403-6300) [4]
Bárbara Iansã de Lima Barroso (https://orcid.org/0000-0002-3591-4350) [5]

Abstract *This study aimed to verify the association between work and sociodemographic factors, health behaviors, and cardiovascular risk in Brazilian adolescents. Data from the Study of Cardiovascular Risks in Adolescents (ERICA) were analyzed, with a sample of 37,815 adolescents aged 12-17 years and morning shift students. Considering complex sampling, crude and adjusted Prevalence Ratios (PR) were calculated with interval estimates for variables by Poisson multiple regression model with robust variance estimate. The sociodemographic factors associated with work among Brazilian adolescents were male gender (PR 1.34), aged 15-17 years, with maternal schooling up to elementary school (PR 1.26), public school students (PR 1.63), and from the rural area (PR 1.90). Regarding lifestyle habits and social behavior, the association was significant in physically active (PR 1.19) and alcohol-consuming students (PR 1.35). In conclusion, work among Brazilian adolescent morning shift students is still strongly linked to social issues. Work was associated with alcohol consumption, and there was no association with metabolic markers.*
Key words *Child labor, Cardiovascular diseases, Adolescent working students*

[1] Faculdade de Educação Física e Fisioterapia, Universidade Federal do Amazonas (UFAM). Av. General Rodrigo Octávio 6200, Coroado I. 69080-900 Manaus AM Brasil. elisadleon@ufam.edu.br
[2] Instituto de Ciências Biológicas, UFAM. Manaus AM Brasil.
[3] Departamento de Terapia Ocupacional, Universidade Federal de Sergipe. Lagarto SE Brasil.
[4] Faculdade de Saúde Pública, Universidade de São Paulo. São Paulo SP Brasil.
[5] Departamento de Terapia Ocupacional, Universidade Federal da Paraíba. João Pessoa PB Brasil.

Introduction

The Federal Constitution guarantees to the young population actions that can reduce risks in childhood and adolescence, such as extemporaneous work. Article 224 provides that "the policy of attending to the rights of children and adolescents will be conducted through an articulated set of governmental and non-governmental actions, from the Federal Government, States, Federal District, and Municipalities"[1].

However, studies conducted with adolescents and essential documents on the subject identify that there is still a long way to go regarding legislation and public policies, considering that many adolescents have no alternative but to work, especially those residing in rural areas. The inclusion and permanence of adolescents at work may be interconnected with the influence of the family environment – such as the educational and socio-cultural background of the parents – and with the socioeconomic realities of their countries and contexts, something that can result in adverse effects on the health of these young people[2-4].

Some issues involving work in adolescence such as high demands, psychological pressure, sleep deprivation, reduced time for leisure activities, and low food quality have already been mentioned as harmful to the health of the subjects who experience them. Studies indicate that characteristics like these increase the risk of developing chronic non-communicable diseases, such as cardiovascular diseases (CVD), obesity, and a tendency to use psychotropics[5,6].

In this sense, it is assumed that the effects of early work and CVD can be suggestive of high blood pressure, overweight, dyslipidemia, high blood glucose, and metabolic syndrome, which are the leading death causes in western countries[6], causing adverse socioeconomic effects for individuals, their families, and the State. Such implications can generate high costs with medication, medical care, other health professionals, hospitalization, sick leave, and early retirements[5,7-9].

Scientific research conducted in the last decades in some Brazilian cities, such as Belo Horizonte and Londrina, was carried out to analyze health behaviors and the incidence of cardiovascular diseases in adolescents. The results showed the low consumption of fruits and vegetables and physical inactivity as the most prevalent risk factors, leading to cardiovascular diseases[10-12]. The association between health behaviors and CVDs has also been researched internationally in different socioeconomic contexts, which has identified work activity as a potential risk factor for individuals participating in the research[11,13,14].

Although some Brazilian studies show an association between health behaviors and the incidence of cardiovascular diseases in this population, the literature lacks research investigating the issue of adolescent work as a possible risk factor. Moreover, it is believed that updated national research with representative samples could overly contribute to discussing work, youth, and health.

This paper builds on the analysis of data from the Study of Cardiovascular Risks in Adolescents (ERICA), pioneering research in the country, which has already collected data from about 75 thousand young people aged 12-17 years from all Brazilian regions. ERICA aims to generate scientific evidence that can support or reorient public health policies directed at Brazilian adolescents and young people since its outcomes identify this population's vulnerabilities and health needs.

Specifically, this study presented an excerpt from the ERICA data and aimed to verify the association between work and sociodemographic factors, health behaviors, and cardiovascular risks in Brazilian adolescents.

Methods

The sample consisted of adolescents participating in the 'Study of Cardiovascular Risks in Adolescents' (ERICA), a national, sectional, school-based survey. Data were collected from February 2013 to November 2014, including evaluations in all Brazilian capitals and cities with more than 100,000 inhabitants. Overall, 85,615 public and private school students aged 12-17 years located in Brazilian urban and rural areas were evaluated.

The research population was stratified into 32 geographic strata, consisting of the 27 Brazilian capitals and five sets of municipalities with more than 100,000 inhabitants in each of the five Brazilian regions. The sample size was calculated for each stratum to ensure representative estimates for each city, in a total of 124 municipalities.

The 1,247 schools were selected with proportional probability, directly influenced by the number of students enrolled in the year preceding the last three years of elementary school and in the three years of high school, and inversely to the distance in kilometers between the seat of the municipality where the school is located and the seat of the capital's municipality. The classes

in each school were selected in a combination of shifts (morning and afternoon periods). All students in the selected classes were invited to participate in ERICA. Adolescents with temporary or permanent physical disabilities and pregnant women were excluded from the analysis. More details on the sampling process can be found in Vasconcellos et al.[15].

The individual questionnaire was applied to the adolescents after contacting the school and principal's acceptance, duly structured and self-completed, entered in an electronic data collector called Personal Digital Assistant (PDA), consisting of eleven thematic blocks, applied in classrooms, under the supervision of the previously trained study team. ERICA's logistics and methods were described by Bloch et al.[16].

An adaptation of the Self-Administered Physical Activity Checklist[17] was employed to determine the level of physical activity of adolescents, consisting of 24 modalities that collect information on frequency (days) and the time (hours and minutes) in which the subject engaged in any of the activities listed in the last week. The version used was validated by ERICA[18]. Adolescents who did not accumulate at least 300 min/week of physical activity were considered insufficiently active/inactive[19], and those ≥300 min/week physical activity were considered active. The frequency of adolescents who did not report any physical activity in the week before the survey (0 min/week) was also assessed[20].

