



## Article

# Negative Self-Rated Health and Non-Utilization of University Restaurants Are Associated with Overweight and Obesity among College Students in Brazil

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**Abstract:** The aim of this study was to analyze the factors associated with overweight and obesity in a sample of university students. This was a quantitative, cross-sectional analytical observational study conducted with undergraduate students at the main campus of the Federal University of Acre. The study included a total of 655 students, 58.3% being female and 41.7% male. The overweight was 48.9%, with higher rates among males (53.8%), those aged 30 years and older (76.6%), and those from families with incomes above three minimum wages (57.2%). Obesity was present in 18.2% of students, with higher rates among females (18.8%), those aged 30 years and older (34.2%), and 19.1% among those from families with incomes above three minimum wages. The age group of 30 years and older; non-utilization of the university restaurant; being female; and self-rated health as regular, poor, or very poor emerged as associated factors with overweight in university students in the adjusted final model. The same association pattern for obesity was observed, except for the variable of gender. The findings of this study point to a higher prevalence of overweight and obesity among older university students, those who reported unfavorable self-rated health, and those who reported not consuming meals offered at the UR.

**Keywords:** nutritional surveys; students; overweight; obesity



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## 1. Introduction

Upon embarking on the academic journey, young adults are propelled into a transition that encompasses adapting to new environments and demands, in addition to experiencing greater lifestyle freedom [1]. Along with these changes, others become established as they progress through adolescence and reach university [2]. With the ability to make their own dietary decisions, the choices previously established since childhood face a critical period, which can negatively impact their eating behavior depending on the influences received [3]. These influences can be external, such as family factors, peer pressure, media, socioeconomic and cultural issues, and food environments, or internal, reinforced by pathophysiological, genetic, and emotional aspects, and are directly proportional to the constructs that shape an individual's eating behavior [4]. Moreover, other factors such as age, weight, and height that reflect body composition influence excess weight and the development of non-communicable chronic diseases (NCDs), and this context is concerning when it emerges among the academic population [5].

The excessive consumption of ultra-processed products since adolescence [6], which utilize exclusively industrial processing techniques and include items such as cookies, white bread, sweets, desserts, sugary beverages, processed meats, and fried potatoes or chips, tends to solidify in adulthood [7] and is associated with overweight, cardiovascular diseases, metabolic syndrome, and obesity [8].

Overweight and obesity are characterized by an abnormal or excessive accumulation of fat that poses a health risk [8]. Obesity, in particular, has been increasing among individuals aged 18 and older worldwide over recent years, with 650 million obese adults as of 2016 [9], reaching endemic proportions with an annual mortality rate of over 4 million deaths due to overweight or obesity in 2017, according to the global burden of disease. The prevalence of these diagnoses continues to rise in adults [8].

According to data from the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL), Brazil mirrors the global scenario and its trends, noting variations in the prevalence of overweight in Brazilian capitals and the Federal District from 2006 to 2019 [10,11].

Among students entering the academic community, lifestyle and dietary habits are strongly influenced by the new routine and social relationships [12]. A study observed that among university students from 13 European countries, there was an increase in less healthy lifestyles over a 10-year period [13].

In Brazil, over the last decade, among the university students evaluated, 41.3% were overweight according to body mass index (BMI), and 29.6% had a high percentage of body fat. In the same study, considering the Dietary Guidelines for the Brazilian Population, the average consumption of groups such as sugars and sweets; oils and fats; legumes; and meats and eggs were high, while the consumption of cereals; dairy products; vegetables; and fruits were below the recommended average intake. This suggests a negative and significant correlation, as BMI tends to decrease with increased fruit consumption, while a positive and significant correlation is observed between BMI and the consumption of legumes with cereals, cereals with oils and fats, and oils and fats with sugars and sweets [14].

Educational spaces such as universities can be important health promoters [15]. Although the university restaurants of Brazilian public educational institutions are subsidized by the National Student Assistance Program to support low-income students, rethinking strategies in this scenario is necessary, as there are no national public policies promoting healthy eating in higher education [16]. By monitoring key dietary factors, such as recommending reduced intake of foods high in saturated fats and cholesterol and high glycemic index foods, while encouraging the consumption of whole grains, fruits, and vegetables, meal quality can be improved [17,18]. Thus, it is possible to minimize high obesity rates among young people through early interventions to reduce the global burden of NCDs, particularly among university students [15].

A review study analyzed and discussed a total of 37 articles on the dietary intake of university students [16]. Among the included studies, 8 were conducted in Brazil and had a cross-sectional study design. Overall, the results of both Brazilian and international studies converged on similar conclusions regarding dietary patterns among university students. The findings indicate that most university students adopt inadequate eating behaviors, characterized by a high consumption of fast food, snacks, sweets, soft drinks, and alcoholic beverages, along with a low intake of fruits, vegetables, greens, fish, whole grains, and legumes. The analysis also revealed that the dietary pattern of university students was consistently classified as inadequate, regardless of their field of study or gender. This phenomenon was particularly notable among students who had left their parents' homes and taken responsibility for their own meals [16].

