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Food consumption changes among teachers during the COVID-19 pandemic

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ABSTRACT

The present study aimed to analyze changes in food consumption among teachers of state schools in Minas Gerais in the context of the pandemic of coronavirus disease 2019 (COVID-19). This is a cross-sectional study of teachers at elementary, middle, and high schools in Minas Gerais. An online questionnaire was made available to all participants through the Google Forms platform. For the analysis, sociodemographic, economic, occupational profile, health conditions, and behavioral/habitual variables were used. Food consumption was assessed through the weekly frequency of eating foods considered healthy and unhealthy before and during the pandemic. The changes observed in the frequency were classified as: decreased intake, no change in intake, and increased intake during the pandemic. Statistical analysis was performed using bivariate and multiple analysis using the Multinomial Logistic model. The data were tabulated with the aid of the Statistical Package for Social Sciences (SPSS), version 18.0. A total of 15,641 teachers participated in this study, with an average age of 42.96 (±9.27) years, and most of them were female (81.9%). During the pandemic, approximately 40% reported altered sleep quality and alcohol consumption, and lack of physical activity with 60.4% of the professionals categorized as overweight. During this period, there was an increase in the consumption of sweets (19.5%), soft drinks (13.3%), sausages (12.0%), frozen foods (8.9%), salty foods (6.3%), vegetables (13.1%), fruits (12.6%), and wholegrain products (8.3%). In the regression analysis, several factors were found to be associated with changes in teachers’ food consumption in a bidirectional way when associated with variables related to sociodemographic characteristics, occupational profile, general health, and lifestyle.

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1. Introduction

The coronavirus disease 2019 (COVID-19) is a highly infectious disease caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), and its first occurrence was reported in China in December 2019 (Ye et al., 2020). Due to its worldwide spread, the World Health Organization (WHO) declared COVID-19 as a global pandemic (WHO, 2020). In January 2021, Brazil ranked third in the number of cases observed worldwide and second with respect to number of deaths (Halil, 2021). For stemming the spread of the infection, interventions have been imposed by governments. These include restrictive measures of circulation and social agglomeration with the closing of schools, universities, events, and any service considered non-essential (Garcia and Duarte, 2020; Martínez-Ferran et al., 2020).

Prevention measures with social restrictions were essential to minimize infection rates, but they can also effect changes in the population's lifestyle (Ammar et al., 2020). Among the behavioral changes, there were changes in eating habits (Di Renzo et al., 2020; Malta et al., 2020; Fiocruz, 2020; Kriauciuniene et al., 2020; Sánchez-Sánchez et al., 2020; Blaszczynk-Boberek et al., 2020; Sidor and Ryzmks, 2020; Steele et al., 2020; Scarmozzino and Visioli, 2020). The published studies, so far, have evidenced the impact of the pandemic on eating behaviors, manifested by the increase in the consumption of “unhealthy” foods such as alcoholic beverages, snacks, and sweets and the reduction in the practice of physical activity (Sánchez-Sánchez et al., 2020). However, other studies have identified an increase in the consumption of healthy foods, especially vegetables, fruits, legumes, fish, and eggs (Steele et al., 2020; Pérez-Rodrigo et al., 2020).

The increase in the frequency of risky eating behaviors is worrying and can result in damage to health, such as an increase in the occurrence of chronic non-communicable diseases (Steele et al., 2020). In Brazil, chronic non-communicable diseases are among the leading causes of hospital admissions generating increasing impacts on the direct costs for the Health System (BRASIL, 2011). It is also necessary to consider that most comorbidities were associated with the worsening of the clinical condition and an increased risk of mortality of COVID-19 patients (Williamson et al., 2020; Emami et al., 2021; Naeini et al., 2021).

In addition to this context, one of the most significant challenges ever faced by education systems was observed, where many governments enforced the interruption of face-to-face teaching in favor of the implementation of virtual education (Daniel, 2020). The need for prompt support and professional development for teachers globally required a critical skill set to realign from face-to-face to emergency remote teaching. The teachers, already shaken by the pandemic, included in their teaching practice the ability to teach outside the physical classrooms (Abaci et al., 2020).

Teaching is a profession with different levels of work-related stress (Agi-Demjah et al., 2015) and may have consequences on occupational health and quality of life, among other aspects, due to negative behaviors in the diet and practice of insufficient physical activity (Sánchez et al., 2019). There is limited evidence to assess the effect of the blocks and restrictions linked to the COVID-19 pandemic on changes in dietary behaviors among teachers. Therefore, the present study aimed to analyze changes in food consumption among teachers from state schools in Minas Gerais in the context of the COVID-19 pandemic.

2. Methods

This study is part of the Projeto ProSMoC – Etapa Minas Covid “Health and work conditions among teachers in the state education system in the state of Minas Gerais in the COVID-19 pandemic.” This is an epidemiological, cross-sectional, and analytical study of teachers at elementary schools, middle schools, and high schools from state public schools of Minas Gerais, Brazil. Minas Gerais comprises approximately 90,000 teachers who work at schools that provide services from the elementary to high school levels (data provided by the Minas Gerais State Department of Education - SEE-MG), working in 3441 state public schools.

