

The COVID-19 Pandemic and changes in adult Brazilian lifestyles: a cross-sectional study, 2020

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Abstract

Objective: To describe lifestyle changes with regard to consumption of tobacco and alcohol, food intake and physical activity, in the period of social restriction resulting from the COVID-19 pandemic. **Methods:** This is a cross-sectional study conducted in Brazil with data from the ConVid online health behavior survey. The data were collected via an online questionnaire answered by the survey participants. Post-stratification procedures were used to calculate prevalence rates and 95% confidence intervals. **Results:** 45,161 individuals aged 18 years or more participated. During the period of social restriction participants reported a decrease in practicing physical activity and an increase in time spent using computers or tablets or watching TV, intake of ultra-processed foods, number of cigarettes smoked and alcoholic beverage consumption. Differences were observed according to sex and age group. **Conclusion:** The results indicate a worsening of lifestyles and an increase in health risk behaviors.

Keywords: Quarantine; Coronavirus Infections; Risk Factors; Life Style; Cross-Sectional Studies.

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Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic was recognized by the World Health Organization (WHO) on March 11th 2020.¹ In Brazil, following the first case confirmed on February 26th, a further 374,898 cases and 23,485 deaths were confirmed as at June 1st.²

An important epidemiological question relates to the highly infectious nature of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the etiological agent of COVID-19, the effective reproduction number of which can vary between 1.6 and 4.1.³⁻⁵ The highly infectious nature of SARS-CoV-2 and the absence of a vaccine against this virus result in an exponential increase in the number of cases.³⁻⁶

With regard to lifestyles, social restriction can lead to an important reduction in levels of moderate to vigorous physical activity, as well as leading to increase in time spent on sedentary behaviors.

Given the inexistence of specific COVID-19 prevention or treatment measures, as well as its rapid rate of transmission and contamination, WHO recommended governments to adopt non-pharmaceutical interventions (NPI), which include individual measures (hand washing, use of masks and social restriction), environmental measures (routine cleaning of areas and surfaces) and community measures (restriction or prohibition of schools and universities being open, community gathering places, public transport, as well as other places where people may gather).^{1,6} Among all these measures, we highlight the social restriction.

In Brazil, the states and municipalities adopted diverse measures, such as closure of schools and unessential commercial services. Workers were advised to work from home, some municipalities and states closed their city limits and borders. Some local public authorities decreed lockdown, with punishment for establishments and individuals who did not obey these norms.^{7,8} Social restriction has been the measure most publicized by authorities and is the most effective measure for avoiding the spread of the disease and for flattening the coronavirus transmission curve. As a general rule, the clinical and behavioral repercussion of this obligation

implies changes to lifestyles and may affect people's mental health.⁹⁻¹⁰

With regard to lifestyles, social restriction can lead to an important reduction in levels of moderate to vigorous physical activity, as well as leading to an increase in time spent on sedentary behaviors.^{11,12} In the United States of America (USA), an increase in watching television (TV) and using the internet has been found among adults during the pandemic.¹³ Similar results have been found in Italy and Spain, both with regard to participation in live transmissions on social media, and with regard to an increase in installing TV program applications.¹⁴

Another concern relates to changes in eating habits. At the beginning of the epidemic in the USA there was an increase in supermarket purchases and home stocking of ultra-processed and high energy density foods, such as potato fries, popcorn, chocolate and ice cream.¹⁵ Moreover, studies point to increased alcohol consumption,¹⁰ both on its own and in association with tobacco use, during the quarantine period.¹²

Successful adoption of social restriction as a Public Health measure provides evidence-based benefits for reducing the COVID-19 transmission rate; however, negative effects associated with social restriction may have medium and long-term health consequences. As such, Public Health actions are also expected to have the capacity to minimize the adverse effects of prolonged social restriction.

The objective of this study was to describe lifestyle changes with regard to consumption of tobacco and alcohol, food intake and physical activity, in the period of social restriction intended to prevent and control the COVID-19 pandemic.

Methods

This is a cross-sectional study conducted in Brazil using data from the online health survey known as the 'ConVid Behavior Survey'. The ConVid health survey is conducted by the Oswaldo Cruz Institute Foundation (Fiocruz) in partnership with the Federal University of Minas Gerais (UFMG) and the Campinas State University (Unicamp).

Anyone aged 18 years old or over, resident in the Brazilian territory during the COVID-19 pandemic was eligible to take part in this study.