Therefore, sociodemographic, economic, academic, health, and lifestyle factors need to be investigated as strong predictors of the increased prevalence of overweight and obesity among the academic population. Thus, the objective of this study was to analyze the factors associated with overweight and obesity in a sample of Brazilian university students.

## 2. Materials and Methods

This is a quantitative, cross-sectional observational analytical study conducted with undergraduate students from the main campus of the Federal University of Acre (UFAC). The choice of this institution is due to it being the only public university in the area with the highest number of undergraduates and diversity in undergraduate courses.

Acre is one of the states in the northern region of Brazil. It borders Peru, Bolivia, Amazonas, and Rondônia. It covers an area of 164,123.429 km<sup>2</sup> and has 22 municipalities [19]. Its capital, Rio Branco, has a population of 364,756 people [20]. The educational institution where the study was conducted is based in Rio Branco but offers academic activities throughout the state. It is public and free, subsidized by the Federal University of Acre Foundation. In 2023, UFAC had 5401 students enrolled in 37 regular undergraduate courses at the main campus [21].

### 2.1. Study Population

The study population consisted of students enrolled in all undergraduate courses at UFAC's main campus (Rio Branco), aged 18 years or older. The inclusion criteria for this research were: (i) being a student regularly enrolled in an undergraduate course at the Federal University of Acre, main campus; (ii) having internet access; (iii) being 18 years of age or older. Exclusion criteria included pregnant women or those unaware of their pregnancy.

The sample of this study consisted of the total number of respondents invited to participate in the research, thus constituting a non-probabilistic convenience sampling. This technique was adopted to reach the largest number of respondents and to represent various fields of study, regardless of gender, age, or course.

Initially, sensitization was carried out through social networks, in-person dissemination in classrooms, and via email sent to students' institutional emails through course coordination, explaining the characteristics and objective of the research.

### 2.2. Data Collection

Data collection took place between December 2022 and April 2023, using a structured online questionnaire that included socioeconomic, demographic, lifestyle, and health characteristics, utilizing the Google Forms platform. To eliminate or minimize any risks related to the possible identification of participants, the Google Forms account was protected with a complex password and restricted access to the project coordinators. For analysis, the data were kept in a digital file on a password-protected computer, secured with antivirus software, and accessible only to the coordinators.

### 2.3. Variables

The dependent variables were overweight and obesity, obtained through the body mass index (BMI). Self-reported weight (kg) and height (cm) were used, and BMI was determined by calculating the ratio of weight in kilograms divided by the square of height in meters (kg/m<sup>2</sup>). Individuals with a BMI  $\geq 25.0$  kg/m<sup>2</sup> were classified as overweight, and those with a BMI  $\geq 30.0$  kg/m<sup>2</sup> were classified as obese, according to the guidelines of the World Health Organization [22].

The independent variables were sociodemographic characteristics (age, age group; gender; and race/skin color), economic factors (family income in minimum wages and receiving university aid), academic (courses by areas) and lifestyle factors (frequency of meal delivery consumption and use of the university restaurant—UR), and health factors (perceived stress—PSS and self-rated health—SRH). The Brazilian scale by Siqueira Reis et al. was used [23]. For the interpretation of the results obtained through the PSS, no cut-off points were established. Therefore, tertiles were calculated based on the scale scores, classifying participants into three groups: low stress level, moderate stress level, and high stress level. These variables were chosen based on observations from similar studies in the university setting, with a focus on lifestyle and health, considering the pioneering nature of this research in the region and its possible association with overweight and obesity in this population.

For self-declared race/skin color, the classification criteria of the IBGE were used: white, black, brown, indigenous, or yellow. However, considering the distribution of

responses by category and in accordance with the criteria used by the local university, the categorization was simplified to white and non-white [24].

### 2.4. Statistical Analysis

Initially, descriptive statistics were used to characterize the study population. Absolute and relative frequencies of qualitative variables and measures of central tendency for quantitative variables were presented. For the analysis of associated factors, unconditional logistic regression was used. In the binomial logistic regression, variables with a *p*-value < 0.20 were selected as candidates for the multiple model.

In the multiple analysis, the overall model significance was evaluated along with possible confounding effects and collinearity among variables. Variables were retained in the model based on the criteria of a *p*-value < 0.05 (Wald test) or a modification > 10% in the regression coefficient of another independent variable.

In the model fit analyses, the log likelihood test was used to check the overall fit of the model; Nagelkerke’s R<sup>2</sup> was used to evaluate the model’s fit to the data; and the Hosmer–Lemeshow test assessed the degree of fit between observed and estimated probabilities.