For sample calculation, a reasoned formula was used for an infinite population, considering a prevalence of 50% and the tolerable error of 3%. Additionally, the sample was doubled (Deff = 2) because it came from conglomerates. Further, a 20% increase was made in the sample size to compensate for possible losses (non-response rate) that could compromise the study’s validity. Thus, it was estimated that there was a need to collect data from 2564 teachers from the state schools in Minas Gerais to ensure inclusive representation.

Access to the list of state schools and teachers present in the state was made available by the Minas Gerais State Department of Education. This made it possible to identify the total number of teachers and their distribution according to the Regional Teaching Superintendence (SRE) to which the teachers were affiliated. Thus, the minimum numbers necessary to ensure representativeness in each of the 45 Regional Teaching Superintendencies have been achieved.

The study included teachers in the exercise of the teaching function in 2020, those working in early childhood, elementary education, and/or high school (linked to some state public schools in Minas Gerais) and those who agreed to participate in the study. Teachers who were not currently practicing their profession, retirees, and those who answered “no” when asked if they agreed to participate in the study were not included.

2.1. Ethical aspects of research

In all stages of this study, the ethical precepts determined by Resolution No. 466 were followed in accordance with the approval of the Research Ethics Committee Involving Human Beings at the State University of Montes Claros - UNIMONTES, under substantiated opinion no. 4,200,389/2020 and conducted with authorization from the State Education Secretariat of Minas Gerais.

2.2. Data collection

For data collection, a partnership was initially made with the Minas Gerais State Department of Education, where authorizations were obtained to carry out the study. A standardized online questionnaire was used, made available to all participants through the Google Forms platform. This consisted of questions about the sociodemographic and economic profiles, occupational profile, health conditions during the pandemic, and behaviors/habits during the pandemic.

For this study, the variables evaluated were: 1) Sociodemographic and economic profile, which was evaluated considering the following variables: age (in years: ≤40; > 40), sex (female; male), skin color (white; non-white), living with a partner (yes; no) and family income (considering the current minimum wage of R $ 1045.00 at the time of data collection: 1 to 2 minimum wage; 3 to 5 minimum wage; > 6 minimum wage). 2) Occupational profile, evaluated by teaching hours per week (2–10; 11 to 39; 40 or more). 3) Health conditions during the pandemic, which were assessed according to the presence of diseases such as hypertension, diabetes, heart disease, and respiratory diseases (yes; no), adhered to social isolation (yes; no), and whether the pandemic affected the quality of life, including sleep (no; yes). 4) Behaviors/Habits during the pandemic, which were assessed according to: alcohol consumption during the pandemic (no; yes); if the participant currently smoked (no; yes); if the participant was doing physical activity during the pandemic (yes; no), overweight (no; yes) and food consumption (days a week). Food consumption was assessed using groups of foods considered healthy (raw or cooked vegetables/fruits, beans, and whole foods) and unhealthy (sausage, frozen foods, “packaged” snacks, sweets, soft drinks, and/or artificial juice). This instrument aims to identify the weekly frequency of consumption of some foods and/or drinks that are related to both a healthy and an unhealthy diet, in the seven days before the interview, with the answer options: never/almost never, 1/2 times a
week, 3/4 times a week, and 5/6 times a week or every day of the week.

The percentage of change in food group consumption was estimated
based on answers to the questions. These included: “BEFORE the
pandemic; how many days of the week did you use to eat [the particular
food group]?” “DURING the pandemic, how many days of the week do
you usually eat [the particular food group]?” The changes observed in
the frequency were used to determinate three consumption patterns:

(-1) decreased intake during the pandemic;
(0) never consumed before and during the pandemic; no changes in
intake;
(1) increased intake during the pandemic.

From the self-reported data of weight and height, the Body Mass
Index (BMI) was calculated, obtained through the calculation: current
weight in kilograms divided by the height in centimeters squared \([PA/\]
\([A^2]\)) and classified by the parameters made available by the WHO:
<18.5 (low weight), 18.5 to 24.9 (normal weight), ≥25 overweight
(WHO, 2000). Overweight and obese participants were included in the
“overweight” variable.

The link to this survey was released by the Minas Gerais State
Department of Education on its social networks and sent to all Regional
Teaching Superintendencies (SRE). At the beginning of the digital form,
participants were presented with the Free and Informed Consent Form
and a question on the consent to participate in the research. The auto-
matic filling was avoided through the reCAPTCHA system.

2.3. Statistical analysis

A descriptive analysis of the investigated variables was carried out
through their frequency distributions and expressed in percentage (%)
and absolute (n). Then, bivariate analyses were performed between
the outcome variables and each independent variable. The gross Odds Ratio
(OR) was estimated, with their respective 95% confidence intervals. The
variables that presented a descriptive level (p-value) below 0.20 were
selected for multiple analysis, in which the Multinomial Logistic
Regression model was adopted. A theoretical model was used for the
multiple models, as shown in Fig. 1. In the analysis of the fit quality of
the multiple models, the Deviance test was used. The data were tabu-
lated and analyzed using the Statistical Package for Social Sciences
(SPSS), version 18.0.