The intensity and characteristics of consumption were considered[21] to analyze smoking behavior and alcohol consumption. Current tobacco smokers were considered to have smoked at least once in the past 30 days. Having smoked cigarettes for at least seven consecutive days[22] was used as an indicator to investigate the frequent use of tobacco cigarettes. Data on the consumption of alcoholic beverages were also used. This variable was measured through the following questions: (a) Age at which the subject had at least one glass (or dose) of alcoholic beverage for the first time and (b) Days drinking at least one glass (dose) of alcohol in the last 30 days[23].

The sleep block consisted of four questions that allowed determining the amount of sleep on weekdays (working days) and weekends[24]. Sleep hours on weekdays were stratified into less than six hours; greater than or equal to six hours and less than eight hours; and greater than or equal to eight hours. Sleep time on weekends was stratified into less than eight hours and greater than or equal to eight hours.

Firstly, for work-related variables, the current weekly work hours were considered, categorized as 'not working' (0 hours/week), 'working up to 20 hours/week', 'working 21-40 hours/week', receiving income or not. The variable was dichotomized between 'not working' and 'working' (one or more work weekly hours) to analyze the associations, the latter consisting of joining the last two categories of the last variable.

Besides the questionnaire, anthropometric measurements of height, weight, waist, and arm circumference were obtained, followed by blood pressure assessment[25]. Nutritional status was determined by the BMI and classified as per a reference from the WHO[26]. Blood pressure was checked with a digital monitor (Omron 05-IT), validated for use in adolescents, and measured on the right arm. The creation of this variable was based on the classification criteria of the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents (2004)[27], considering the high blood pressure results as hypertension and non-hypertensive those with normal or borderline values, as described by Bloch et al.[25].

Blood collection required 12-hour fasting and was only performed on morning class students. As a result, the inference of the results related to the relationship between work and the other variables can only be made for students who study in the morning shift. The samples allowed measuring total cholesterol, HDL-cholesterol, triglycerides, blood glucose, glycated hemoglobin, and insulin[28]. The plasma dosage methods and cutoff points, and criteria for determining Metabolic Syndrome can be consulted in Faria-Neto et al.[29] and Kuschnir et al.[30] papers.

Statistical analysis

The study sample consisted of adolescents who completed the work-related block and had blood collection data. The prevalence of work was estimated with the respective 95% confidence intervals (95%CI), according to the sociodemographic aspects and health-related lifestyle habits.

Pearson's chi-square test was used to assess the difference in the prevalence of the work situation according to the other variables, considering the 5% significance level. Crude Prevalence Ratios (PR) were calculated with 95%CI estimates for each variable, using the Poisson model with robust variance, and for the multiple regression model, controlling for possible confounding

variables. For the multivariate analysis, variables with a p-value <0.20 were included in the univariate analysis, whose criteria for entering variables followed the hierarchical model based on three groups: (1) sociodemographic, (2) lifestyle habits (3), and health-related. The variables were adjusted for those belonging to the same group and that were significant ($p<0.05$) in the previous group(s). Thus, the final model consisted of those with statistical significance after the last analysis group. The data were analyzed using the Stata program, version 14, using the Survey module (with weighting factors) to analyze complex sample data.

The ERICA project was approved by the Research Ethics Committee of each of the 27 federation units. All adolescents signed the assent form, and the informed consent form signed by the guardians was added in five states. The project was endorsed by the State and Municipal Education and Health Secretariats.

Results

Of the 85,615 students who participated in ERICA throughout Brazil, we analyzed the data of 37,815 adolescents who presented information on variables 'work', 'nutritional status', 'blood pressure', and 'biochemical tests'. All adolescents studied in the morning shift, of which 60.0% were females, and 54.2% were aged 15-17 years, with a mean of 14.6 (SD=1.6) years. Most (74%) studied in public schools and were from the Northeast (31%) and Southeast (22.7%), followed by the North (19.3%), Midwest (14.5%), and South (12.5%).

The prevalence of adolescents who declared working in the last year was 16.2%, with few (1%) over 20 weekly hours. Regarding sociodemographic aspects, Brazilian boys worked more in both categories of hours than girls (PR1: 1.45 and PR2: 1.55, respectively). Older adolescents reported having worked more than younger ones, especially those working 21-40 weekly hours (PR2: 11.9) (Table 1).

Adolescents born to mothers with lower schooling worked more, considering lower workload (PR1: 1.67), but they were those who worked 21-40 weekly hours less (PR2: 0.46). The frequency of adolescent workers was higher in public schools than in private schools in both weekly workloads (PR1: 1.98 and PR2: 3.27, respectively) and higher in rural areas up to 20 hours (PR1: 2.20), and less from 21 to 40 hours (PR2: 0.15). The regions that concentrated the most significant number of working students were the Midwest, Southeast, and South, in both workloads (Table 1).

Regarding lifestyle habits, the adolescents who worked the most reported sleeping less than eight daily hours, both on weekdays and weekends. A higher frequency of physically active adolescents (PR1: 1.48) was observed among those working up to 20 hours, which was not seen among those who reported working 21-40 hours. Adolescents who worked less said they smoked and drank more (PR1: 1.44 and PR: 1.62, respectively). Only the habit of consuming alcohol was significant among those who worked the most (PR2: 2.05) (Table 1).

Finally, considering health information, underweight adolescents worked less on both workloads (PR1: 0.54 and PR2: 0.13), and overweight students worked up to 20 weekly hours (PR1: 0.83) compared to those of adequate weight. The prevalence of students with high blood pressure, metabolic syndrome, and high total cholesterol was lower in those who worked from 21 to 40 weekly hours (Table 1).

After multivariate analysis for complex samples, the sociodemographic factors associated with work among Brazilian adolescents in any workload were male gender (PR: 1.34; 95%CI: 1.17-1.53); older students (PR: 1.68; 95%CI: 1.45-1.94); maternal schooling up to incomplete elementary school (PR: 1.26; 95%CI: 1.08-1.47) compared to those who had completed at least high school; public school students (PR: 1.63; 95%CI: 1.34-1.99); located in the rural area (PR: 1.90; 95%CI: 1.52-2.38); residing in a region other than the Northeast, emphasizing the Midwest (PR: 1.81; 95%CI: 1.55-2.12, Table 2).

