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Association between lifestyle and emotional aspects of food consumption during the COVID-19 pandemic

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Abstract
Background and aims: Adequate nutrition during infectious outbreaks require a personal management strategy, especially when there are emotional factors involved. To evaluate the association between lifestyle and emotional aspects of food consumption during the pandemic COVID-19.

Methods and results: Cross-sectional study using online self-applied questionnaire with 15,372 active schoolteachers who worked in primary education (kindergarten, elementary and high school) from Minas Gerais, Brazil. Poisson Regression model with robust variance was used to determine the association between lifestyle and emotional aspects and food consumption. Greater adherence to the healthy consumption profile showed a statistically significant association with decreased weight (PR = 1.58; p = 0.000), decreased physical activity (PR = 1.27; p = 0.000), reduced income, (PR = 1.26; p = 0.000), reduced alcohol consumption (PR = 1.22; p = 0.000), and changes in mental health (PR = 1.19; p = 0.000). Unhealthy consumption profile was significantly correlated with weight gain (PR = 1.54; p = 0.000), consuming more alcohol, or started drinking during the pandemic (PR = 1.44; p = 0.000), increased physical activity (PR = 1.43; p = 0.000); increased cigarette consumption (PR = 1.17; p = 0.000), and being a younger adult (PR = 1.17; p = 0.000).

Conclusions: The COVID-19 pandemic influenced the food profiles of basic education teachers in the Minas Gerais state education system in a bidirectional manner, favoring the practice of consuming healthy or unhealthy foods.

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1. Introduction

The novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the etiologic agent of COVID-19 [1–3]. Its high pathogenicity has resulted in a pandemic [4,5], causing a state of emergency worldwide [6]. Due to a lack of definite treatment, non-pharmacological interventions such as isolation, quarantine, and social distancing have been recommended worldwide to reduce the spread of this disease [7].

Mandatory social distancing prevents and mitigates the spread of the virus [8,9]; however, it has been noted that it amplifies and worsens various stressors. The pandemic’s influence [4,10] on population health caused a sudden involuntary change in behavior [3] due to these stressors being triggered.

The harmful consequences of non-pharmacological interventions [6] permeate the physical sphere and undermine people’s mental well-being [11]. Moreover, the incidence of mental health disorders, such as depression and anxiety, has increased [12], manifesting symptoms such as boredom, stress, fear, panic [7,10], and mood changes [1]. These symptoms, in turn, influence lifestyle behaviors and food choices [6,13].

While some are unaffected by the pandemic and improve their lifestyle habits [3], others experience a significant personal burden [14]. Studies on the pandemic’s consequences on lifestyle have shown an influence on socialization [3,14], increased screen time [4,6,9,15], physical inactivity [1,4,6,9,15,16], weight gain [1,3,8,15,17], increased consumption of alcoholic beverages [1,8,9,15,17], smoking [1,3,8,15], and dysfunctional eating habits, such as excessive eating and drinking [18], with a focus on foods that are sources of refined carbohydrates, high glycemic index and calorie density.

Adequate nutrition during infectious outbreaks requires a personal management strategy [19], especially when there are emotional factors involved. Natural and minimally processed foods have a positive impact on depression scores [11], examples of which include fruits, vegetables, and whole grains [20], which are rich in antioxidants, phenolic compounds, fiber, vitamins, minerals, and polyunsaturated fatty acids [4,13], accompanied by moderate intake of poultry, eggs, and dairy products, and occasionally red meat [21]. In contrast, a diet rich in simple sugars and saturated fat, and low in fiber has been associated with modulation of cytokine gene expression, which is correlated with inflammatory processes. These expressions are triggered by hormonal, neuronal, and inflammatory pathways that connect the immune system and the intestinal microbiome to brain functions, thereby influencing mood, depressive symptoms, and hunger [13].

Although several studies have reported the consequences of COVID-19 on lifestyle, its effect on teachers has not been thoroughly investigated. During the pandemic, teachers faced an overload of demands on a personal and professional level, and this may have compromised not only their performance at work and the students’ learning, but also their lifestyle practices, such as food consumption. Considering these aspects, this study aimed to identify the association between lifestyle and the emotional aspects of food consumption in the state network of teachers from Minas Gerais, Brazil, during the COVID-19 pandemic.