3. Results

A total of 15,641 teachers participated in this study, with an average
age of 42.96 (±9.27) years, working in 795 different municipalities in
Minas Gerais. Most participants were female (81.9%), non-white race/
skin color (51.2%), monthly income being categorized as 3–5 on the

![Fig. 1. Theoretical research model for the association of independent variables with teachers’ food consumption before and during the COVID-19 pandemic.](image-url)
minimum wage range used in this study (59.5%), and lived with a partner (66.8%). During the pandemic, 75.6% worked from 11 to 39 h/week in teaching and 79.8% adhered to social isolation. Approximately 40% reported altered sleep quality, as well as alcohol consumption and lack of physical activity. Finally, 60.4% of the professionals were observed to be overweight (Table 1).

Table 2 shows the characterization of teachers’ food consumption during the COVID-19 pandemic. During this period, there was an increase in the consumption of unhealthy foods, such as sweets (19.5%), soft drinks (13.3%), sausage (12.0%), frozen foods (8.9%), and salty foods (6.3%). Among healthy foods, there was an increase in the consumption of vegetables (13.1%), fruits (12.6%), and whole products (8.3%), and a 6.4% decrease in the consumption of beans among food groups before and during the COVID-19 pandemic. ProfSMoc Project - Minas Covid Stage, 2020 (n = 15641).

Table 1
Sociodemographic, work, health, and behavioral characteristics of teachers during the pandemic. ProfSMoc Project - Minas Covid Stage, 2020 (n = 15641).

| Variables                                      | n  | %   |
|------------------------------------------------|----|-----|
| Sociodemographic characteristics              |    |     |
| Sex                                            |    |     |
| Female                                         | 12817 | 81.9 |
| Male                                           | 2824  | 18.1 |
| Age (years)                                    |    |     |
| 21 a 40                                        | 6447  | 41.2 |
| > 41                                           | 9194  | 58.8 |
| Income (minimum wages) a                       |    |     |
| 1 a 2                                          | 3969  | 25.4 |
| 3 a 5                                          | 9301  | 59.5 |
| > 6                                            | 2371  | 15.2 |
| Lives with a partner                           |    |     |
| Yes                                            | 10453 | 66.8 |
| No                                             | 5188  | 33.2 |
| Skin color                                     |    |     |
| White                                          | 7642  | 48.9 |
| Non-white                                      | 7999  | 51.2 |
| Work characteristics                           |    |     |
| Hours of work/week                             |    |     |
| 2 to 10                                        | 1351  | 8.6  |
| 11 to 39                                       | 11816 | 75.6 |
| ≥ 40                                           | 2472  | 15.8 |
| Health characteristics                         |    |     |
| Hypertension                                   |    |     |
| No                                             | 12981 | 83.0 |
| Yes                                            | 2660  | 17.0 |
| Diabetes                                       |    |     |
| No                                             | 14990 | 95.8 |
| Yes                                            | 651   | 4.2  |
| Heart diseases                                 |    |     |
| No                                             | 15361 | 98.2 |
| Yes                                            | 280   | 1.8  |
| Respiratory diseases                           |    |     |
| No                                             | 14159 | 90.5 |
| Yes                                            | 1482  | 9.5  |
| Behavioral Characteristics                     |    |     |
| Adhered to social isolation                    |    |     |
| Yes                                            | 12486 | 79.8 |
| No                                             | 3155  | 20.2 |
| Altered sleep quality                          |    |     |
| No                                             | 8648  | 55.3 |
| Yes                                            | 6993  | 44.7 |
| Alcohol consumption                            |    |     |
| No                                             | 9290  | 59.4 |
| Yes                                            | 6351  | 40.6 |
| Currently smokes                               |    |     |
| No                                             | 14788 | 94.5 |
| Yes                                            | 853   | 5.5  |
| Practice of physical activities                |    |     |
| No                                             | 8798  | 56.2 |
| Yes                                            | 6843  | 43.8 |
| Overweight                                     |    |     |
| No                                             | 5846  | 37.4 |
| Yes                                            | 9452  | 62.6 |

| Table 2  
| Frequency of consumption of teachers’ food groups before and during the COVID-19 pandemic. ProfSMoc Project - Minas Covid Stage, 2020 (n = 15641). |
|----------------------------------------------------|--------|--------|--------|
| Variables                                          | Decreased | No changes | Increased |
| Vegetables                                         | 1442    | 9.2 %   | 12144   | 77.6 % | 2055   | 13.1 % |
| Fruits                                             | 1519    | 9.7 %   | 12151   | 77.7 % | 1971   | 12.6 % |
| Beans                                              | 1005    | 6.4 %   | 13836   | 88.5 % | 800    | 5.1   |
| Whole foods                                        | 1004    | 6.4 %   | 13337   | 85.3 % | 1300   | 8.3   |
| Sausage                                            | 1055    | 6.7 %   | 12710   | 81.3 % | 1876   | 12.0 |
| Frozen Foods                                       | 826     | 5.3 %   | 13427   | 85.8 % | 1388   | 8.9   |
| Savory                                             | 530     | 3.4 %   | 14126   | 90.3 % | 985    | 6.3   |
| Sweats                                             | 903     | 5.8 %   | 11689   | 74.7 % | 3049   | 19.5 |
| Soft drinks and/or artificial juice                 | 970     | 6.2 %   | 12588   | 80.5 % | 2083   | 13.3 |

a Minimum wage: R$1045, 00.
Table 3
Multiple multinominal regression analysis for the consumption of vegetables and fruits for the association between sociodemographic characteristics, teacher occupational profile, health characterization, behavioral characteristics.