Participants were invited by means of a chain sampling procedure.¹⁵ In the first stage the researchers

responsible for this study chose 200 researchers from different Brazilian states. Each researcher selected 20 people from their social network, totaling around 500 people. The people chosen in the first stage were referred to as influencers or 'seeds', because they triggered the network of invited participants. After answering the questionnaire, the 'seeds' formed the first wave of the recruitment chain: they sent the survey link to at least 12 people forming part of their social networks, according to stratification by sex, age group (years: 18-39; 40-59; 60 or over) and level of schooling (incomplete high school education or less; complete high school education or above), i.e. they invited at least three people from each of the 12 strata. The people invited by the 'seeds' formed the second wave of the recruitment chain. Each person from the second wave was asked to invite at least a further three people from their social networks, by means of the message at the end of the questionnaire:

Be part of the ConVid Network and share this survey with three or more invited acquaintances from your social network. You can do this by clicking here or copying and sending our link to them: <https://convid.fiocruz.br>

As the process unfolded, the network of invited people increased rapidly. The sociodemographic variables studied were 'sex' (female; male) and 'age group' (years: 18-29; 30-39; 40-49; 50-59; 60 or over).

Increase in the number of cigarettes smoked was assessed by the following questions:

Do you smoke?

If YES,

a) Before the pandemic, on average, how many cigarettes a day did you smoke?

b) During the pandemic, on average, how many cigarettes a day do you smoke now?

The answer options for the last two questions were: "I didn't smoke cigarettes, just other products"; "Less than 1 a day"; "1 to 9 cigarettes"; "10 to 19 cigarettes"; "20 to 29 cigarettes"; "30 to 39 cigarettes"; "40 or more cigarettes". To assess the quantity of cigarettes before (time 1 or t1) and during a pandemic (time 2 or t2) the midpoint of the response category was used and the difference between the two moments (t2 - t1). We consider an increase in the cigarettes smoked when the difference between t2 and t1 was positive.

Increased consumption of alcoholic beverage during the pandemic was assessed by the question:

During the pandemic:

a) I've continued drinking with the same frequency

b) I'm drinking more than I used to

c) I'm drinking less than I used to

d) I had stopped drinking, but I've started drinking again

Increased consumption of alcoholic beverage was considered to be when individuals reported options 'b' and 'd'.

Indication of consumption of certain food items was used in order to assess eating habits:

a) Before the pandemic how many days a week did you usually eat any of the following foods?

b) During the pandemic, how frequently do you eat these foods now?

The following food options were available for both questions: vegetables (greens or vegetables); fruit; beans; frozen pizza or frozen lasagna or other ready-to-eat frozen food; bags of savory snacks; chocolate, sweet biscuits, pieces of tart. The answer alternatives for each option were: 5 days or more; 2 to 4 days; one day or less. In the case of healthy food (greens or vegetables, fruit and beans), regular consumption was considered to be consumption 5 days a week or more.¹⁶ In the case of unhealthy food (frozen pizza or frozen lasagna or other ready-to-eat frozen food, bags of savory snacks, chocolate, sweet biscuits, pieces of tart), inadequate consumption was considered to be consumption 2 or more days a week, given that consumption of any amount of these foods is not recommended.¹⁷ This would be the answer option with the lowest number of days available on the questionnaire.

Practicing physical activity was assessed by means of the following questions:

a) Before the coronavirus pandemic, how many days a week did you practice some kind of physical activity or sport? (physiotherapy does not count)

b) How long did this activity last for?

c) During the pandemic, how many days a week did/do you practice some kind of physical activity or sport?

d) During the pandemic, how long does/did this activity last for?

Individuals who reported at least 150 minutes of physical activity a week were considered to be sufficiently active.

Sedentary behavior was assessed according to time spent watching TV and using a computer/tablet.

The following questions were asked about TV:

- a) *Before the pandemic, how many hours a day did you watch television?*
- b) *During the pandemic, how many hours a day do/did you watch television?*

And with regard to computers/tablets:

- a) *Before the pandemic, how many hours a day did you use a computer or a tablet?*
- b) *During the pandemic, how many hours a day do you use a computer or a tablet?*

The answer options for the 'TV time' variable were: did not watch TV; less than 1 hour; between 1 hour and less than 2 hours; between 2 hours and less than 3 hours; between 3 hours and less than 4 hours; between 4 hours and less than 5 hours; between 5 hours and less than 6 hours; 6 hours or more. TV time was calculated considering the average point of the category. For the variable time spent using a computer/tablet the answer was open and the participant indicated the number of hours or 0 if did not use a computer/tablet.

The data were collected via web. Participants answered the questionnaire by cell phone or computer with internet access, between April 24th and May 24th 2020. The instrument was built using the RedCap (Research Electronic Data Capture) application, a platform for research data collection, storing, management and dissemination. The information was collected and stored on the server of the Fiocruz Institute of Scientific and Technological Communication and Information (ICICT/Fiocruz).