Regarding lifestyle habits and social behavior, the association was significant in physically active students (PR: 1.19; 95%CI: 1.06-1.33) compared to those who were inactive and regularly consumed alcohol (PR: 1.35; 95%CI: 1.20-1.52). Work was inversely associated with low weight (PR: 0.55; 95%CI: 0.35-0.89) (Table 2).

Discussion

ERICA is a crucial epidemiological study on the health of Brazilian adolescents. This selection evidenced that work is strongly associated with males and older adolescents. Work was more prevalent among public school students residing in rural areas and less educated mothers. It

Table 1. Prevalence and Prevalence Ratios (PR) of work in the last year in Brazilian adolescents aged 12 to 17 years, considering complex sampling, by sociodemographic variables, lifestyle and health-related variables. Brazil, 2013-2014 (n=37,815).

Variables	Prevalence % (95%CI)					P*
	Not working	Working up to 20 hours/week (1)	PR 1† (95%CI)	Working 21-40 hours/ week (2)	PR 2†† (95%CI)	
Total	82.5 (80.9 - 84.1)	15.2 (13.8 - 16.8)		1.0 (0.6 - 1.4)		
Sociodemographic						
Gender					<0.001	<0,001
Female	85.7 (84.6 - 86.7)	12.5 (11.5 - 13.6)	1	1.8 (1.3 - 2.4)	1	
Male	79.4 (76.6 - 81.9)	18.0 (15.5 - 20.8)	1.45 (1.25 - 1.68)	2.6 (2.0 - 3.5)	1.55 (1.18 - 2.03)	
Age					<0.001	<0,001
12-14 years	87.7 (85.9 - 89.4)	11.9 (10.2 - 13.8)	1	0.3 (0.2 - 0.5)	1	
15-17 years	78.0 (76.1 - 79.8)	18.2 (16.5 - 19.9)	1.59 (1.40 - 1.81)	3.8 (2.9 - 5.0)	11.9 (6.90 - 20.50)	
Maternal schooling					<0.001	<0,001
Up to incomplete elementary school	76.4 (71.0 - 81.1)	22.5 (17.8 - 28.1)	1.67 (1.33 - 2.11)	1.1 (0.5 - 2.1)	0.46 (0.23 - 0.91)	
Elementary school to incomplete high school	78.7 (75.6 - 81.4)	18.3 (15.4 - 21.7)	1.38 (1.17 - 1.62)	3.0 (2.3 - 3.9)	1.29 (0.86 - 1.95)	
High school to incomplete higher education	84.3 (82.6 - 85.8)	13.3 (12.0 - 14.7)	1	2.4 (1.7 - 3.5)	1	
School type					<0.001	<0,001
Public	80.2 (78.4 - 82.0)	17.2 (15.4 - 19.0)	1.98 (1.60 - 2.44)	2.6 (1.9 - 3.5)	3.27 (1.61 - 6.65)	
Private	90.4 (88.4 - 92.1)	8.8 (7.4 - 10.4)	1	0.9 (0.5 - 1.5)	1	
School geographic environment					<0.001	<0,001
Urban	83.2 (82.0 - 84.4)	14.5 (13.4 - 15.6)	1	2.3 (1.8 - 3.0)	1	
Rural	66.9 (60.5 - 72.8)	32.8 (26.7 - 39.6)	2.20 (1.76 - 2.74)	0.3 (0.5 - 1.3)	0.15 - (0.03 - 0.75)	
Region of Brazil					<0.001	<0,001
Northeast	88.8 (87.4 - 90.0)	10.2 (9.0 - 11.4)	1	1.1 (0.6 - 2.0)	1	
North	87.0 (85.9 - 88.1)	12.0 (11.1 - 13.0)	1.18 (1.03 - 1.36)	0.9 (0.6 - 1.4)	0.89 (0.43 - 1.81)	
Southeast	80.9 (77.9 - 83.5)	16.7 (14.1 - 19.6)	1.67 (1.37 - 2.04)	2.4 (1.6 - 3.8)	2.52 (1.21 - 5.25)	
South	80.2 (77.0 - 83.0)	16.2 (13.9 - 18.7)	1.65 (1.36 - 2.00)	3.7 (2.7 - 5.0)	3.68 (1.84 - 7.38)	
Midwest	77.7 (74.4 - 80.7)	20.1 (16.9 - 23.9)	2.01 (1.64 - 2.47)	2.1 (1.2 - 3.5)	2.36 (1.12 - 4.97)	
Lifestyle habits						
Sleep on working days					<0.001	<0,001
<6 hours	79.0 (76.3 - 81.5)	16.4 (14.0 - 19.2)	1.04 (0.83 - 1.32)	4.6 (3.1 - 6.8)	3.76 (2.40 - 5.89)	
≥6 hours and <8 hours	83.5 (81.8 - 85.0)	13.8 (12.4 - 15.3)	0.86 (0.70 - 1.06)	2.7 (1.9 - 3.9)	2.20 (1.40 - 3.47)	
≥8 hours	82.3 (80.9 - 84.1)	16.5 (13.7 - 19.6)	1	1.2 (0.9 - 1.6)	1	
Sleep on weekends					0.003	0,003
<8 hours	78.9 (75.9 - 81.6)	17.3 (14.6 - 20.5)	1.19 (1.00 - 1.40)	3.8 (1.6 - 5.4)	1.95 (1.25 - 3.05)	
≥8 hours	83.1 (81.4 - 84.6)	15.0 (13.4 - 16.6)	1	2.0 (1.5 - 2.7)	1	
Physical activity					<0.001	<0,001
Inactive (0 min/week)	85.0 (83.4 - 86.5)	12.4 (11.1 - 13.9)	1	2.6 (1.8 - 3.7)	1	
Insufficiently active (0-300 min/week)	85.0 (81.5 - 88.0)	12.8 (10.0 - 16.2)	1.02 (0.77 - 1.35)	2.2 (1.5 - 3.4)	0.86 (0.65 - 1.15)	
Active (≥300min/week)	79.6 (77.6 - 81.4)	18.5 (16.7 - 20.4)	1.48 (1.26 - 1.73)	2.0 (1.5 - 2.5)	0.78 (0.55 - 1.11)	
Tobacco use					0,04	0,04
Currently smoking	73.9 (66.2 - 80.3)	21.4 (16.0 - 28.0)	1.44 (1.07 - 1.93)	4.7 (1.6 - 13.0)	2.44 (0.85 - 7.05)	
Not currently smoking	82.7 (81.0 - 84.2)	15.1 (13. 6 - 16.8)	1	2.2 (1.7 - 2.8)	1	

it continues

Table 1. Prevalence and Prevalence Ratios (PR) of work in the last year in Brazilian adolescents aged 12 to 17 years, considering complex sampling, by sociodemographic variables, lifestyle and health-related variables. Brazil, 2013-2014 (n=37,815).