| Variables                  | Vegetables Increased consumption | Vegetables Decreased consumption | Fruits Increased consumption | Fruits Decreased consumption |
|----------------------------|---------------------------------|---------------------------------|------------------------------|------------------------------|
|                            | OR IC95% P value                | OR IC95% P value                | OR IC95% P value             | OR IC95% P value             |
| Sociodemographic characteristics |                                |                                 |                              |                              |
| Age (years)                |                                 |                                 |                              |                              |
| From 21 to 40              | 1.00                            | 1.00                            | 1.00                         | 1.00                         |
| 41 or more                 | 0.76 0.69-0.85 0.000            | 0.73 0.66-0.83 0.000           | 0.75 0.68-0.83 0.000         | 0.73 0.65-0.82 0.000         |
| Sex                       |                                 |                                 |                              |                              |
| Female                     | 1.00                            |                                 | 1.00                         | 1.00                         |
| Male                       | 0.75 0.66-0.86 0.000            | 1.00                            | 0.85 0.75-0.98 0.020         | 0.80 0.69-0.94 0.005         |
| Income (minimum wages)     |                                 |                                 |                              |                              |
| 1 to 2                     | - - - - - - - - - - - - - -     | 1.00                            | - - - - - - - - - - - - - -  | 1.00                         |
| 3 to 5                     | - - - - - - - - - - - - - -     | 1.28                            | 1.14-1.45 0.000             | 1.04 0.92-1.20 0.495         |
| Higher than 6              | - - - - - - - - - - - - - -     | 1.22                            | 1.04-1.45 0.014             | 1.30 1.09-1.56 0.003         |
| Lives with spouse          |                                 |                                 |                              |                              |
| Yes                        | 1.00                            | 1.00                            | 1.00                         | 1.00                         |
| No                         | 0.94 0.85-1.05 0.265            | 1.15                            | 1.03-1.30 0.015             | 1.02 0.93-1.14 0.595         |
| Work characteristic        |                                 |                                 |                              |                              |
| Hours of work per week teaching |                             |                                 |                              |                              |
| 2 to 10                    | 1.00                            | 1.00                            | - - - - - - - - - - - - - -  | - - - - - - - - - - - - - -  |
| 11 to 39                   | 1.19 0.99-1.44 0.058            | 0.98 0.81-1.21 0.908           | - - - - - - - - - - - - - -  | - - - - - - - - - - - - - -  |
| 40 or more                 | 1.39 1.13-1.72 0.002            | 1.03 0.82-1.31 0.771           | - - - - - - - - - - - - - -  | - - - - - - - - - - - - - -  |
| Health characteristics     |                                 |                                 |                              |                              |
| Hypertension               |                                 |                                 |                              |                              |
| No                         | 1.00                            | 1.00                            | 1.00                         | 1.00                         |
| Yes                        | 1.15 1.01-1.31 0.034            | 0.97 0.83-1.14 0.738           | 1.18 1.04-1.35 0.010         | 0.88 0.76-1.04 0.143         |
| Respiratory diseases       |                                 |                                 |                              |                              |
| No                         | 1.00                            | 1.00                            | 1.00                         | 1.00                         |
| Yes                        | 1.25 1.07-1.46 0.004            | 1.39 1.18-1.65 0.000           | 1.27 1.09-1.49 0.002         | 1.16 0.98-1.39 0.083         |
| The pandemic affected sleep quality |                   |                                 |                              |                              |
| No                         | 1.00                            | 1.00                            | 1.00                         | 1.00                         |
| Yes                        | 1.21 1.11-1.34 0.000            | 2.00 1.79-2.25 0.000           | 1.32 1.20-1.46 0.000         | 2.12 1.90-2.38 0.000         |
| During the pandemic is doing physical activity |                  |                                 |                              |                              |
| Yes                        | 1.00                            | 1.00                            | 1.00                         | 1.00                         |
| No                         | 0.73 0.67-0.82 0.000            | 1.57 1.41-1.76 0.000           | 0.65 0.60-0.73 0.000         | 1.39 1.25-1.56 0.000         |
| Overweight                 |                                 |                                 |                              |                              |
| No                         | 1.00                            | 1.00                            | 1.00                         | 1.00                         |
| Yes                        | 1.17 1.06-1.30 0.002            | 1.17 1.05-1.33 0.007           | 1.18 1.06-1.31 0.002         | 1.15 1.03-1.30 0.016         |

Variables with - did not remain in the final model of the regression analysis.

1OR – odds ratio; 2IC – confidence interval of 95%.

juice. Heart disease was associated with reduced chances of increased consumption of frozen foods (46.2%) and soft drinks and/or artificial juice (35%).

Respiratory diseases increased the chance of alteration (increase/decrease) in the consumption of vegetables (25.2%/39.1%) and whole foods (48.8%/31.1%). There was an even greater chance of increasing fruit consumption (27.5%) and reducing bean consumption (38.8%). There was an association of respiratory diseases with the change (increase/decrease) in the consumption of all unhealthy foods, except savory foods, with a higher prevalence for the chance of decreasing these (40%–50%).