Prevalence and 95% confidence intervals (95%CI) were calculated for the 'practicing physical activity', 'eating habits', 'changes in tobacco and alcohol use' qualitative variables; while averages and 95%CIs were calculated for the 'screen time' quantitative variable. All the analyses were performed for the total sample population, by sex and age group. Significant differences were identified by non-overlapping 95%CI data of the prevalence rates in question. As the sample was not probabilistic, post-stratification procedures were used for the statistical analysis of the data.¹⁸ This technique corrects under or overrepresentation of population segments and has been used frequently in household surveys, such as the Continuous National Household Sample Survey (*PNAD Contínua*), to fit sample totals to population projections in the domains in which data are publicized as well as those of the Non-Communicable Disease Risk and Protective Factors Surveillance Telephone Survey (VIGITEL), with

the purpose of compensating for low landline telephone coverage in some of the country's state capitals. In this study the sample was calibrated using data from the *PNAD Contínua 2019* survey, conducted by the Brazilian Institute of Geography and Statistics (IBGE), with the aim of obtaining the same distribution by federative unit, sex, age group, race/skin color and level of schooling.

The information was processed using Stata version 14, using the survey module, which takes post-stratification weighting into consideration.

Participants filled in a Free and Informed Consent form. Confidentiality of all answers was guaranteed and participants were not identified in any way. The study was approved by the National Research Ethics Committee (CONEP)/National Health Council (CNS): Opinion No. 3.980.277, issued on April 7th 2020.

Results

In all, 47,184 people agreed to take part in the study and began to answer the questionnaire. However, 2,023 (4.3%) of these questionnaires were excluded because the information needed to calibrate the data had not been filled in, namely: federative unit, sex, age, race/skin color or schooling. The final sample was comprised of 45,161 individuals, 53.6% of whom were female. With regard to age group, 24.7% of the sample studied were between 18 and 29 years old, 21.0% between 30 and 39, 18.1% between 40 and 49, 15.9% between 50 and 59, and 20.3% were aged 60 or over. In relation to schooling, the majority of participants had complete high school education (72.4%), 11.1% had incomplete elementary education and 16.5% reported having complete higher education or above (Supplementary Table).

Of the total sample population, 12.0% (95%CI 11.1;12.9) were smokers, with higher prevalence among men (13.8% – 95%CI 12.3;15.5). With regard to age group, smoking was more prevalent among young adults in the 18-29 age group (8.7% – 95%CI 7.3;10.4). In relation to tobacco smoking, 34% of smokers reported having increased cigarette consumption during the pandemic: an increase of 10 cigarettes per day was found for 22.5% (95%CI 19.6;25.7), and an increase of 20 cigarettes per day for 5.1% (95%CI 3.4;7.7) of the participants. When stratifying the sample by sex, percentage increase of 10 cigarettes per day was greater among females (28.9% – 95%CI 24.7;33.6), when compared to males (16.8% – 95%CI 13.3;21.0). An increase of 5 cigarettes per day was more prevalent among young

Table 1 – Prevalence of smoking habit and change in number of cigarettes consumed per day, during the COVID-19 pandemic, by sex and age group, ConVid Behavior Survey, Brazil, 2020

Variables	Current smoker	Change in number of cigarettes consumed per day				
		Reduced	Remained the same	Increase of 5 cigarettes or less	Increase of around 10 cigarettes	Increase of 20 cigarettes or more
		% (95%CI) ^a	% (95%CI) ^a	% (95%CI) ^a	% (95%CI) ^a	% (95%CI) ^a
Total	12.0 (11.1;12.9)	12.1 (9.7;14.9)	53.9 (50.0;57.8)	6.4 (4.3;9.4)	22.5 (19.6;25.7)	5.1 (3.4;7.7)
Sex						
Male	13.8 (12.3;15.5)	11.9 (8.6;16.3)	57.9 (51.8;63.8)	8.4 (4.9;14.1)	16.8 (13.3;21.0)	5.0 (2.7;8.8)
Female	10.4 (9.5;11.4)	12.3 (9.2;16.0)	49.4 (44.6;54.1)	4.1 (2.9;5.7)	28.9 (24.7;33.6)	5.3 (2.9;9.54)
Age group (years)						
18-29	8.7 (7.3;10.4)	13.7 (9.6;19.2)	50.2 (40.7;59.6)	15.7 (8.2;28.0)	17.0 (12.0;23.5)	3.4 (1.8;6.2)
30-39	13.1 (11.1;15.5)	12.7 (7.3;21.1)	49.3 (40.7;57.9)	6.6 (3.4;12.5)	21.6 (16.0;28.6)	9.8 (4.3;20.6)
40-49	12.5 (10.5;14.8)	9.3 (4.9;17.0)	57.7 (48.6;66.3)	7.1 (3.4;14.4)	20.9 (15.0;28.4)	5.0 (2.4;10.0)
50-59	14.1 (12.3;16.3)	13.9 (9.0;20.9)	56.6 (49.1;63.7)	1.1 (0.6;1.93)	23.5 (18.3;29.5)	4.9 (2.5;9.3)
≥60	12.7 (10.7;15.0)	10.7 (6.8;16.4)	56.3 (47.6;57.8)	2.6 (0.6;1.93)	28.6 (21.1;37.3)	1.8 (0.8;4.4)