The final model selection considered the best fit with the fewest variables and those that remained statistically significant (*p* < 0.05) and biologically plausible. Residual and multicollinearity analyses were performed, and no residuals with undue influence were observed, nor was there correlation between two variables in the final model. Data were analyzed using IBM® SPSS® Statistics 20.0.0 software.

### 2.5. Ethical Guidelines

The project adhered to ethical guidelines according to Resolution 466/2012 of the National Health Council of Brazil and was approved by the Research Ethics Committee of the Federal University of Acre, under opinion 5.740.597 (CAAE: 63466722.0.0000.5010). All participants provided consent through a Free and Informed Consent Form.3.

## 3. Results

### 3.1. Sample Characteristics

Of the 655 eligible participants who responded to the questionnaire, 58.3% were women, 72.8% were between 20 and 29 years old, and the average age was 25.29 years (standard deviation = 7.39). A total of 71.0% self-identified as non-white, and 70.9% reported a family income of up to three minimum wages (MW), as shown in Table 1.

**Table 1.** Bivariate logistic regression of overweight according to sociodemographic, economic, academic, health, and lifestyle variables among university students at the Federal University of Acre. Rio Branco, 2023.

| Total                  |          |      | Overweight |      |        |             |                    |
|------------------------|----------|------|------------|------|--------|-------------|--------------------|
| Variables              | <i>n</i> | %    | <i>n</i>   | %    | OR *** | 95% CI      | <i>p</i> -Value ** |
| <b>Age</b>             | 654      |      |            |      | 1.09   | (1.06–1.12) | <0.001             |
| <b>Age group</b>       |          |      |            |      |        |             |                    |
| 18 to 19 years         | 67       | 10.2 | 16         | 23.9 | 0.37   | (0.21–0.67) | 0.001              |
| 20 to 29 years         | 476      | 72.8 | 218        | 45.8 | 1      |             |                    |
| 30 years and older     | 111      | 17.0 | 85         | 76.6 | 3.87   | (2.41–6.22) | <0.001             |
| <b>Gender</b>          |          |      |            |      |        |             |                    |
| Male                   | 273      | 41.7 | 147        | 53.8 | 1      |             |                    |
| Female                 | 382      | 58.3 | 173        | 45.3 | 0.71   | (0.52–0.97) | 0.031              |
| <b>Race/skin color</b> |          |      |            |      |        |             |                    |
| Non-white              | 457      | 71.0 | 218        | 47.7 | 1      |             |                    |
| White                  | 187      | 29.0 | 98         | 52.4 | 1.21   | (0.86–1.70) | 0.279              |

Table 1. Cont.

| Total   |          |      | Overweight |      |        |              |                    |
|---|----------|------|------------|------|--------|--------------|--------------------|
| Variables                                     | <i>n</i> | %    | <i>n</i>   | %    | OR *** | 95% CI       | <i>p</i> -Value ** |
| <b>Family income *</b>                        |          |      |            |      |        |              |                    |
| Up to 3 MW (minimum wages)                    | 422      | 70.9 | 200        | 47.4 | 1      |              |                    |
| Above 3 MW                                    | 173      | 29.1 | 99         | 57.2 | 1.48   | (1.04–2.12)  | <b>0.030</b>       |
| <b>Receive university aid</b>                 |          |      |            |      |        |              |                    |
| No  | 528      | 81.6 | 260        | 49.2 | 1      |              |                    |
| Yes   | 119      | 18.4 | 55         | 46.2 | 0.89   | (0.59–1.32)  | 0.551              |
| <b>Courses by areas</b>                       |          |      |            |      |        |              |                    |
| Health  | 216      | 33.0 | 100        | 46.3 | 0.81   | (0.56–1.16)  | 0.255              |
| Biological and Natural Sciences               | 122      | 19.0 | 61         | 50.0 | 0.94   | (0.61–1.45)  | 0.778              |
| Exact Sciences                                | 59       | 9.0  | 26         | 44.1 | 0.74   | (0.42–1.31)  | 0.301              |
| Education and Humanities                      | 258      | 39.0 | 133        | 51.6 | 1      |              |                    |
| <b>Self-rated health</b>                      |          |      |            |      |        |              |                    |
| Very good and good                            | 303      | 46.6 | 134        | 44.2 | 1      |              |                    |
| Fair, Poor, and very poor                     | 347      | 53.4 | 183        | 52.7 | 1.40   | (1.03–1.92)  | <b>0.031</b>       |
| <b>Perceived stress (PS)</b>                  |          |      |            |      |        |              |                    |
| Low level of stress                           | 211      | 32.5 | 111        | 52.6 | 1      |              |                    |
| Moderate level of stress                      | 204      | 31.4 | 93         | 45.6 | 0.75   | (0.51–1.11)  | <b>0.153</b>       |
| High level of stress                          | 234      | 36.1 | 115        | 49.1 | 0.87   | (0.60–1.26)  | 0.466              |
| <b>Frequency of meal delivery consumption</b> |          |      |            |      |        |              |                    |
| 1 to 2 days per week                          | 147      | 22.5 | 72         | 49.0 | 1.17   | (0.78–1.75)  | 0.438              |
| 3 to 4 days per week                          | 35       | 5.4  | 24         | 68.6 | 2.66   | (1.25–5.66)  | <b>0.011</b>       |
| 5 or more days per week                       | 7        | 1.1  | 5          | 71.4 | 3.05   | (0.58–16.01) | <b>0.187</b>       |
| Once per fortnight                            | 111      | 17.0 | 56         | 50.5 | 1.24   | (0.80–1.93)  | 0.334              |
| Once per month                                | 83       | 12.7 | 41         | 49.4 | 1.19   | (0.73–1.95)  | 0.484              |
| Almost never or never                         | 271      | 41.4 | 122        | 45.0 | 1      |              |                    |
| <b>UR utilization</b>                         |          |      |            |      |        |              |                    |
| No  | 110      | 16.8 | 71         | 64.5 | 2.16   | (1.41–3.30)  | <b>&lt;0.001</b>   |
| Yes   | 544      | 83.2 | 249        | 45.8 | 1      |              |                    |