2. Methods

2.1. Study design and participants

In this cross-sectional epidemiological study, we evaluated the teachers who taught primary education (kindergarten, elementary and high school) at state schools in Minas Gerais, Brazil, from August to September 2020. During this period, Brazil and Minas Gerais were experiencing mandatory social distancing due to the COVID-19 pandemic. This study was part of the ProSMoc Project entitled “Health and work conditions among teachers from the state education network of the state of Minas Gerais in the COVID-19 pandemic”.

According to the Epidemiological Bulletin of the Minas Gerais State Health Department [22], from March to September 2020, 295,169 (1.4%) people in Minas Gerais tested positive for this disease, among which 7360 (0.034%) died. More than 70% of those who died were aged >60 years and suffered from chronic comorbid diseases. The case fatality rate was 2.5%.

A formula based on the prevalence of disease or event, equal to 50%, was used as a calculation, with an infinite and duplicated population (Deff = 2) because the sample comprised of clusters and an increase of 20% in the sample size to compensate for possible losses. Data from at least 2564 subjects was estimated to ensure the proportionality of teachers in the state of Minas Gerais.

Participants independently completed an anonymous online questionnaire and explicitly agreed to participate in the survey. Anonymity was guaranteed by the platform, with no way to link participants’ email addresses to their responses. To avoid automatic filling of the survey form, a reCAPTCHA was used which prevented a form from being answered by a robot.

The inclusion criteria were teachers who worked in a teaching role in primary education in 2020 within the state school system in Minas Gerais, Brazil, of both sexes, who had internet access and signed the written consent form to participate in the research. The exclusion criteria were teachers currently not practicing their profession including retirees, and those with incomplete questionnaires. The study protocol was approved by the Human Research Ethics Committee of the State University of Montes Claros (Protocol # 4.200.389/2020).

2.2. Questionnaire

The questionnaire was built on the Google Forms survey management application (Google LLC; Menlo Park, CA, USA), a free tool that allows for the collection of information through a customized survey or questionnaire. The information was automatically linked to a Microsoft® Excel® spreadsheet (Microsoft Corporation; Redmond,
WA, USA), which ultimately contained the responses of the participants. The questionnaire included 144 questions related to sociodemographic variables, working conditions, overall health, and lifestyle. Some questions solicited responses before and during the pandemic for the same scenario. The invitation to participate in the research and the questionnaire were sent to teachers by email sent by the State Secretariat of Education of Minas Gerais.

### 2.3. Variables

A validated questionnaire used in a Brazilian population-based survey, called Vigilância de Fatores de Risco e Proteção para Doenças Crônicas não Transmissíveis por Inquérito Telefônico (VIGITEL - Risk Factor Surveillance for Non-Transmissible Chronic Diseases by Telephone Survey), was used to evaluate food consumption [23]. The questionnaire had good reproducibility and adequate validity for most of the indicators evaluated [23].

The dependent variable “food consumption profile” assessed in this study was defined as the changes in the consumption frequencies of healthy foods (vegetables, fruits, legumes, and whole grain products) and unhealthy foods (processed meats, fast foods, snack packs, sweets, soft drinks, and artificial juices) by comparing the periods before and during the pandemic.

This profile was created in three stages: 1) calculation of the average consumption frequencies of healthy and unhealthy foods (obtained by adding the frequencies and dividing by the number of foods in the group) for the periods before and during the pandemic; 2) recategorization of the groups; and 3) identification of the food consumption profile.

In the first stage, after obtaining the average values, the differences between consumption during and before the pandemic were calculated. For the healthy food group, the value obtained from this difference was categorized as “code 0” if there was an increase in the consumption frequency, “code 1” if there was no change, and “code 2” if there was a decrease. For the unhealthy group, “code 0” indicated decreased consumption frequency, “code 1” indicated no change, and “code 2” indicated increased consumption frequency.

Thus, a healthy profile was adopted when healthy and unhealthy food consumption were both categorized as (0), healthy and unhealthy food consumption was categorized as (0) and (1), respectively, or healthy and unhealthy food consumption was categorized as (1) and (0), respectively.

An unhealthy profile was adopted when healthy and unhealthy food consumption was categorized as (0) and (2), respectively; or healthy and unhealthy food consumption was categorized as (1) and (2), respectively; or healthy and unhealthy food consumption was categorized as (2) and (0), respectively; healthy and unhealthy food consumption was categorized as (2) and (1), respectively; healthy and unhealthy food consumption were both categorized as (2).

An unaltered profile, on the other hand, occurred when the change in consumption of healthy and unhealthy foods was categorized as (1).