a) 95%CI: 95% confidence interval.

adults aged 18-29 (15.7% – 95%CI 8.2;28.0), compared to individuals aged 50 and over while an increase of 10 cigarettes and more than 20 cigarettes a day was similar in all age groups (Table 1).

Increased alcoholic beverage consumption among the adult population during the period of social restriction was reported by 17.6% (95%CI 16.4;18.9), with no differences between sexes. Highest prevalence of alcohol consumption was found among people aged 30-39 (24.6% – 95%CI 21.2;28.3), followed by those aged 18-

29; lowest prevalence of alcohol consumption was found among the elderly (11.2% – 95%CI 8.8;14.2) (Table 2).

Frequency of healthy food consumption decreased during the pandemic. The greatest decrease was found in regular consumption of greens and vegetables, falling from 37.3% (95%CI 35.9;38.6) to 33.0% (95%CI 31.7;34.3). There were no differences in fruit and bean consumption. Among males there were also no differences in healthy food consumption; while frequency of consumption of greens and vegetables decreased

Table 2 – Increase in alcoholic beverage intake during the COVID-19 pandemic, by sex and age group, ConVid Behavior Survey, Brazil, 2020

Variables	Higher alcoholic beverage intake during the pandemic
	% (95%CI) ^a
Total	17.6 (16.4;18.9)
Sex	
Male	18.1 (16.0;20.4)
Female	17.1 (15.9;18.5)
Age group (years)	
18-29	18.6 (16.4;21.0)
30-39	24.6 (21.2;28.3)
40-49	16.9 (14.3;19.9)
50-59	15.2 (12.9;17.7)
≥60	11.2 (8.8;14.2)

a) 95%CI: 95% confidence interval.

Table 3 – Consumption of healthy and unhealthy food before and during the COVID-19 pandemic, by sex and age group, ConVid Behavior Survey, Brazil, 2020

Variables	Before the pandemic	During the pandemic
	% (95%CI) ^a	% (95%CI) ^a
Total		
Regular consumption of greens and vegetables	37.3 (35.9;38.6)	33.0 (31.7;34.3)
Regular consumption of fruit	32.8 (31.5;34.2)	31.9 (30.6;33.3)
Regular consumption of beans	43.3 (41.8;44.7)	40.9 (39.4;42.3)
Frozen food more than 2 days	10.0 (8.9;11.2)	14.6 (13.5;15.9)
Savory snacks more than 2 days	9.5 (8.6;10.5)	13.2 (12.2;14.3)
Chocolate/sweet biscuits/pieces of tart more than two days	41.3 (39.8;42.7)	47.1 (45.6;48.6)
Male		
Regular consumption of greens and vegetables	33.3 (31.1;35.6)	28.6 (26.5;38.3)
Regular consumption of fruit	28.3 (26.1;30.6)	27.1 (24.9;29.4)
Regular consumption of beans	47.0 (44.5;49.6)	44.3 (41.8;46.8)
Frozen food more than 2 days	12.4 (10.4;14.7)	17.0 (14.8;19.5)
Savory snacks more than 2 days	10.0 (8.4;11.9)	14.2 (12.3;16.4)
Chocolate/sweet biscuits/pieces of tart more than two days	40.6 (38.1;43.1)	45.1 (42.6;47.6)
Female		
Regular consumption of greens and vegetables	40.7 (39.2;42.1)	36.8 (35.3;38.3)
Regular consumption of fruit	36.8 (35.3;38.3)	36.1 (34.5;37.7)
Regular consumption of beans	39.9 (38.4;41.5)	37.9 (36.4;39.5)
Frozen food more than 2 days	7.9 (7.1;8.7)	12.6 (11.7;13.5)
Savory snacks more than 2 days	9.0 (8.2;9.9)	12.4 (11.6;13.3)
Chocolate/sweet biscuits/pieces of tart more than two days	41.8 (40.3;43.4)	48.8 (47.2;50.4)
Age group (years)		
18-29		
Regular consumption of greens and vegetables	29.8 (27.6;32.0)	27.8 (25.7;30.0)
Regular consumption of fruit	21.8 (19.8;24.1)	20.6 (18.5;22.8)
Regular consumption of beans	49.1 (46.4;51.7)	45.3 (42.7;48.1)
Frozen food more than 2 days	12.7 (10.4;15.3)	20.5 (18.1;23.2)
Savory snacks more than 2 days	14.6 (13.0;16.4)	21.8 (19.5;24.3)
Chocolate/sweet biscuits/pieces of tart more than two days	54.2 (51.6;56.8)	63.0 (60.3;65.6)
30-39		
Regular consumption of greens and vegetables	31.9 (28.7;35.3)	26.1 (23.3;29.1)
Regular consumption of fruit	24.9 (21.9;28.0)	23.5 (20.7;26.7)
Regular consumption of beans	41.1 (37.6;44.6)	38.5 (38.5;42.0)
Frozen food more than 2 days	12.4 (9.6;15.7)	18.2 (15.3;21.6)
Savory snacks more than 2 days	12.3 (9.8;15.3)	16.1 (13.7;18.9)
Chocolate/sweet biscuits/pieces of tart more than two days	41.9 (38.6;45.2)	49.4 (45.8;52.9)