Variables	Prevalence % (95%CI)					P*
	Not working	Working up to 20 hours/week (1)	PR 1† (95%CI)	Working 21-40 hours/ week (2)	PR 2†† (95%CI)	
Alcohol use					<0.001	<0,001
Drinking	75.1 (71.3 - 78.6)	21.3 (17.9 - 25.2)	1.62 (1.38 - 1.90)	3.6 (2.6 - 4.8)	2.05 (1.51 - 2.77)	
Not drinking	84.8 (83.7 - 85.8)	13.4 (12.3 - 14.5)	1	1.9 (1.4 - 2.5)	1	
Health-related						
Common mental disorder					0.15	0,15
No	83.1 (81.2 - 84.9)	14.7 (12.9 - 16.6)	1	2.2 (1.6 - 3.0)	1	
Yes	81.2 (79.3 - 83.0)	16.6 (14.8 - 18.5)	1.12 (0.97 - 1.30)	2.2 (1.7 - 2.8)	0.99 (0.74 - 1.33)	
Nutritional status					0.003	0,003
Underweight	91.0 (85.9 - 94.4)	8.7 (5.3 - 13.9)	0.54 (0.33 - 0.87)	0.3 (0.2 - 0.7)	0.13 (0.06 - 0.29)	
Adequate	81.7 (80.0 - 83.2)	15.9 (14.4 - 17.6)	1	2.4 (1.8 - 3.1)	1	
Overweight	84.6 (82.0 - 86.8)	13.4 (11.3 - 15.7)	0.83 (0.73 - 0.96)	2.1 (1.3 - 3.2)	0.84 (0.59 - 1.19)	
Obese	83.2 (79.9 - 86.0)	15.1 (12.4 - 18.4)	0.94 (0.77 - 1.16)	1.7 (1.1 - 2.6)	0.69 (0.42 - 1.14)	
High blood pressure					0.06	0,06
No	82.5 (81.0 - 84.0)	16.1 (13.2 - 19.4)	1.05 (0.90 - 1.22)	1.3 (0.8 - 2.1)	0.52 (0.31 - 0.87)	
Yes	82.7 (79.4 - 85.5)	15.2 (13.7 - 16.7)	1	2.3 (1.8 - 3.0)	1	
High blood glucose					0.06	0,06
No	82.3 (80.7 - 83.9)	10.4 (7.8 - 13.8)	0.67 (0.49 - 0.92)	2.6 (1.2 - 5.6)	1.12 (0.51 - 2.45)	
Yes	87.0 (82.7 - 90.4)	15.5 (13.9 - 17.2)	1	2.2 (1.7 - 2.9)	1	
Metabolic Syndrome					0.23	0,23
No	82.5 (76.6 - 87.1)	15.2 (12.1 - 22.6)	1.07 (0.76 - 1.53)	0.8 (0.4 - 1.6)	0.33 (0.15 - 0.75)	
Yes	82.5 (80.8 - 84.0)	15.2 (13.7 - 16.9)	1	2.3 (1.7 - 3.0)	1	
Total Cholesterol					0.21	0,21
Adequate	81.7 (80.1 - 83.2)	15.7 (14.3 - 17.1)	1	2.6 (1.9 - 3.6)	1	
Borderline	83.3 (79.7 - 86.5)	14.9 (11.8 - 18.7)	0.95 (0.75 - 1.18)	1.8 (1.3 - 2.4)	0.69 (0.44 - 1.08)	
High	83.8 (81.7 - 85.8)	14.5 (12.5 - 16.7)	0.91 (0.79 - 1.05)	1.7 (1.1 - 2.5)	0.62 (0.43 - 0.89)	
HDL					0.71	0,71
Adequate	82.4 (80.0 - 84.5)	15.5 (13.4 - 17.9)	1	2.1 (1.5 - 2.9)	1	
Inadequate	82.8 (81.2 - 84.2)	14.9 (13.4 - 16.5)	0.96 (0.83 - 1.12)	2.3 (1.8 - 3.1)	1.11 (0.82 - 1.50)	
LDL					0.46	0,46
Adequate	82.1 (80.5 - 83.7)	15.5 (14.1 - 17.1)	1	2.4 (1.7 - 3.2)	1	
Borderline	83.6 (80.4 - 86.3)	14.6 (11.9 - 17.9)	0.94 (0.78 - 1.12)	1.8 (1.3 - 2.6)	0.76 (0.49 - 1.18)	
High	85.3 (80.8 - 88.8)	13.0 (9.9 - 17.0)	0.84 (0.63 - 1.11)	1.7 (0.8 - 3.8)	0.68 (0.31 - 1.48)	
Triglycerides					0.26	0,26
Adequate	82.0 (80.0 - 83.9)	15.6 (13.7 - 17.7)	1	2.4 (1.8 - 3.1)	1	
Borderline	84.9 (82.2 - 87.2)	13.6 (11.3 - 16.3)	0.86 (0.67 - 1.10)	1.5 (0.9 - 2.6)	0.62 (0.40 - 0.97)	
High	84.3 (81.4 - 86.2)	13.8 (11.4 - 16.6)	0.87 (0.70 - 1.09)	1.9 (1.0 - 3.5)	0.76 (0.39 - 1.47)	
Waist circumference					0.61	0,61
Adequate	82.5 (80.8 - 84.1)	15.2 (13.6 - 16.9)	1	2.3 (1.7 - 3.0)	1	
High	82.7 (80 - 85.0)	15.5 (13.2 - 18.2)	1.01 (0.86 - 1.20)	1.8 (1.3 - 2.6)	0.77 (0.51 - 1.17)	

* Pearson's chi-square test between the Work variable (3 categories) and the others. †PR 1: Prevalence ratio among those working up to 20 hours a week. ††PR 2: Prevalence ratio among those working 21 to 40 hours a week.

Source: Survey Data, 2013 and 2014.

has also been shown to interfere with daily sleep and was associated with risky adolescent behavior and alcohol consumption; however, it is less present among sedentary or underweight[9,10].