Concerning behavioral characteristics, among teachers who did not adhere to social isolation, there was less chance of increased consumption of groups of vegetables (18.3%), fruits (16.4%), whole foods (20.9%), and sweets (13.1%). As for the association of food consumption and alcohol intake during the pandemic, there was a greater chance of increasing the consumption of sausages (48%), frozen foods (36.3%), savory (46.5%), sweets (42.9%), and soft drinks and/or artificial juice (42.3%), and to reduce the consumption of beans (42.6%). Teachers who drank alcohol were also associated with lower chances of decreasing the consumption of snacks (18.3%), sweets (19.2%), and soft drinks and/or artificial juice (16.9%).

Among the teachers who smoked, there was an increase in the chances of consuming sausages (50.1%), frozen foods (58.1%), salty foods (34.2%), and soft drinks and/or artificial juice (32, 3%). There were also greater chances of reducing the consumption of snacks (69.2%) and beans (38%).

Regarding the practice of physical activity during a pandemic, the results showed that sedentary teachers are less likely to increase the consumption of food from groups of vegetables (27.2%), fruits (35.1%), and whole foods (45.4%) and lower chances of reducing consumption of sausage (24.7%), salty (29.7%), sweets (26.5%), soft drinks and/or artificial juice (24.5%). On the other hand, these teachers had an even greater chance of decreasing the consumption of the groups of vegetables (57.5%), fruits (39.9%), and beans (16.4%) and of increasing the consumption of sausages (32%), frozen foods (43.8%), salty foods (50.8%), sweets (30.2%), and soft drinks and/or artificial juice (57.2%).

The variable sleep quality altered due to the pandemic. Being overweight was associated with greater chances of changes (increase/decrease) in the consumption of all food groups, except for whole foods. It also increased the chances of changes in the consumption of unhealthy foods (25.2%–72.8%).
The findings of this study show a higher proportion of increased consumption of different food groups, whether healthy or not, due to the social isolation caused by the pandemic of COVID-19. Only the bean group was associated with decreased consumption during this period. Similar results have recently been found in other populations that have demonstrated that the current home confinement can effect changes in consumption and exploring the associated factors. Although it is undestandable, the specific approach for a given group of foods considered healthy or unhealthy does not allow a bidirectional and more realistic assessment of the complexity and dynamics of food consumption during a pandemic.

It is widely agreed that anxiety, fear, uncertainty, lack of information, and frustrations caused by social isolation are considered risk factors for consuming more food. This includes the consumption of lower quality food, as recorded by an international online survey on mental health and behaviors—multidimensional lifestyles during home confinement (Ammar et al., 2020). Therefore, at the beginning of the pandemic, the WHO published a guide on eating healthy during the self-quarantine of COVID-19. This guide contains valuable nutrition information to strengthen the immune system. It guides control in the intake of salt, sugar, fat, and alcohol; and encourages increased fiber and water consumption (WHO, 2020).

In the present study, it was found that people over the age of 41 were less likely to change their eating habits. A cross-sectional study was conducted in Brazil with data from the virtual health survey ConVid, Behavioral Research. It showed that during the pandemic, there was an increase in the prevalence of consumption of unhealthy foods (i.e., of frozen and salty foods) for two or more days per week in both sexes. Simultaneously, consumption of chocolates/cookies, sweets/pieces of pie was higher among women. Among young adults (18–29 years old), the frequency of consumption of all unhealthy foods increased by a more significant proportion, with a highlight on chocolates/sweet, cookies/pieces of pie for two or more days of the week, from 54.2% before the pandemic to 63.0% during the pandemic (Malta et al., 2020).

The variables of income and living without a partner were associated with a greater chance of changing eating habits among teachers. A

4. Discussion

The findings of this study show a higher proportion of increased consumption of different food groups, whether healthy or not, due to the social isolation caused by the pandemic of COVID-19. Only the bean group was associated with decreased consumption during this period. Similar results have recently been found in other populations that have demonstrated that the current home confinement can effect changes in the population’s eating behaviors (Ammar et al., 2020; Malta et al., 2020; Rehm et al., 2020). However, this study first analyzed changes in food consumption among teachers in the state network of Minas Gerais before and during the COVID-19 pandemic considering the frequency of consumption and exploring the associated factors. Although it is understandable, the specific approach for a given group of foods considered healthy or unhealthy does not allow a bidirectional and more realistic assessment of the complexity and dynamics of food consumption during a pandemic.

It is widely agreed that anxiety, fear, uncertainty, lack of information, and frustrations caused by social isolation are considered risk factors for consuming more food. This includes the consumption of lower quality food, as recorded by an international online survey on mental health and behaviors—multidimensional lifestyles during home confinement (Ammar et al., 2020). Therefore, at the beginning of the pandemic, the WHO published a guide on eating healthy during the self-quarantine of COVID-19. This guide contains valuable nutrition information to strengthen the immune system. It guides control in the intake of salt, sugar, fat, and alcohol; and encourages increased fiber and water consumption (WHO, 2020).

In the present study, it was found that people over the age of 41 were less likely to change their eating habits. A cross-sectional study was conducted in Brazil with data from the virtual health survey “ConVid, Behavioral Research.” It showed that during the pandemic, there was an increase in the prevalence of consumption of unhealthy foods (i.e., of frozen and salty foods) for two or more days per week in both sexes. Simultaneously, consumption of chocolates/cookies, sweets/pieces of pie was higher among women. Among young adults (18–29 years old), the frequency of consumption of all unhealthy foods increased by a more significant proportion, with a highlight on chocolates/sweet, cookies/pieces of pie for two or more days of the week, from 54.2% before the pandemic to 63.0% during the pandemic (Malta et al., 2020).