to be continue

among females. No differences between age groups were found in the frequency of healthy food consumption, although their consumption remained higher among the elderly (60 years old or over) (Table 3).

During the pandemic, prevalence of unhealthy food consumption 2 days or more a week increased: frozen food from 10.0% (95%CI 8.9;11.2) to 14.6% (95%CI 13.5;15.9); savory snacks from 9.5% (95%CI 8.6;10.5)

continuation

Table 3 – Consumption of healthy and unhealthy food before and during the COVID-19 pandemic, by sex and age group, ConVid Behavior Survey, Brazil, 2020

Variables	Before the pandemic	During the pandemic
	% (95%CI) ^a	% (95%CI) ^a
40-49		
Regular consumption of greens and vegetables	36.8 (33.7;40.1)	32.1 (29.1;35.2)
Regular consumption of fruit	29.2 (26.1;32.4)	29.5 (26.4;32.9)
Regular consumption of beans	42.6 (39.2;46.1)	41.5 (38.1;45.0)
Frozen food more than 2 days	9.7 (7.2;12.8)	13.4 (10.8;16.6)
Savory snacks more than 2 days	8.6 (6.5;11.3)	12.3 (9.9;15.0)
Chocolate/sweet biscuits/pieces of tart more than two days	37.8 (34.5;41.3)	42.4 (38.9;45.9)
50-59		
Regular consumption of greens and vegetables	45.0 (41.9;48.1)	39.4 (36.4;42.4)
Regular consumption of fruit	39.4 (36.5;42.5)	38.4 (35.4;41.4)
Regular consumption of beans	40.6 (37.5;43.7)	37.7 (34.7;40.8)
Frozen food more than 2 days	7.6 (6.2;9.3)	10.2 (8.5;12.1)
Savory snacks more than 2 days	5.9 (4.2;8.2)	7.5 (5.8;9.7)
Chocolate/sweet biscuits/pieces of tart more than two days	34.5 (31.7;37.5)	39.8 (36.9;42.8)
60 or over		
Regular consumption of greens and vegetables	46.2 (42.8;49.5)	42.5 (39.2;45.8)
Regular consumption of fruit	52.6 (49.1;56.0)	51.5 (48.0;55.0)
Regular consumption of beans	41.0 (37.7;44.5)	39.8 (36.4;43.4)
Frozen food more than 2 days	6.2 (4.8;7.9)	7.4 (5.5;9.8)
Savory snacks more than 2 days	2.8 (2.2;3.7)	3.4 (2.7;4.4)
Chocolate/sweet biscuits/pieces of tart more than two days	32.7 (29.6;36.0)	34.0 (30.9;37.2)

a) 95%CI: 95% confidence interval.

to 13.2% (95%CI 12.2;14.3); and chocolate/sweet biscuits/pieces of tart from 41.3% (95%CI 39.8;42.7) to 47.1% (95%CI 45.6;48.6). Frequency of frozen food and savory snack consumption increased in both sexes, while consumption of chocolate/sweet biscuits/pieces of tart increased more among females. The greatest proportional increase in consumption of all unhealthy food occurred among young adults (18-29 years old), in particular consumption of chocolate/sweet biscuits/pieces of tart 2 or more days a week, from 54.2% (95%CI 51.6;56.8) before the pandemic to 63.0% (95%CI 60.3;65.6) during the pandemic. No increase in the frequency of consumption of unhealthy food was found among the elderly (Table 3).