Children and adolescents living in developing countries commonly find themselves in an unfavorable economic situation and consequent social vulnerability, which leads to a greater need to enter the labor market to mainly contribute to family income or the domestic budget[31,32]. Often, family pressure on entering the job market falls on male adolescents, often in the age group that precedes the onset of adulthood[33]. This statement corroborates the data in this study. Cultural factors influence how child and youth work is viewed and even desirable. Evidence observed in the world trend points out that boys represent 52% of all working children in the age group of 12-14 years of age. The increase reaches up to 81%[8,11-14,34] in the age group of 15-17 years of age.

Low maternal schooling was found (PR=1.26; 1.08-1.47) in a representative portion of the sample. While fathers are responsible for the household's financial balance in many Brazilian homes, mothers are in charge of maintaining the family core in most of them as providers and incentives for their children, in their studies' continuity[35]. Many adolescents reconcile the study with early work, but the exclusive dedication to school activities is favorable to results that translate into a possibly more prosperous professional future[4,36]. Most of the time, earlier entry into the labor market is linked to dropping out of school, which systematically contributes to the increased wage, subcontracted, outsourced, and informal labor service sector[10].

Regarding demographic data, it is noteworthy that the Northeast had the highest proportion of young workers or those looking for a job in the last decade. It is still the region with the lowest income distribution, lowest GDP and HDI, and, consequently, the highest concentration of poverty[37]. However, our data showed a higher prevalence of adolescent workers in the Midwest, where both subsistence agriculture, complementary to livestock and extractivism,

Table 2. Multiple Poisson regression model: variables associated with work in Brazilian adolescents aged 12 to 17 years, considering complex sampling. Brazil, 2013-2014 (n=37,815).

Variables	Crude PR	95%CI	Adjusted PR*	95%CI
Group 1 - Sociodemographic				
Gender				
Female	1		1	
Male	1.43	(1.25 - 1.63)	1.34[a]	(1.17 - 1.53)
Age				
12-14 years	1		1	
15-17 years	1.60	(1.41 - 1.81)	1.68[a]	(1.45 - 1.94)
Maternal schooling				
Up to incomplete elementary school	1.47	(1.21 - 1.79)	1.26[a]	(1.08 - 1.47)
Elementary school to incomplete high school	1.36	(1.17 - 1.58)	1.08[a]	(0.98 - 1.20)
High school to incomplete higher education	1		1	
School type				
Public	2.09	(1.71 - 2.56)	1.63[a]	(1.34 - 1.99)
Private	1		1	
School geographic environment				
Urban	1		1	
Rural	2.07	(1.70 - 2.52)	1.9[a]	(1.52 - 2.38)
Region of Brazil				
Northeast	1		1	
North	1.14	(0.94 - 1.39)	1.20[a]	(1.04 - 1.38)
Midwest	1.75	(1.41 - 2.16)	1.81[a]	(1.55 - 2.12)
Southeast	1.56	(1.23 - 1.98)	1.57[a]	(1.34 - 1.84)
South	1.57	(1.25 - 1.97)	1.57[a]	(1.29 - 1.90)

it continues

Table 2. Multiple Poisson regression model: variables associated with work in Brazilian adolescents aged 12 to 17 years, considering complex sampling. Brazil, 2013-2014 (n=37,815).

Variables	Crude PR	95%CI	Adjusted PR*	95%CI
Group 2 - Lifestyle habits				
Physical activity				
Inactive (0 min/week)	1		1	
Insufficiently active (0-300 min/week)	1.02	(0.79 - 1.31)	1.03[a]	(0.86 - 1.24)
Active (≥300 min/week)	1.35	(1.18 - 1.54)	1.19[a]	(1.06 - 1.33)
Alcohol use				
Drinking	1.57	(1.35 - 1.82)	1.35[a]	(1.20 - 1.52)
Not drinking	1		1	
Tobacco use				
Currently smoking	1.61	(1.27 - 2.05)	1.14	(0.87 - 1.49)
Not currently smoking	1		1	
Sleep on weekends				
<8 hours	1.19	(1.05 - 1.33)	1.09	(0.96 - 1.24)
≥8 hours	1		1	
Group 3 - Health-related				
Nutritional status				
Underweight	0.51	(0.34 - 0.76)	0.56[a]	(0.35 - 0.89)
Adequate	1		1	
Overweight	0.83	(0.75 - 0.93)	0.99[a]	(0.86 - 1.13)
Obese	0.91	(0.76 - 1.78)	1.16[a]	(0.97 - 1.38)
Common mental disorder				
No	1		1	
Yes	1.11	(0.98 - 1.26)	1.11	(0.97 - 1.27)
LDL				
Adequate	1.14	(1.01 - 1.71)	1.13	(0.85 - 1.50)
Borderline	1.01	(0.88 - 1.58)	0.99	(0.74 - 1.32)
High	1		1	
Triglycerides				
Adequate	1.14	(0.94 - 1.39)	1.04	(0.86 - 1.27)
Borderline	1.01	(0.84 - 1.21)	1.00	(0.77 - 1.30)
High	1		1	

*Adjustment for all variables in the same group and with those significant variables ($p<0.05$) from the previous group(s). [a]Values of the variables in the final model (only with the statistically significant variables).

Source: Survey Data, 2013 and 2014.

and agribusiness, have been growing in the last two decades[38], also supported by much adolescent labor and rural dwellers.

A protective effect concerning body weight was identified in the group of adolescents working less than 20 weekly hours, similar to the study by Drake et al.[39]. When conceptualizing physical activity as any bodily movement produced by skeletal muscles resulting in energy expenditure[40], work can contribute to caloric expenditure, keep workers physically active, and is favorable to maintaining the weight of these people. However, this should not be considered a way of encouraging the early work of children and adolescents[4].

Regarding alcohol use, a risk behavior that often begins in childhood or adolescence is a severe public health problem. Despite the commercial prohibition guaranteed by law in Brazil, young people can easily access psychotropics[33,41,42]. This study found a positive association between adolescents working and consuming alcoholic beverages (PR=1.36; 1.04-1.31). A similar situation was found in a study by Souza et al.[33], in which alcohol intake among working students was 81.0%, and alcohol abuse was identified in 13.4%

of the sample (33). These data are alarming, as it is known that the earlier the consumption of alcohol and other psychotropics, the greater the likelihood of abuse and addiction[33,42].