The independent variables evaluated included sociodemographic, behavioral, and stressful conditions. For data analysis, the variables were categorized according to the following: Sociodemographic variables included sex, age in years (≤43 years and ≥43 years), income during the pandemic (the same or increased, decreased, or lost income; using the current minimum wage at the time of data collection of R$ 1.045.00/month), number of children (do not have children, 1 or 2 and 3 or more), and the number of residents per household (1, 2 to 4, and 5 or more); behavioral variables included changes in alcohol consumption (does not consume or no change, not currently drinking or drinking less, and consuming more or started to drink), changes in cigarette consumption, physical activity, and body weight (did not change, decrease, or increase).

Regarding the stressful conditions, variables included being part of the high-risk group for COVID-19 (presence of any of the following: age ≥60 years and diagnosed with comorbid conditions like hypertension, diabetes, heart disease, obesity, autoimmune disease, chronic respiratory diseases, or being in an immunocompromised state), separated from spouse during the pandemic; family member, close friend, or co-worker experiencing severe symptoms of COVID-19 or death due to COVID-19; and if there was a change in mental health; the parameters under these variables are answered with Yes or No.

The questions that generated the variable change in mental health were positive responses to questions about anxiety and nervousness, sadness, and depression, psychological or psychiatric monitoring during the pandemic, and a medical diagnosis of anxiety or depression during the COVID-19 pandemic, with corresponding negative responses for the same questions before the pandemic.

Notably, for this study, we considered the responses from both time periods (before and during the pandemic) when evaluating the changes in the variables mentioned above.

### 2.4. Statistical analysis

The variables were analyzed using descriptive statistics, and the results are presented as simple (n) and relative (%) frequencies. The chi-square test was used to verify the association between the food consumption profile and independent variables. Univariate and multivariate binary Poisson regression analyses were performed to analyze the factors that influenced the likelihood of changes in the food consumption profile during the pandemic.

The results of the Poisson regression analyses are expressed as gross or adjusted prevalence ratios (PRs), 95% confidence intervals (95% CIs), and p-values. To assess the quality of the model's fit, Pearson's chi-square proportion test value was divided by the degrees of freedom [24]. The model is considered well-adjusted if there is no
overdispersion, and for this reason, this proportion will be close to 1. For all analyses, statistical significance was set at $p \leq 0.05$. Analyses were performed using the Statistical Package for the Social Sciences software (version 18.0; IBM Corporation, NY, USA).

3. Results

The questionnaire was completed by 15,641 teachers from the state school system in Minas Gerais. Of these, questionnaires from 269 individuals were excluded from the analysis, as 246 were answered by pregnant women and 23 did not contain complete information, resulting in a final sample of 15,372 questionnaires. The emotional aspects, lifestyle, food consumption, and sociodemographic characteristics of the participants are shown in Table 1.

Table 1 shows that the majority of the participants were women (81.8%), were part of the group at risk for COVID-19 (65.0%), had one to two children (59.1%), gained weight during the pandemic (58.1%), and were younger adults (52.7%). More participants adopted an unhealthy food consumption profile (41.3%), and 35.8% reported changes in mental health. A small amount reported an increased consumption of alcoholic beverages (7.5%) and cigarettes (2.6%).

Table 2 shows the distribution of participants according to the food consumption profiles practiced during the pandemic. Except for separation from spouse during the pandemic and the number of residents in the home, all assessed variables differed statistically ($p$-values) between the periods studied according to the food consumption profiles.

Greater adherence to the healthy consumption profile showed a statistically significant association with several of the independent variables analyzed; however, the ones that had the greatest impact were decreased weight (PR = 1.58; $p = 0.000$), decreased physical activity (PR = 1.27; $p = 0.000$), reduced physical activity (PR = 1.26; $p = 0.000$), reduced alcohol consumption (PR = 1.22; $p = 0.000$), and changes in mental health (PR = 1.19; $p = 0.000$) (Table 3).

Similar to the healthy consumption profile, the unhealthy profile was significantly correlated with several of the independent variables analyzed; however, the ones that impacted this profile the most were weight gain (PR = 1.54; $p = 0.000$), increased alcohol consumption or initiation of alcohol usage during the pandemic (PR = 1.44; $p = 0.000$), increased physical activity (PR = 1.43; $p = 0.000$), increased cigarette consumption (PR = 1.17; $p = 0.000$), and being a younger adult (PR = 1.17; $p = 0.000$) (Table 4).