There were also changes in practicing physical activity due to the pandemic in Brazil. Prior to COVID-19, physical activity was sufficient among 30.1% (95%CI 28.9;31.5) of adults; during the pandemic it dropped to just 12.0% (95%CI 11.1;12.9). Prevalence of sufficient physical activity was higher among males (33.0% –

95%CI 30.7;35.5) in relation to females (27.6% – 95%CI 26.2;29.0) before the pandemic; during the pandemic, although there was a reduction in both sexes, males continued to account for a higher proportion of physical activity (14.0% – 95%CI 12.4;15.8) in comparison to females (10.3% – 95%CI 9.4;11.2). Young adults (18-29 years old), who practiced more physical activity before the pandemic, 32.6% (95%CI 30.2;35.1), decreased physical activity to 10.9% (95%CI 9.6;12.5), followed by adults aged 30-39 years old: before the pandemic 31.0% (95%CI 27.7;34.5) of them did sufficient physical activity, during the pandemic only 10.6% (95%CI 8.8;12.7) did so. Among the elderly (60 years old or over), sufficient physical activity fell from 30.4% (95%CI 27.2;33.8) to 14.2% (95%CI 11.9;16.9) (Table 4).

In turn, with regard to sedentary behavior during the pandemic, average time spent watching TV was 3.31 hours (95%CI 3.24;3.38), representing an increase of 1 hour and 45 minutes in relation to average time spent watching TV before the epidemic. Increased time spent

Table 4 – Sufficient physical activity before and during the COVID-19 pandemic, by sex and age group, ConVid Behavior Survey, Brazil, 2020

Variables	Sufficient physical activity before the pandemic	Sufficient physical activity during the pandemic
	% (95%CI) ^a	% (95%CI) ^a
Total	30.1 (28.9;31.5)	12.0 (11.1;12.9)
Sex		
Male	33.0 (30.7;35.5)	14.0 (12.4;15.8)
Female	27.6 (26.2;29.0)	10.3 (9.4; 11.2)
Age group (years)		
18-29	32.6 (30.2;35.1)	10.9 (9.6;12.5)
30-39	31.0 (27.7;34.5)	10.6 (8.8;12.7)
40-49	27.1 (24.3;30.1)	11.6 (9.6;14.1)
50-59	28.2 (25.6;31.0)	13.2 (11.3;15.4)
≥60	30.4 (27.2;33.8)	14.2 (11.9;16.9)

a) 95%CI: 95% confidence interval.

watching TV was found among males and females. The biggest increase in time spent watching TV occurred among adults aged 30-39, from an average of 1.72 hours (95%CI 1.60;1.83) to 3.38 hours (95%CI 3.21;3.55). Despite the elderly being the group with the highest average time spent watching TV, they accounted for the lowest average increase, just one hour more, during the period of social restriction (Table 5).

With regard to computers or tablets, average time using them was more than 5 hours during the pandemic, representing an average increase of 1 hour and 30 minutes in relation to the time spent using them prior

to the pandemic. Greatest average time spent using them was reported by young adults (18-29 years old): 7 hours and 15 minutes, representing an increase of nearly 3 hours in time spent using them (Table 5) compared to use before the COVID-19 pandemic.

Discussion

The findings of this study point to an increase in health risk behaviors. Brazilians reduced physical activities, increased the amount of time dedicated to screens (TV, tablets and/or computers), reduced

Table 5 – Average time spent using computer, tablet and television before and during the COVID-19 pandemic, by sex and age group, ConVid Behavior Survey, Brazil, 2020

Variables	Average time spent using computer or tablet (hours)		Average spent watching TV (hours)	
	Before	After	Before	After
	Average (95%CI) ^a	Average (95%CI) ^a	Average (95%CI) ^a	Average (95%CI) ^a
Total	3.81 (3.71;3.92)	5.30 (5.17;5.43)	1.85 (1.80;1.90)	3.31 (3.24;3.38)
Sex				
Male	4.36 (4.18;4.53)	5.91 (5.69;6.13)	1.88 (1.79;1.96)	3.17 (3.05;3.29)
Female	3.34 (3.24;3.45)	4.76 (4.62;4.90)	1.80 (1.78;1.89)	3.44 (3.36;3.52)
Age group (years)				
18-29	4.48 (4.29;4.67)	7.22 (6.97;7.47)	1.14 (1.07;1.20)	2.83 (2.71;2.96)
30-39	4.22 (3.98;4.46)	5.65 (5.35;5.95)	1.72 (1.60;1.83)	3.38 (3.21;3.55)
40-49	3.84 (3.60;4.09)	5.05 (4.76;5.33)	1.92 (1.81;2.04)	3.51 (3.34;3.68)
50-59	3.42 (3.20;3.65)	4.22 (3.99;4.45)	2.19 (2.08;2.30)	3.44 (3.29;3.60)
≥60	2.85 (2.63;3.07)	3.65 (3.38;3.91)	2.53 (2.40;2.66)	3.54 (3.39;3.69)

a) 95%CI: 95% confidence interval.