The variables of income and living without a partner were associated with a greater chance of changing eating habits among teachers. A
similar result was presented in a study carried out in the Chilean territory. In the study, both income and medium to high socioeconomic status were associated with increased consumption of unhealthy foods; consequently, increased body weight (Reyes-Olavarría et al., 2020). Such changes can be justified by factors such as increasing the amount of food consumed, and diversity, preference, and food knowledge (Renornicka et al., 2020). The study carried out by Gornicka et al. (2020) with Polish adults found that adherence to the consumption of unhealthy foods was 1.8 times higher in the interviewees who had worked or had a considerable level of reduction in working time than in those whose workload remained the same as before (Gornicka et al., 2020).

The workload was also associated with greater chances of changes in eating habits. The previous investigation with adults evidenced that the adherence to the consumption of unhealthy foods was 1.5 times higher in the interviewees who did not work or had a considerable level of reduction in working time than in those whose workload remained the same as before (Gornicka et al., 2020).

There was a variation in the increase and decrease in the consumption of healthy and unhealthy foods in teachers with hypertension, diabetes, and respiratory diseases. In a study by Destri et al. (2017), when analyzing the frequency of consumption of the participants, it was observed that the recommended weekly frequency for fried foods and snacks was higher among individuals with hypertension and diabetes. The daily consumption of raw salad/fruits and the frequency of consumption of soft drinks up to once a week were higher among those who had only diabetes (Destri et al., 2017). Considering that healthy eating habits can be a protective factor for health, heart disease has been shown to be associated with less consumption of frozen foods and soft drinks, and/or artificial juice. A healthy diet can reduce the levels of inflammatory markers, contributing to the prevention/control of metabolic conditions related to the manifestation of chronic non-communicable diseases (Geraldo and Alfenas, 2008). In this sense, it is of utmost importance to maintain healthy eating habits through a balanced and varied diet since this can help strengthen the immune system, acting as a protection against COVID-19 (WHO, 2020; Reyes-Olavarría et al., 2020). Such an explanation for greater consumption of

Table 5
Multiple multinominal regression analysis for the consumption of sausages and frozen foods for the association between sociodemographic characteristics, teacher occupational profile, health characterization, behavioral characteristics.

| Variable                      | Sausages Increased consumption | Sausages Decreased consumption | Frozen foods Increased consumption | Frozen foods Decreased consumption |
|-------------------------------|--------------------------------|--------------------------------|-----------------------------------|-----------------------------------|
|                               | OR IC95% P value               | OR IC95% P value               | OR IC95% P value                  | OR IC95% P value                  |
| Sociodemographic characteristics |                                 |                                 |                                   |                                   |
| Age (years)                   |                                 |                                 |                                   |                                   |
| 18 to 24                      | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| 25 to 34                      | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| 35 to 44                      | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| 45 or higher                  | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Skin color                    |                                 |                                 |                                   |                                   |
| White                         | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Non-white                     | 1.02-1.24                      | 0.021                           | 0.97                              | 0.86-1.11                        |
| Income (minimum wages)        |                                 |                                 |                                   |                                   |
| 1 to 2                        | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| 3 to 5                        | 1.03                            | 0.90-1.19                       | 0.66                             | 0.51-0.79                        |
| Higher than 6                 | 1.41                            | 1.17-1.70                       | 0.000                            | 0.75-1.24                        |
| Lives with spouse             |                                 |                                 |                                   |                                   |
| Yes                           | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| No                            | 1.09                            | 0.98-1.21                       | 1.10                             | 1.03-1.34                        |
| Work characteristics          |                                 |                                 |                                   |                                   |
| Hours of work per week teaching |                                 |                                 |                                   |                                   |
| 2 to 10                       | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| 11 to 39                      | 1.29                            | 1.03-1.64                       | 0.030                            | 0.63                             |
| 40 or more                    | 1.42                            | 1.09-1.86                       | 0.009                            | 0.79                             |
| Health characteristics        |                                 |                                 |                                   |                                   |
| Heart diseases                |                                 |                                 |                                   |                                   |
| No                            | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Yes                           | 1.37                            | 1.18-1.60                       | 0.000                            | 1.49                             |
| Respiratory diseases          |                                 |                                 |                                   |                                   |
| No                            | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Yes                           | 1.21                            | 1.02-1.44                       | 0.032                            | 1.39                             |
| Behavioral characteristics    |                                 |                                 |                                   |                                   |
| The pandemic affected sleep quality |                              |                                 |                                   |                                   |
| No                            | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Yes                           | 2.18                            | 1.97-2.42                       | 0.000                            | 1.48                             |
| Alcohol consumption during the pandemic |           | 1.30-1.68                       | 0.000                            | 2.24                             |
| No                            | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Yes                           | 1.48                            | 1.34-1.64                       | 0.000                            | 0.92                             |
| Currently smokes              |                                 |                                 |                                   |                                   |
| No                            | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Yes                           | 1.50                            | 1.24-1.82                       | 0.000                            | 1.18                             |
| During the pandemic is doing physical activity |                 | 0.89-1.56                       | 0.246                            | 1.58                             |
| No                            | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Yes                           | 1.50                            | 1.24-1.82                       | 0.000                            | 1.18                             |
| Overweight                    | 1.43                            | 1.28-1.61                       | 0.000                            | 0.87                             |
| No                            | 1.00                            | 1.00                            | 1.00                              | 1.00                              |
| Yes                           | 1.25                            | 1.13-1.392                      | 0.000                            | 1.35                             |