4. Discussion

This research was conducted during the first six months of the COVID-19 pandemic, and the results indicate that the pandemic changed teachers’ lifestyles, psychological aspects, and food consumption profiles.

Among the participants, 14% reported consuming predominantly healthy foods, while 41.3% reported consuming unhealthy foods. These results differ from studies that

| Table 1 | Sociodemographic characteristics, lifestyle, food consumption, and emotional aspects of the participants. |
|---------|---------------------------------------------------------------------------------------------------|
| Variables evaluated | n | % |
| Sex | | |
| Female | 12,568 | 81.8 |
| Male | 2804 | 18.2 |
| Age (years) | | |
| ≤43 | 8094 | 52.7 |
| ‘43 | 7278 | 47.3 |
| Income during the pandemic | | |
| The same or increased | 9098 | 59.2 |
| Decreased or lost income | 6274 | 40.8 |
| Separated during the pandemic | | |
| No | 12,137 | 79.0 |
| I have no spouse | 2890 | 18.8 |
| Yes | 345 | 2.2 |
| Number of children | | |
| Do not have children | 4181 | 27.2 |
| 1 or 2 | 9081 | 59.1 |
| 3 or more | 2110 | 13.7 |
| Number of residents per household | | |
| 1 | 1019 | 6.6 |
| 2 to 4 | 12,553 | 81.7 |
| 5 or more | 1800 | 11.7 |
| It is part of the risk group for COVID-19 | | |
| Yes | 9992 | 65.0 |
| No | 5380 | 35.0 |
| Any family member, close friend, or co-worker developed severe symptoms of COVID-19 | | |
| Yes | 5540 | 36.0 |
| No | 9832 | 64.0 |
| Any family member, close friend, or co-worker died because of COVID-19 | | |
| Yes | 3151 | 20.5 |
| No | 12,221 | 79.5 |
| Changes in alcohol consumption during the pandemic | | |
| Does not consume or no change | 11,036 | 71.8 |
| Not currently drinking or drinking less | 3185 | 20.7 |
| Consuming more or started to drink | 1151 | 7.5 |
| Changes in cigarette consumption during the pandemic | | |
| Did not change | 14,885 | 96.8 |
| Decreased | 81 | 0.5 |
| Increased | 406 | 2.6 |
| Changes in physical activity during the pandemic | | |
| Did not change | 7835 | 51.0 |
| Decreased | 5028 | 32.7 |
| Increased | 2509 | 16.3 |
| Changes in body weight during the pandemic | | |
| Did not change | 4838 | 31.5 |
| Decreased | 1610 | 10.5 |
| Increased | 8924 | 58.1 |
| Changes in food consumption | | |
| Increased consumption of healthy food | 2145 | 14.0 |
| Did not change | 6871 | 44.7 |
| Increased consumption of unhealthy food | 6356 | 41.3 |
| Change in mental health | | |
| Yes | 5500 | 35.8 |
| No | 9872 | 64.2 |
observed positive changes in food intake during the pandemic, in which 57.2% of participants opted for fresh foods and only 25.6% for fast foods [1], while 34% and 19% perceived an improvement and worsening in diet quality, respectively [16].

Another study conducted on the Brazilian population during the first months of the pandemic showed that there was a favorable change in the participants, identified by the increased consumption of healthy food (vegetables, fruits, and legumes) and a minimal change in the indicators of unhealthy eating during the pandemic, except for in the North and Northeast regions [25].

Several changes were initiated in the professional lives of many workers, especially the teachers. Aside from restructuring the act of staying home from being associated with pleasure and relaxation into the extension of the professional environment that needs to be balanced with the domestic life, teachers had to deal with a lack of privacy, extended working hours, lack of infrastructure and skills with electronic resources, the need for the

Table 2  Food consumption profile during the COVID-19 pandemic according to independent variables.