Another risky behavior is the restricted number of daily sleep hours, as shown in our study. The results of this work corroborate the data by Felden et al.[43], who evidenced that adolescent workers were more likely to have a short sleep time compared to those who did not work. Adolescents studying in the morning shift must wake up early, affecting chronic sleep deprivation during the week and cumulative fatigue, causing changes in the sleep-wake cycle[9,36,43,44], which can lead to many organic disorders, such as cardiovascular disease, immunological deficits, cognitive and affective behavior disorders, and risk of obesity. It can also be a precursor to harmful habits, such as alcohol and tobacco use[45-48]. Due to all the possible consequences of early working hours, attention should be paid to the repercussions in adulthood arising from changes in the circadian rhythm of sleep and wakefulness.

The literature points to obesity as a significant risk factor for CVD onset, such as high blood pressure in adolescents[49,50], plus atherogenic eating habits, sedentary behavior, and inactivity[51]. No statistically significant results were found in the relationship between the health variables analyzed (high blood pressure, metabolic syndrome, and biochemical changes) and work activities. These findings may be related to the maintenance of body weight induced by physical activity reported by participants.

One of the limitations of this study is that only young people who studied in the morning participated in the blood collection, justified by the need for fasting. Another limitation may be the use of a questionnaire to measure lifestyle habits in adolescents. However, a similar strategy was used by another sizeable national study (PeNSE)[52]. Although the cross-sectional study preserves limits regarding the inability to establish a cause-and-effect relationship, it proved robust for raising hypotheses about work in Brazilian adolescents. The sample size and the complex sampling process conferred an excellent capacity for the external validity of the findings.

Thus, the study showed that work among Brazilian adolescents, especially those studying in the morning shift, is still strongly linked to social issues, such as public-school students with low maternal education living in the rural area. While work was associated with alcohol consumption in adolescence, a relationship was identified between protection for low weight and a sedentary lifestyle. Adolescent work was not associated with cardiometabolic markers.

Collaborations

EB Leon: project design, data collection in the State of Amazonas, writing of the paper, and final approval of the version to be published. BM Tavares, TG Fernandes, FM Fischer, and BIL Barroso: project design, writing of the paper, and final approval of the version to be published. RL Gonçalves, FFS Franco, and MBCA Souza: design and writing of the paper and final approval of the version to be published.

Funding

Ministério da Saúde (Departamento de Ciências e Tecnologia), Ministério da Ciência, Tecnologia e Inovação, Financiadora de Estudos e Projetos (FINEP) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

References

1. Brasil. Lei nº 8.069, de 13 de julho de 1990. Dispõe sobre o Estatuto da Criança e do Adolescente e dá outras providências. *Diário Oficial da União* 1990; 16 jul.
2. Guerreiro MD, Abrantes P. Como tornar-se adulto: processos de transição na modernidade avançada. *Rev Bras Cien Soc* 2005; 20(58):157-175.
3. Oliveira BRG, Robazzi MLCC. O trabalho na vida dos adolescentes: alguns fatores determinantes para o trabalho precoce. *Rev Lat Am Enferm* 2001; 9(3):83-89.
4. Organização Internacional do Trabalho (OIT). *Emprego Juvenil: Síntese de Indicadores Sociais 2016*. Brasília: Nações Unidas, IBGE; 2021.
5. Rohlman DS, Nuwayhid I, Ismail A, Saddik B. Using epidemiology and neurotoxicology to reduce risks to young workers. *Neurotoxicology* 2012; 33(4):817-822.
6. Esin MN, Bulduk S, Ince H. Workrelated risks and health problems of working children in urban Istanbul, Turkey. *J Occup Health* 2005; 47(5):431-436.
7. Facchini LA, Fassa AG, Dall'Agnol M, Maia MFS. Trabalho infantil em Pelotas: perfil ocupacional e contribuição à economia. *Cien Saude Colet* 2003; 8(4):953-961.
8. Benvegnú LA, Fassa AG, Facchini LA, Wegman DH, Dall'Agnol MM. Work and behavioural problems in children and adolescents. *Int J Epidemiol* 2005; 34(6):1417-1424.
9. GBD 2015 Obesity Collaborators, Afshin A, Forouzanfar MH, Reitsma MB, Sur P, Estep K, Lee A, Marczak L, Mokdad AH, Moradi-Lakeh M, Naghavi M, Salama JS, Vos T, Abate KH, Abbafati C, Ahmed MB, Al-Aly Z, Alkerwi A, Al-Raddadi R, Amare AT, Amberbir A, Amegah AK, Amini E, Amrock SM, Anjana RM, Ärnlöv J, Asayesh H, Banerjee A, Barac A, Baye E, Bennett DA, Beyene AS, Biadgilign S, Biryukov S, Bjertness E, Boneya DJ, Campos-Nonato I, Carrero JJ, Cecilio P, Cercy K, Ciobanu LG, Cornaby L, Damtew SA, Dandona L, Dandona R, Dharmaratne SD, Duncan BB, Eshrati B, Esteghamati A, Feigin VL, Fernandes JC, Fürst T, Gebrehiwot TT, Gold A, Gona PN, Goto A, Habtewold TD, Hadush KT, Hafezi-Nejad N, Hay SI, Horino M, Islami F, Kamal R, Kasaeian A, Katikireddi SV, Kengne AP, Kesavachandran CN, Khader YS, Khang Y-H, Khubchandani J, Kim D, Kim YJ, Kinfu Y, Kosen S, Ku T, Defo BK, Kumar GA, Larson HJ, Leinsalu M, Liang X, Lim SS, Liu P, Lopez AD, Lozano R, Majeed A, Malekzadeh R, Malta DC, Mazidi M, McAlinden C, McGarvey ST, Mengistu DT, Mensah GA, Mensink GBM, Mezgebe HB, Mirrakhimov EM, Mueller UO, Noubiap JJ, Obermeyer CM, Ogbo FA, Owolabi MO, Patton GC, Pourmalek F, Qorbani M, Rafay A, Rai RK, Ranabhat CL, Reinig N, Safiri S, Salomon JA, Sanabria JR, Santos IS, Sartorius B, Sawhney M, Schmidhuber J, Schutte AE, Schmidt MI, Sepanlou SG, Shamsizadeh M, Sheikhbahaei S, Shin M-J, Shiri R, Shiue I, Roba HS, Silva DAS, Silverberg JI, Singh JA, Stranges S, Swaminathan S, Tabarés-Seisdedos R, Tadese F, Tedla BA, Tegegne BS, Terkawi AS, Thakur JS, Tonelli M, Topor-Madry R, Tyrovolas S, Ukwaja KN, Uthman OA, Vaezghasemi M, Vasankari T, Vlassov VV, Vollset SE, Weiderpass E, Werdecker A, Wesana J, Westerman R, Yano Y, Yonemoto N, Yonga G, Zaidi Z, Zenebe ZM, Zipkin B, Murray CJL. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N Engl J Med* 2017; 377(1):13-27.