1 OR – odds ratio; 2 IC – confidence interval of 95%.

Variables with · did not remain in the final model of the regression analysis.
Table 6
Multiple multinominal regression analysis for the consumption of snacks, sweets, and soft drinks and/or artificial juice for the association between sociodemographic characteristics, teacher occupational profile, health characterization, behavioral characteristics.

| Variables                  | Savory                      | Soft drink and/or artificial juice |
|----------------------------|-----------------------------|-----------------------------------|
|                            | Increased consumption       | Decreased consumption             |
|                            | OR  IC95%  P value          | OR  IC95%  P value                |
| Sociodemographic characteristics |                             |                                   |
| Age (years)                |                             |                                   |
| From 21 to 40              | 1.00                        | 1.00                               |
| 41 or higher               | 0.51 0.45-0.59 0.000        | 0.56 0.47-0.67 0.000              |
| Sex                        |                             |                                   |
| Female                     | 1.00                        | 1.00                               |
| Male                       | 0.51 0.45-0.59              | 0.56 0.47-0.67                    |
| Income (minimum wages)     |                             |                                   |
| 1 to 2                     | 1.00                        | 1.00                               |
| 3 to 5                     | 1.27 1.15-1.42 0.000        | 1.17 1.00-1.40 0.057              |
| Higher than 6              | 1.64 1.43-1.89 0.000        | 1.22 0.97-1.56 0.094              |
| Lives with spouse          |                             |                                   |
| Yes                        | 1.00                        | 1.00                               |
| No                         | 1.17 1.02-1.35 0.024        | 1.21 1.01-1.46 0.035              |
| Work characteristics       |                             |                                   |
| Hours of work per week teaching |                        |                                   |
| 2 to 10                    | 1.00                        | 1.00                               |
| 11 to 39                   | 1.14 0.88-1.48 0.308        | 0.72 0.55-0.95 0.022              |
| 40 or more                 | 1.52 1.15-2.04 0.004        | 0.95 0.68-1.33 0.768              |
| Health characteristics     |                             |                                   |
| Hypertension               |                             |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 0.87 0.77-0.99 0.029        | 1.02 0.84-1.24 0.819              |
| Diabeteys                  |                             |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 0.82 0.66-1.04 0.096        | 0.62 0.42-0.95 0.026              |
| Heart diseases             |                             |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 0.66 0.44-0.99 0.047        | 0.82 0.48-1.40 0.476              |
| Respiratory diseases       |                             |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 1.31 1.08–1.60 0.006        | 1.14 0.86–1.53 0.341              |
| Behavioral characteristics |                             |                                   |
| Adhered to social isolation|                             |                                   |
| Yes                        | 1.00                        | 1.00                               |
| No                         | 0.87 0.79-0.98 0.021        | 0.93 0.78-1.12 0.452              |
| The pandemic affected sleep quality |               |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 2.41 2.10–2.78 0.000        | 1.20 1.01–1.44 0.040              |
| Alcohol consumption during the pandemic |               |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 1.46 1.28–1.68 0.000        | 0.82 0.69-1.00 0.044              |
| Currently smokes           |                             |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 1.34 1.04–1.73 0.023        | 1.69 1.21–2.38 0.002              |
| During the pandemic is doing physical activity |             |                                   |
| Yes                        | 1.00                        | 1.00                               |
| No                         | 1.50 1.32–1.72 0.000        | 0.71 0.59–0.86 0.000              |
| Overweight                 |                             |                                   |
| No                         | 1.00                        | 1.00                               |
| Yes                        | 1.32 1.15–1.53 0.000        | 1.45 1.20–1.76 0.000              |

1OR – odds ratio; 2 IC – confidence interval of 95%.
Variables with - did not remain in the final model of the regression analysis.
unhealthy foods during the pandemic may be found in their high energy density and the addition of ingredients to increase the durability and palatability of the products (BRASIL, 2014).

This study observed that both alcohol intake and cigarette use favored an increase in the consumption of unhealthy foods. It is worth mentioning that other studies sought to describe changes in the population’s lifestyle based on the effects of home confinement during the pandemic (Malta et al., 2020; WHO, 2020; Reyes-Olivarria et al., 2020; Górnicka et al., 2020; Rodríguez-Muñoz et al., 2020). However, this study was the first to assess the association of alcohol and tobacco consumption with changes in food consumption among teachers. In a different scenario from the one presented in our study, Rodríguez-Muñoz et al. (2020) established an association between consumption of psychoactive substances and nutrition. The authors pointed out that alcohol, for example, inhibits food intake while tobacco stimulates it. Given the pandemic scenario caused by COVID-19 and the importance of keeping the immune system strengthened, it is significant that any changes in alcohol and tobacco consumption related to eating habits are monitored. There is a scarcity of studies on the consumption of these substances and eating habits among teachers. Thus, there is a need for more research to analyze and understand this correlation to promote teachers’ health.