| Variables evaluated                          | Food consumption profile during the COVID-19 pandemic | p-value* |
|---------------------------------------------|-----------------------------------------------------|----------|
|                                             | Maintained consumption | Healthy consumption | Unhealthy consumption |
| Sex                                         | Female 5529 (80.5)      | 1743 (81.3)         | 5286 (83.3)           | 0.000                |
|                                             | Male 1342 (19.5)        | 402 (18.7)          | 1060 (16.7)           |                      |
| Age (years)                                 | <43 3284 (47.8)         | 1121 (52.3)         | 3689 (58.0)           | 0.000                |
|                                             | ≥43 3587 (52.2)         | 1024 (47.7)         | 2667 (42.0)           |                      |
| Income during the pandemic                  | The same or increased 4351 (63.3) | 1159 (54.0)       | 3588 (56.5)           | 0.000                |
|                                             | Decreased or lost income 2520 (36.7) | 986 (46.0)       | 2768 (43.5)           |                      |
| Separated from spouse during the pandemic   | No 5444 (79.2)          | 1672 (77.9)         | 5021 (79.0)           | 0.000                |
|                                             | Yes 150 (2.2)           | 50 (2.3)            | 145 (2.3)             | 0.786                |
| Number of children                          | Do not have children 1720 (25.0) | 604 (28.2)         | 1857 (29.2)           | 0.000                |
|                                             | 1 or 2 4124 (60.0)     | 1246 (58.1)         | 3711 (58.4)           |                      |
|                                             | 3 or more 1027 (14.9)  | 295 (13.8)          | 788 (12.4)            |                      |
| Number of residents per household           | 1 440 (6.4)             | 139 (6.5)           | 440 (6.9)             | 0.000                |
|                                             | 2 to 4 5623 (81.8)     | 1735 (80.9)         | 5195 (81.7)           |                      |
|                                             | 5 or more 808 (11.8)   | 271 (12.6)          | 721 (11.3)            | 0.417                |
| It is part of the high-risk group for COVID-19 | Yes 4584 (66.7) | 1348 (62.8)       | 4060 (63.9)           | 0.000                |
|                                             | No 2287 (33.3)         | 797 (37.2)          | 2296 (36.1)           |                      |
| Any family member, close friend, or co-worker developed severe symptoms of COVID-19 | Yes 4680 (68.1) | 1316 (61.4)       | 3836 (60.4)           | 0.000                |
|                                             | No 2191 (31.9)         | 829 (38.6)          | 2520 (39.6)           |                      |
| Any family member, close friend, or co-worker died because of COVID-19 | Yes 1218 (17.7) | 481 (22.4)       | 1452 (22.8)           | 0.000                |
|                                             | No 5653 (82.3)         | 1664 (77.6)         | 4004 (77.2)           |                      |
| Changes in alcohol consumption during the pandemic | Does not consume or no change 5310 (77.3) | 1512 (70.5)       | 4214 (66.3)           | 0.000                |
|                                             | Not currently drinking or drinking less 1307 (19.0) | 516 (24.1)         | 1362 (21.4)           |                      |
|                                             | Consuming more or started to drink 254 (3.7) | 117 (5.5)          | 780 (12.3)            |                      |
| Changes in cigarette consumption during the pandemic | Did not change 6711 (97.7) | 2087 (97.3)       | 6084 (95.7)           | 0.000                |
|                                             | Decreased 33 (0.5)     | 13 (0.6)            | 35 (0.6)              |                      |
|                                             | Increased 127 (1.8)    | 45 (2.1)            | 234 (3.7)             |                      |
| Changes in physical activity during the pandemic | Did not change 4083 (59.4) | 1073 (50.0)       | 2679 (42.1)           | 0.000                |
|                                             | Decreased 1907 (27.8)  | 773 (36.0)          | 2348 (36.9)           |                      |
|                                             | Increased 881 (12.8)   | 299 (13.9)          | 1329 (20.9)           |                      |
| Changes in body weight during the pandemic  | Did not change 2837 (41.3) | 639 (29.8)         | 1362 (21.4)           | 0.000                |
|                                             | Decreased 622 (9.1)    | 290 (13.5)          | 698 (11.0)            |                      |
|                                             | Increased 3471 (49.7)  | 1216 (56.7)         | 4296 (67.6)           |                      |
| Change in mental health                     | Yes 4749 (69.1)        | 1322 (61.6)         | 3801 (58.8)           | 0.000                |
|                                             | No 2122 (30.9)         | 823 (38.4)          | 2555 (40.2)           |                      |

*p-value obtained by the chi-square test.
reformulation of didactics, and, in many cases, lack of support for the adequate improvement of pedagogical practices and internet capabilities. These conditions have simultaneous oppressive potential and promote intense emotions [18], which directly correlate with our findings that changes in mental health are found in more than a third of teachers (35.8%).