10. Romanzini M, Reichert FF, Lopes AS, Petroski ÉL, Farias Júnior JC. Prevalência de fatores de risco cardiovascular em adolescentes. *Cad Saude Publica* 2008; 24(11):2573-2581.
11. Hemmingsson T, Lundberg I. Is the association between low job control and coronary heart disease confounded by risk factors measured in childhood and adolescence among Swedish males 40-53 years of age? *Int J Epidemiol* 2006; 35(3):616-622.
12. Ribeiro RQC, Lotufo PA, Lamounier JA, Oliveira RG, Soares JF, Botter DA. Fatores adicionais de risco cardiovascular associados ao excesso de peso em crianças e adolescentes. O estudo do coração de Belo Horizonte. *Arq Bras Cardiol* 2006; 86(6):408-418.
13. Schnall P, Belkić K, Landsbergis P, Baker D. Why the workplace and cardiovascular disease? *Occup Med State Art Rev* 2000; 15(1):1-6.
14. Marmot M, Theorell T, Siegrist J. Work and coronary heart disease. In: Stansfeld SA, Marmot MG. *Stress and the heart: Psychosocial pathways to coronary heart disease*. BMJ Books; 2002. p. 50-71.
15. Vasconcellos MTL, Silva PLN, Szklo M, Kuschnir MCC, Klein CH, Abreu GDA, Barufaldi LA, Bloch KV. Desenho da amostra do Estudo do Risco Cardiovascular em Adolescentes (ERICA). *Cad Saude Publica* 2015; 31(5):1-10.
16. Bloch KV, Szklo M, Kuschnir MCC, Abreu GA, Barufaldi LA, Klein CH, Vasconcelos MTL, Veiga GV, Figueiredo VC, Dias A, Moraes AJP, Souza ALL, Oliveira AMA, D'Argord Schaan B, Tavares BM, Oliveira CL, Cunha CF, Giannini DT, Belfort DR, Ribas DLB, Santos EL, Leon EB, Fujimori E, Oliveira ERA, Magliano ES, Vasconcelos FAG, Azevedo GD, Brunken GS, Dias GM, Correa Filho HR, Monteiro MI, Guimarães ICB, Faria Neto JR, Oliveira JS, Carvalho KMB, Gonçalves LGO, Santos MM, Muniz PT, Jardim PCBV, Ferreira PAM, Montenegro Jr RM, Gurgel RQ, Vianna RP, Vasconcelos SM, Matta SS, Martins SMS, Goldberg TBL, Silva TLN. The study of cardiovascular risk in adolescents - ERICA: Rationale, design and sample characteristics of a national survey examining cardiovascular risk factor profile in Brazilian adolescents. *BMC Public Health* 2015; 15:94.
17. Sallis JF, Strikmiller PK, Harsha DW, Feldman HA, Ehlinger S, Stone EJ, Williston J, Woods S. Validation of interviewer- and self-administered physical activity checklists for fifth grade students. *Med Sci Sports Exerc* 1996; 28(7):840-851.
18. Farias Júnior JC, Lopes AS, Mota J, Santos MP, Ribeiro JC, Hallal PC. Validade e reprodutibilidade de um questionário para medida de atividade física em adolescentes: uma adaptação do Self-Administered Physical Activity Checklist. *Rev Bras Epidemiol* 2012; 15(1):198-210.
19. World Health Organisation (WHO). *Global recommendations on physical activity for health*. Geneva: WHO; 2010.
20. Cureau FV, Silva TLN, Bloch KV, Fujimori E, Belfort DR, Carvalho KMB, Leon EB, Vasconcellos MTL, Ekelund U. ERICA: leisure-time physical inactivity in Brazilian adolescents. *Rev Saude Publica* 2016; 50(Supl. 1):4s.
21. Figueiredo VC, Szklo AS, Costa LC, Kuschnir MCC, Silva TLN, Bloch KV, Szklo M. ERICA: prevalência de tabagismo em adolescentes brasileiros. *Rev Saude Publica* 2016; 50(Supl. 1):12s.
22. Warren CW, Jones NR, Peruga A, Chauvin J, Baptiste JP, Silva VC, el Awa F, Tsouros A, Rahman K, Fishburn B, Bettcher DW, Asma S, Centers for Disease Control and Prevention (CDC). Global youth tobacco surveillance, 2000-2007. *MMWR Surveill Summ* 2008; 57(1):1-28.
23. Coutinho ESF, França-Santos D, Magliano ES, Bloch KV, Barufaldi LA, Cunha CF, Vasconcellos MTL, Szklo M. ERICA: padrões de consumo de bebidas alcoólicas em adolescentes brasileiros. *Rev Saude Publica* 2016; 50(Supl. 1):8s.
24. Abreu GA, Silva TLN, Teixeira LR, Bloch KV. Análise da qualidade da informação autorreferida sobre duração do sono de escolares do Estudo de Riscos Cardiovasculares em Adolescentes (ERICA). *Cad Saude Publica* 2019; 35(10):e00152918.
25. Bloch KV, Klein CH, Szklo M, Kuschnir MCC, Abreu GA, Barufaldi LA, Veiga GV, Schaan B, Silva TLN, Vasconcellos MTL, Moraes AJP, Borges AL, Oliveira AMA, Tavares BM, Oliveira CL, Cunha CF, Giannini DT, Belfort DR, Santos EL, Leon EB, Fujimori E, Oliveira ERA, Magliano ES, Vasconcelos FAG, Azevedo GD, Brunken GS, Guimarães ICB, Faria Neto JR, Oliveira JS, Carvalho KMB, Gonçalves LGO, Monteiro MI, Santos MM, Jardim PCBV, Ferreira PAM, Montenegro Jr RM, Gurgel RQ, Vianna RP, Vasconcelos SM, Goldberg TBL. ERICA: prevalences of hypertension and obesity in Brazilian adolescents. *Rev Saude Publica* 2016; 50(Supl. 1):9s.
26. Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Heal Organ* 2007; 85(9):660-667.
27. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. *Pediatrics* 2004; 114(2):555-576.
28. Cureau FV, Bloch KV, Henz A, Schaan CW, Klein CH, Oliveira CL, Giannini DT, Leon EB, Abreu GA, Telo GH, Dias GM, Carvalho KMB, Barufaldi LA, Kuschnir MCC, Szklo M, Montenegro Jr R, Silva TLN, Ekelund U, Schaan BD. Challenges for conducting blood collection and biochemical analysis in a large multicenter school-based study with adolescents: lessons from ERICA in Brazil. *Cad Saude Publica* 2017; 33(4):e00122816.
29. Faria-Neto JR, Bento VFR, Baena CP, Olandoski M, Gonçalves LGO, Abreu GA, Kuschnir CC, Bloch KV. ERICA: prevalência de dislipidemia em adolescentes brasileiros. *Rev Saude Publica* 2016; 50(Supl. 1):10s.