consumption of healthy food and increased intake of ultra-processed food, as well as consumption of cigarettes and alcohol, as a result of social restrictions imposed by the pandemic. The study therefore confirm the researchers' initial hypothesis, as proven by studies conducted in other countries, of increased behavioral risk factors during the COVID-19 pandemic.

The limitations of this study include data collection via internet, which may not reach all population strata (e.g. people with less schooling), given that not all of them have access to the internet. Involuntary exclusion of such people may have provoked under or overestimation of indicator proportions. Nevertheless, this limitation was minimized by the large sample size and by calibrating the sample with *PNAD Contínua 2019* survey data. The study did not measure the prevalence of some indicators before the pandemic, such as alcohol and tobacco consumption, but rather the increase in their consumption during the pandemic at a specific time of social restriction, which does not represent definitive changes in the form of their use by the population.

With regard to the reduction in practicing physical activity and the increase in sedentary behavior, measured by time spent watching TV and using tablets and computers, these being behaviors also measured by other studies,¹²⁻¹⁴ it is important to highlight that reduction in physical activity can cause a rapid deterioration in cardiovascular health and premature death among populations at greater risk of heart disease.^{12,17} Even short-term physical inactivity (1 to 4 weeks) has been associated with prejudicial effects on cardiovascular function and structure and with increased cardiovascular risk factors.¹² As such, measures are needed to guide the population on strategies for maintaining active habits during the period of social restriction, especially the most affected population groups.¹⁹

Increased consumption of ultra-processed and high energy density foods, such as potato fries, chocolate and ice cream, was also found by this study. These are foods rich in sugar, fat and calories, as well as preservatives and salt, resulting in harm to health, such as increased obesity, hypertension and cardiovascular diseases.^{13,19,20} Social restriction can influence intake and burning of energy, affecting energy balance and contributing to weight gain.¹⁵

This study indicated increased alcoholic beverage consumption during the pandemic, possibly associated with its effects and stress factors, such as sadness and anxiety, fear in relation to the future, employment

insecurity and risk of death. Similar facts were observed in Hubei Province, China, based on an online survey with 1,074 participants. A large increase in alcohol consumption was also indicated by the authors of that study, as a result of restrictions and total lockdown imposed by the authorities of that Chinese province in response to the COVID-19 epidemic, and it may be related to increased anxiety, depression and decreased mental well-being.⁷ An earlier study suggested that social restriction could be a risk factor for increased alcohol consumption.²¹ Our study also showed that adults aged 30-39, followed by those aged 18-29, were those who most reported increased alcohol consumption. This fact is similar to that found by the study in China, in which alcohol consumption was higher among adults aged 21-40 than among the other age groups.⁹ Moreover, our study did not find differences in alcoholic beverage consumption between the sexes, differently to the online survey in Hubei, in which alcohol consumption was greater among males when compared to females.⁹

With regard to the number of cigarettes smoked per day, it is important to highlight that tobacco use increases with the occurrence of several environmental stressors, such as armed conflicts, natural disasters and other health emergencies.¹¹ There are also discussions as to tobacco use mediated by depression symptoms or post-traumatic stress.^{22,23} Our study identified a greater increase in cigarette use among females. Gender-based differences have also been found by other studies, according to which women have recourse to smoking more frequently than men, as a way of compensating for negative affect.²⁴ Another study pointed to tobacco consumption and its relationship with worse effects of the illness caused by SARS-CoV-2,²⁵ given that cardiovascular diseases or respiratory diseases, apart from their progression being worse among smokers, have been associated with poorer prognosis among people with COVID-19. As such, special care must be provided to this group, given its increased risk of progressing to the severe form of the disease.