Experiencing stressful situations can lead to both positive and negative behavioral changes. Regarding eating behavior, it is common to increase the consumption of foods rich in energy, foods containing a high amount of fats and/or sugars, which are present in fast foods, sweets, soft drinks, and other ultra-processed products [26–29]. The increased consumption of these foods is rationalized

| Variables                               | Healthy consumption vs. Not changed | Healthy consumption vs. Not changed |
|-----------------------------------------|-------------------------------------|-------------------------------------|
|                                         | Gross PR* (95% CI) | p-value | Adjusted PR* (95% CI) | p-value |
| **Sex**                                 |                       |         |                       |         |
| Female                                  | 1                     |         |                       |         |
| Male                                    | 0.96 (0.87; 1.06)     | 0.420   |                       |         |
| **Age (years)**                         |                       |         |                       |         |
| ≤43                                     | 1.15 (1.06; 1.23)     | 0.000   | 1.11 (1.03; 1.20)     | 0.009   |
| >43                                     | 1                     |         | 1                      |         |
| **Income during the pandemic**          |                       |         |                       |         |
| The same or increased                   |                       |         |                       |         |
| Decreased or lost income                | 1.34 (1.24; 1.44)     | 0.000   | 1.26 (1.17; 1.36)     | 0.000   |
| **Separated from spouse during the pandemic** |                       |         |                       |         |
| No                                      | 1                     |         |                       |         |
| Yes                                     | 1.06 (0.96; 1.16)     | 0.225   |                       |         |
| **Number of children**                  |                       |         |                       |         |
| Do not have children                    | 1                     |         |                       |         |
| 1 or 2                                  | 0.89 (0.82; 0.97)     | 0.008   | 0.91 (0.84; 0.99)     | 0.033   |
| 3 or more                               | 0.86 (0.76; 0.97)     | 0.014   | 0.91 (0.80; 1.03)     | 0.143   |
| **Number of residents per household**   |                       |         |                       |         |
| 1                                       | 1                     |         |                       |         |
| 2 to 4                                  | 0.98 (0.84; 1.14)     | 0.815   |                       |         |
| 5 or more                               | 1.05 (0.88; 1.25)     | 0.619   |                       |         |
| **It is part of the high-risk group for COVID-19** |                       |         |                       |         |
| Yes                                     | 0.88 (0.82; 0.95)     | 0.001   | 0.89 (0.82; 0.96)     | 0.003   |
| No                                      | 1                     |         | 1                      |         |
| **Any family member, close friend, or co-worker developed severe symptoms of COVID-19** |                       |         |                       |         |
| Yes                                     | 1.24 (1.14; 1.36)     | 0.000   | 1.08 (0.97; 1.19)     | 0.143   |
| No                                      | 1                     |         | 1                      |         |
| **Changes in alcohol consumption during the pandemic** |                       |         |                       |         |
| Does not consume or no change           | 1                     |         |                       |         |
| Not currently drinking or drinking less | 1.28 (1.17; 1.39)     | 0.000   | 1.22 (1.12; 1.32)     | 0.000   |
| Consuming more or started to drink      | 1.42 (1.22; 1.66)     | 0.000   | 1.21 (1.03; 1.41)     | 0.019   |
| **Changes in cigarette consumption during the pandemic** |                       |         |                       |         |
| Did not change                          | 1                     |         |                       |         |
| Decreased                               | 1.19 (0.75; 1.89)     | 0.458   |                       |         |
| Increased                               | 1.10 (0.86; 1.42)     | 0.449   |                       |         |
| **Changes in physical activity during the pandemic** |                       |         |                       |         |
| Did not change                          | 1                     |         |                       |         |
| Decreased                               | 1.39 (1.28; 1.50)     | 0.000   | 1.27 (1.17; 1.38)     | 0.000   |
| Increased                               | 1.22 (1.09; 1.36)     | 0.001   | 1.15 (1.03; 1.28)     | 0.014   |
| **Changes in body weight during the pandemic** |                       |         |                       |         |
| Did not change                          | 1                     |         |                       |         |
| Decreased                               | 1.73 (1.54; 1.95)     | 0.000   | 1.58 (1.40; 1.78)     | 0.000   |
| Increased                               | 1.43 (1.31; 1.56)     | 0.000   | 1.30 (1.19; 1.42)     | 0.000   |
| **Change in mental health**             |                       |         |                       |         |
| Yes                                     | 1                     |         | 1                      |         |
| No                                      | 1.28 (1.19; 1.38)     | 0.000   | 1.19 (1.10; 1.28)     | 0.000   |

Model adjustment parameters: $X^2 = 6853.58$ and value of $X^2$degree of freedom = 0.761. *Prevalence ration.
because they positively affect mood by increasing the production of serotonin and dopamine [30]. With social distancing, the ability to buy food may represent the only freedom granted during this period, amplifying the relationship between food and emotion thus inhibiting individuals from restricting their food intake [10].