30. Kuschnir MCC, Bloch KV, Szklo M, Klein CH, Barufaldi LA, Abreu GA, Schaan B, Veiga GV, Silva TLN, Vasconcellos MTL, Moraes AJP, Borges AL, Oliveira AMA, Tavares BM, Oliveira CL, Cunha CF, Giannini DT, Belfort DR, Santos EL, Leon EB, Fujimori E, Oliveira ERA, Magliano ES, Vasconcelos FAG, Azevedo GD, Brunken GS, Guimarães ICB, Faria Neto JR, Oliveira JS, Carvalho KMB, Gonçalves LGO, Monteiro MI, Santos MM, Muniz PT, Jardim PCBV, Ferreira PAM, Montenegro Jr RM, Gurgel RQ, Vianna RP, Vasconcelos SM, Martins SMS, Goldberg TBL. ERICA: prevalence of metabolic syndrome in Brazilian adolescents. *Rev Saude Publica* 2016; 50(Supl. 1):11s.
31. Santana VS, Itaparica MS. Social contextual factors contributing to child and adolescent labor: an ecological analysis. *Rev Saude Publica* 2011; 45(4):676-684.
32. Gonçalves H, Menezes AMB, Bacchieri G, Dilélio AS, Bocanegra CAD, Castilhos ED, Gallo EAG, Fiori EJFNS, Meucci RD, Araújo CLP, Carvalho S. Perfil de trabalho urbano de adolescentes de 14-15 anos: um estudo populacional no Sul do Brasil. *Cien Saude Colet* 2012; 17(5):1267-1274.
33. Souza DPO, Areco KN, Silveira Filho DX. Álcool e alcoolismo entre adolescentes da rede estadual de ensino de Cuiabá, Mato Grosso TT. *Rev Saude Publica* 2005; 39(4):585-592.
34. Standing G. The international labour organization. *New Polit Econ* 2010; 15(2):307-318.
35. Boo FL, Mateus MC, Duryea S. Analysis of socioeconomic gradients in the development of children aged 0-3 years in Fortaleza, Northeastern Brazil. *Rev Saude Publica* 2018; 52:84.
36. Teixeira LR, Fischer FM, Nagai R, Turte SL. Teen at Work: The Burden of a Double Shift on Daily Activities. *Chronobiol Int* 2004; 21(6):845-858.
37. Carvalho IMM. Algumas lições do Programa de Erradicação do Trabalho Infantil. *São Paulo Perspect* 2004; 18(4):50-61.
38. Bernardes JA. Novas fronteiras do capital no Cerrado: dinâmica e contradições da expansão do agronegócio na Região Centro-Oeste, Brasil. *Scripta Nova* 2015; 21(507):741-798.
39. Drake KM, Beach ML, Longacre MR, MacKenzie T, Titus LJ, Rundle AG, Dalton MA. Influence of Sports, Physical Education, and Active Commuting to School on Adolescent Weight Status. *Pediatrics* 2012; 130(2):e296-304.
40. Wickel EE, Eisenmann JC. Contribution of youth sport to total daily physical activity among 6- to 12-yr -old boys. *Med Sci Sports Exerc* 2007; 39(9):1493-1500.
41. Sirimarco PL. Fatores associados ao uso pesado de álcool entre estudantes das capitais brasileiras. *Rev Saude Publica* 2010; 44(2):267-273.
42. Romano M. Pesquisa de compra de bebidas alcoólicas por adolescentes em duas cidades do estado de São Paulo. *Rev Saude Publica* 2007; 41(4):495-501.
43. Felden EPG, Barbosa DG, Ferrari GJ, Santos MO, Pelegrini A, Silva DAS. Factors associated with sleep duration in Brazilian high school students. *Chronobiol Int* 2017; 34(6):773-781.
44. Fischer FM, Wey D, Valente D, Luz AA, Pinheiro F, Fonseca BC, Silva-Costa A, Moreno CR, Menna-Barreto L, Teixeira LR. Sleep patterns and sleepiness among young students: a longitudinal study before and after admission as trainees and apprentices. *Chronobiol Int* 2015; 32(4):478-485.
45. Ferrie JE, Shipley MJ, Cappuccio FP, Brunner E, Miller MA, Kumari M, Marmot MG. A prospective study of change in sleep duration: Associations with mortality in the Whitehall II cohort. *Sleep* 2007; 30(12):1659-1666.
46. Carskadon MA, Acebo C, Jenni OG. Regulation of adolescent sleep: Implications for behavior. *Ann N Y Acad Sci* 2004; 1021:276-291.
47. Kenney SR, LaBrie JW, Hummer JF, Pham AT. Global sleep quality as a moderator of alcohol consumption and consequences in college students. *Addict Behav* 2012; 37(4):507-512.
48. Telzer EH, Fuligni AJ, Lieberman MD, Galván A. The effects of poor quality sleep on brain function and risk taking in adolescence. *Neuroimage* 2013; 71:275-283.
49. McCrindle BW. Assessment and management of hypertension in children and adolescents. *Nat Rev Cardiol* 2010; 7(3):155-163.
50. Cao ZQ, Zhu L, Zhang T, Wu L, Wang Y. Blood pressure and obesity among adolescents: A school-based population study in China. *Am J Hypertens* 2012; 25(5):576-582.
51. Camhi SM, Katzmarzyk PT. Tracking of cardiometabolic risk factor clustering from childhood to adulthood. *Int J Pediatr Obes* 2010; 5(2):122-129.
52. Penna G. Pesquisa Nacional de Saúde do Escolar (PeNSE). *Cien Saude Colet* 2010; 15(Supl. 2):3006.

Article submitted 17/02/2020
Approved 19/04/2021
Final version submitted 21/04/2021

Chief editors: Romeu Gomes, Antônio Augusto Moura da Silva