Concerning sedentary teachers, they were less likely to increase the consumption of whole foods, groups of vegetables, fruits, and even greater chances of increasing the consumption of sausage, frozen, savory, and sweet and soft drinks, and/or artificial juice. Another study carried out in Brazil with about 45,000 participants found a significant association between reduced physical activity and increased sedentary behavior and consumption of unhealthy foods, such as ultra-processed foods, during the pandemic (Werneck et al., 2021). In the study, Werneck et al. point out that sedentary behavior caused by social restriction measures is associated with increased energy intake. This can occur through different mechanisms such as increased consumption of ultra-processed foods, mainly when watching TV and using cell phones. That is, for example, due to greater exposure to commercials about these types of foods leading to the desire to consume them. In the literature, there is clear evidence that a sedentary lifestyle associated with inadequate food consumption negatively impacts the population’s health. The practice of physical activity contributes to their physical and mental health, helping prevent COVID-19 and its consequences (SBMEE, 2020; SBC, 2020).

Given the current situation, sleep quality is an essential condition associated with health that must be evaluated to avoid both physical and mental illness of the population. In this study, sleep quality was associated with greater chances of changes in eating habits. Recent studies have stated that sleep disorders aggravate the picture related to quarantine (Barros et al., 2020; Zupo et al., 2020), further aggravating stress and increasing food intake, generating a dangerous vicious cycle for health (Zupo et al., 2020). Some factors contributing to the change in the population’s sleep pattern are changes in routine, less exposure to sunlight, and the stress caused by the current state (Barros et al., 2020). The presence of excess weight was another determining factor for the increase in the consumption of unhealthy foods in this research. A cross-sectional online study was carried out with 1097 adults on nutritional and consumption habits in Poland. It recorded that about 30% of these individuals who were already overweight experienced weight gain. Additionally, the increase in BMI was associated with less frequent consumption of vegetables, fruits, and vegetables during quarantine and greater adherence to meat, dairy, and fast food (Bluszczynk-Bebenek et al., 2020). Another international study carried out with 312 adults during the lockdown found that the body weight of 46.8% of the interviewees increased significantly, with bad eating habits as an influencing factor. Overweight individuals are at increased risk of developing chronic or acute diseases, including infection and complications by COVID-19 (Sidor and Rzymski, 2020; Chowdhury et al., 2021).

The increase in the frequency of consumption of unhealthy foods, observed in this research, calls attention to possible damage to health, such as changes in body weight and an increase in the occurrence of chronic non-communicable diseases. Suppose there was an increase in consumption when one explores the different food groups. In that case, it is possible to observe that the phenomenon of change in food habits at the same time that favors the consumption of some unhealthy foods such as industrialized ones also allowed them to increase the consumption of fruits and vegetables, reflecting the likely need for the act of cooking. According to a survey carried out by Pérez-Rodrigo et al. (2020), 62.5% of the participants declared that they cook at home regularly and 14.1% more said that they cook regularly during this pandemic period. Such changes at home may suggest a more significant concern regarding food consumption.

The ambiguity of the results of this study was reported in another Brazilian study where the implications of the pandemic are linked to sudden changes in lifestyle and which can directly reflect on diet and changing habits, which can be either positive or negative (Duras et al., 2020). The number of teachers’ absences due to health problems in recent years has increased significantly (Antunes, 2014). Negative behaviors in eating and low physical activity practice have also been found more frequently in this population and different regions of the country (Rocha et al., 2015), demonstrating the relevance and the need for further studies on public school teachers.

This study has a limitation as it utilized a self-reported questionnaire to assess lifestyle changes, with the possibility of selection and memory biases, transversality, and assessment of food consumption by healthy and unhealthy food groups. However, the study’s strengths stand out, such as the robust sample population, well distributed in the different regions of the state and essential support from SEE-MG, the analysis method through the regression of multinomial logistics, score, and bidirectional evaluation.

It is hoped that the results presented in this study can be used in future research to contribute to the development of strategies that assist in promoting teachers’ health, especially after this period of the COVID-19 pandemic.

5. Conclusion

The COVID-19 pandemic and variables related to sociodemographic characteristics, occupational profile, general health, and lifestyle were bi-directionally associated with changes in teachers’ food consumption. The findings of this study showed an increase in the consumption of all food groups, except for beans. Harmful and beneficial effects of social isolation were observed, requiring further studies aimed at the health and nutrition of teachers in this particular period.

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CRediT authorship contribution statement

Sabrina Alves Durães: Investigation, Formal analysis, Data curation, Writing – original draft. Georgia das Graças Pena: Writing – original draft. Luciana Nerí Nobre: Writing – original draft. Audrey Handyara Bicalho: Writing – original draft. Rosangela Ramos Veloso Silva: Supervision, Project administration, Investigation. Desirée San‐t’Ana Haikai: Supervision, Project administration, Investigation. Carolina Amaral Oliveira Rodrigues: Writing – original draft. Marie Fagundes Silveira: Writing – review & editing. Maria Fernanda Santos Figueiredo Brito: Writing – review & editing. Vitor Fonseca Bastos: Writing – original draft. Lucineia de Pinho: Supervision, Project administration, Investigation, Formal analysis, Data curation, Writing – original draft, Writing – review & editing, All authors read and approved the final manuscript.
Declaration of competing interest
None to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.obeity.2021.100366.

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