Opting for obesogenic foods, such as comfort foods and eating more meals, positively correlates with emotional eating [31], defined as the impulsive consumption of food resulting from emotional triggers, such as stress, boredom, and negative thinking bias [10]. This practice is greater among women because they have a higher prevalence of anxiety and depression [10,31].

The results of this study corroborate these findings. Our respondents were primarily women with increased frequency of the consumption of unhealthy foods (41.3%) and

### Table 4: Prevalence of unhealthy food consumption profile during the COVID-19 pandemic, crude and adjusted analysis, according to independent variables.

| Variables evaluated | Comparison unhealthy vs. Not changed | Comparison unhealthy vs. Not changed |
|---------------------|---------------------------------------|---------------------------------------|
|                     | Gross PR (95% CI)                      | Adjusted PR (95% CI)                   |
|                     | p-value                               | p-value                               |
| **Sex**             |                                       |                                       |
| Feminine            | 1                                     | 1                                     |
| Male                | 0.90 (0.86; 0.95)                      | 0.88 (0.84; 0.93)                      |
| Age (years)         |                                       |                                       |
| ≤43                 | 1.24 (1.19; 1.29)                      | 1.17 (1.13; 1.21)                      |
| >43                 | 1                                     | 1                                     |
| Income during the pandemic |                                       |                                       |
| The same or increased | 1                                      | –                                      |
| Decreased or lost income | 1.16 (1.12; 1.20)                     | 1.09 (1.06; 1.13)                      |
| **Separated from spouse during the pandemic** |                                       |                                       |
| No                  | 1                                     |                                       |
| 1                   | 1.00 (0.96; 1.05)                      | 0.87                                  |
| Yes                 | 1.02 (0.91; 1.15)                      | 0.68                                  |
| **Number of children** |                                       |                                       |
| Do not have children | 1                                     |                                       |
| 1 or 2              | 0.91 (0.88; 0.95)                      | 0.95 (0.91; 0.98)                      |
| 3 or more           | 0.84 (0.79; 0.89)                      | 0.92 (0.86; 0.98)                      |
| **Number of residents per household** |                                       |                                       |
| 1                   | 1                                     |                                       |
| 2 to 4              | 0.96 (0.89; 1.03)                      | 0.25                                  |
| 5 or more           | 0.94 (0.87; 1.03)                      | 0.17                                  |
| It is part of the high-risk group for COVID-19 |                                       |                                       |
| Yes                 | 0.94 (0.90; 0.97)                      | 0.93 (0.90; 0.96)                      |
| No                  | 1                                     | 1                                     |
| Any family member, close friend, or co-worker developed severe symptoms of COVID-19 |                                       |                                       |
| Yes                 | 1.19 (1.15; 1.23)                      | 1.10 (1.06; 1.14)                      |
| No                  | 1                                     | 1                                     |
| Any family member, close friend, or co-worker died because of COVID-19 |                                       |                                       |
| Yes                 | 1.17 (1.12; 1.22)                      | 1.04 (0.99; 1.09)                      |
| No                  | 1                                     | 1                                     |
| Changes in alcohol consumption during the pandemic |                                       |                                       |
| Does not consume or no change | 1                                      | 1                                      |
| Not currently drinking or drinking less | 1.15 (1.10; 1.20)                     | 1.10 (1.06; 1.15)                      |
| Consuming more or started to drink | 1.71 (1.64; 1.78)                     | 1.44 (1.38; 1.51)                      |
| Changes in cigarette consumption during the pandemic |                                       |                                       |
| Did not change | 1                                      | 1                                      |
| Decreased | 1.08 (0.86; 1.36)                      | 1.05 (0.84; 1.33)                      |
| Increased | 1.36 (1.26; 1.47)                      | 1.17 (1.08; 1.26)                      |
| Changes in physical activity during the pandemic |                                       |                                       |
| Did not change | 1                                      | 1                                      |
| Decreased | 1.39 (1.34; 1.45)                      | 1.23 (1.18; 1.28)                      |
| Increased | 1.52 (1.45; 1.59)                      | 1.43 (1.37; 1.50)                      |
| Changes in body weight during the pandemic |                                       |                                       |
| Did not change | 1                                      | 1                                      |
| Decreased | 1.63 (1.52; 1.74)                      | 1.45 (1.36; 1.55)                      |
| Increased | 1.72 (1.64; 1.80)                      | 1.54 (1.47; 1.61)                      |
| Change in mental health |                                       |                                       |
| Yes                 | 1                                     | 1                                     |
| No                  | 1.23 (1.19; 1.27)                      | 1.11 (1.07; 1.15)                      |

Model adjustment parameters: $\chi^2 = 13,636.39$ and value of $\chi^2$/degree of freedom = 1032.
weight gain (58.1%), in line with other studies that identified weight gain during the pandemic in 38.8% [1] and 44.5% [15] of respondents.