The increase in the frequency of risk behaviors found in this study is of concern and may result in harm to health, such as changes in body weight and increased occurrence of non-communicable chronic diseases. The data collected and analyzed here should be noted by health professionals, such as the results regarding changes in smoking and alcohol use patterns (new users of these substances, increased frequency and greater intensity of consumption) and the possibility of their

being associated with emotional suffering. As such, the government should prepare as a priority population-based health promotion strategies, with special emphasis on more vulnerable individuals, who may need more restrictive and longer-lasting measures to avoid novel coronavirus contamination, such as the elderly and people with cardiovascular diseases.

In Brazil, in view of the insufficient and at times absent engagement of governments and governmental service managers in these actions, it is essential for civil society and research institutions to become engaged and launch alternatives, such as that undertaken by the Brazilian Collective Health Association (ABRASCO) regarding care for elderly people, including recommending measures to avoid violence during the pandemic.²⁶

Finally we highlight that the time needed to conduct a representative national household survey, as well as the generally low rate of response to telephone surveys, mean that online surveys are a promising method for assessing and tracing knowledge, behaviors, lifestyles and perceptions

during outbreaks of rapidly evolving communicable diseases,²⁷ such as COVID-19, as well as the low cost of carrying out online surveys and data collection. As such, national and international studies are being conducted using methods to collect data via internet.^{28,29} Moreover, national and international studies are also being conducted using methods to collect data via social media.^{28,29}

Authors' contributions

Malta DC, Szwarcwald CL, Barros MBA, Gomes CS, Machado IE, Souza Júnior PRB, Romero DE, Lima MG, Damacena GN, Pina ME, Freitas MIF, Werneck AO, Silva DRP, Azevedo LO, Gracie R, contributed to the study concept and design, data analysis and interpretation, drafting or relevant critical reviewing of the intellectual content and approval of the final version of the manuscript, and declare themselves to be responsible for all aspects thereof, including the guarantee of its accuracy and integrity.

Supplementary Table – Sociodemographic characteristics of the participants of the ConVid Behavior Survey 2020, and the National Household Sample Survey 2019, Brazil

Variables	ConVid Survey data		PNAD ^a data
	%	(95%CI) ^b	%
Sex			
Male	46.4%	(45.0;47.9)	47.2%
Female	53.6%	(52.1;55.0)	52.8%
Age group (years)			
18-29	24.7%	(23.5;25.9)	23.6%
30-39	21.0%	(19.8;22.3)	20.7%
40-49	18.1%	(17.0;19.2)	18.4%
50-59	15.9%	(15.0;16.9)	16.2%
≥60	20.3%	(19.1;21.6)	21.0%
Schooling			
Incomplete higher education	83.5%	(83.0;84.0)	84.3%
Complete higher education or above	16.5%	(16.0;17.0)	15.7%
Race/skin color			
White	45.2%	(43.8;46.6)	43.8%
Black	8.3%	(7.5;9.2)	9.7%
Brown	45.7%	(44.2;47.2)	45.4%
Other	0.8%	(0.6;0.9)	1.1%

to be continue

continuation

Supplementary Table – Sociodemographic characteristics of the participants of the ConVid Behavior Survey 2020, and the National Household Sample Survey 2019, Brazil

Federative Units			
North (except Amazonas and Pará)	2.4%	(1.9;3.0)	2.5%
Amazonas	1.7%	(1.3;2.3)	1.7%
Pará	3.6%	(3.0;4.4)	3.7%
Maranhão	2.1%	(1.4;3.1)	3.1%
Piauí	1.1%	(0.7;1.6)	1.5%
Ceará	4.1%	(3.5;4.9)	4.3%
Rio Grande do Norte	1.7%	(1.4;2.1)	1.7%
Paraíba	1.8%	(1.4;2.3)	1.9%
Pernambuco	4.6%	(4.2;5.1)	4.4%
Alagoas	1.4%	(1.0;1.9)	1.5%
Sergipe	1.0%	(0.8;1.3)	1.1%
Bahia	7.2%	(6.2;8.3)	7.0%
Minas Gerais	10.8%	(10.2;11.5)	10.3%
Espirito Santo	1.7%	(1.3;2.1)	1.9%
Rio de Janeiro	9.2%	(8.8;9.6)	8.7%
São Paulo	23.8%	(22.8;24.8)	22.6%
Paraná	5.7%	(5.1;6.3)	5.5%
Santa Catarina	3.6%	(3.1;4.1)	3.5%
Rio Grande do Sul	5.7%	(5.1;6.4)	5.7%
Mato Grosso do Sul	1.0%	(0.8;1.4)	1.3%
Mato Grosso	1.3%	(1.0;1.8)	1.6%
Goiás	3.0%	(2.2;4.0)	3.3%
Federal District	1.4%	(1.2;1.6)	1.5%

a) PNAD: National Household Sample Data.

b) 95%CI: 95% confidence interval.

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