Remarkably, weight gain among the participants in this study occurred among individuals who adhered to both food consumption profiles, but with a higher prevalence among those who adopted an unhealthy profile.

Of the total sample, 40.8% had decreased income during the pandemic, which can be a contributing factor in the adoption of an unhealthy consumption profile, as addressed in recent research [3,6,15], but was not observed in this study. Adopting a healthy consumption profile may have been a strategy used by teachers to strengthen their immune systems to avoid the deleterious effects of COVID-19 in the event of infection by SARS-CoV-2.

Other studies [6,16,18] have identified that living with a spouse and having children may favor greater the consumption of unhealthy foods, a fact that was not confirmed in this study. These results may indicate that although these teachers had an exacerbation of their routine professional chores, they may be more concerned with the health and well-being of their families and the appropriate development of their own children.

The results of this study indicate a worrisome reality: a high percentage of teachers (65%) belong to the high-risk group for COVID-19. Being part of the high-risk group was a protective factor for both consumption profiles in this study; however, it exhibited greater protection for the healthy profile. This may be explained by the frequent release of the results of studies confirming that the most critical cases of COVID-19 occur in the elderly and those with cardiovascular and pulmonary disease, diabetes, or obesity, and that obesity seems to increase the chances of severe symptoms and a negative prognosis [30,32,33].

Experiencing stressful conditions such as having a family member, close friend, or co-worker with severe symptoms of COVID-19 (36%) or who expired due to COVID-19 (20.5%), contributed to 14% and 8% of teachers adopting a healthy food consumption profile, respectively. It is noteworthy, that these conditions can generate an increase in fear and anxiety and contribute to unhealthy lifestyle behaviors such as a reduction in physical activity. Among teachers, 16.3% and 37.2% reported an increase and decrease in physical activity, respectively. Higher values of reductions in physical activity were recorded by other researchers [6,15,16], who observed a reduction in physical activity in 43%–68% of the participants. Furthermore, a survey [3] identified increased physical activity in 38.3% of participants.

This study showed that increased intake of alcohol and cigarettes during the pandemic was associated with unhealthy eating practices. It is common to increase the use of alcoholic beverages, snacks, and fast foods, which may have occurred with the participants in this study. Other studies have also evaluated changes in lifestyle and the effects on food consumption during the pandemic [6,34]. However, these studies did not evaluate teachers.

To the best of our knowledge, this study is the first to assess the influence of the COVID-19 pandemic on the food consumption profiles of primary education teachers in a state network. Other studies have evaluated general populations [16], children [35], adolescents [36], university students [37], and health professionals [38]. Furthermore, the data collection method remotely increased the research scope, giving visibility to a greater diversity of contexts and manifestations of numerous respondents regarding the blockade effects, which, in addition to ensuring anonymity, reduced the bias of social desirability [4].

This study has some limitations. First, we used an online survey; second, a previous publication discussed this issue [39]. However, considering that COVID-19 is relatively new [40], online surveys offer excellent opportunities to collect real-time data to monitor and understand this disease in various scenarios [41]. Third, self-report bias cannot be excluded; however, this bias is shared with all the studies that have used online research during the pandemic. Furthermore, psychological changes may have influenced the responses, personal motivation, or dissatisfaction due to working conditions. Finally, establishing causal relationships was impossible because this was a cross-sectional study.

In conclusion, the COVID-19 pandemic influenced the food profiles of primary education teachers in the Minas Gerais state education system in a bidirectional manner, favoring the practice of consuming healthy or unhealthy foods. However, the simultaneous association of harmful lifestyle behaviors, such as reduced physical activity, increased intake of alcoholic beverages and cigarettes, and changes in mental health, were not only associated with adherence to an unhealthy diet profile, but also favored weight gain and individual susceptibility to unhealthy outcomes. Maintaining healthy lifestyle behaviors is paramount during this pandemic.

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Declaration of competing interest

None declared.

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