Source: Developed by the author, 2023. \* Value corresponding to one minimum wage in Brazil during the data collection period: BRL 1212.00. \*\* Remains for entry into the multivariate model, *p*-value < 0.20 and considering biological plausibility. \*\*\* All reference categories are indicated with OR = 1.

### 3.2. Prevalence of Overweight and Obesity

The frequency of overweight was 48.9%, higher among males (53.8%) compared to females (45.3%), in 76.6% of participants aged 30 years and older, and in those with a family income above three MW (57.2%). High frequencies of overweight were also found among individuals who reported not using the university restaurant (UR) for meals on campus (64.5%) and among those who self-rated their health as fair, poor, or very poor (52.7%), as presented in Table 1.

The frequency of obesity (BMI > 30.0 kg/m<sup>2</sup>) in the study population was 18.2%, being higher among women (18.8%) compared to 17.2% in the male population, in the age group of 30 years and older (34.2%), and among those with a family income above three MW (19.1%). The frequency of obesity in students who reported not using the university restaurant was 30.9%, and in those who rated their health as fair, poor, or very poor, it was 23.6%, Table 2.

**Table 2.** Bivariate logistic regression of obesity according to sociodemographic, economic, academic, health, and lifestyle variables among university students at the Federal University of Acre. Rio Branco, 2023.

| Variables                                     | Total |      | Obesity |      | OR *** | 95% CI       | p-Value ** |
|---|-------|------|---------|------|--------|--------------|------------|
|   | n     | %    | n       | %    |        |              |            |
| <b>Age</b>                                    | 654   |      |         |      | 1.05   | (1.03–1.08)  | <0.001     |
| <b>Age group</b>                              |       |      |         |      |        |              |            |
| 18 to 19 years                                | 67    | 10.2 | 4       | 6.0  | 0.33   | (0.12–0.94)  | 0.039      |
| 20 to 29 years                                | 476   | 72.8 | 76      | 16.0 | 1      |              |            |
| 30 years and older                            | 111   | 17.0 | 38      | 34.2 | 2.74   | (1.72–4.35)  | <0.001     |
| <b>Gender</b>                                 |       |      |         |      |        |              |            |
| Male  | 273   | 41.7 | 47      | 17.2 | 1      |              |            |
| Female  | 382   | 58.3 | 72      | 18.8 | 1.12   | (0.74–1.67)  | 0.593 **   |
| <b>Race/skin color</b>                        |       |      |         |      |        |              |            |
| Non-white                                     | 457   | 71.0 | 81      | 17.7 | 1      |              |            |
| White   | 187   | 29.0 | 35      | 18.7 | 1.08   | (0.69–1.66)  | 0.766      |
| <b>Family income *</b>                        |       |      |         |      |        |              |            |
| Up to 3 MW (minimum wages)                    | 422   | 70.9 | 77      | 18.2 | 1      |              |            |
| Above 3 MW                                    | 173   | 29.1 | 33      | 19.1 | 1.06   | (0.67–1.66)  | 0.813 **   |
| <b>Receive university aid</b>                 |       |      |         |      |        |              |            |
| No  | 528   | 81.6 | 94      | 17.8 | 1      |              |            |
| Yes   | 119   | 18.4 | 21      | 17.6 | 0.99   | (0.59–1.67)  | 0.968      |
| <b>Courses by areas</b>                       |       |      |         |      |        |              |            |
| Health  | 216   | 33.0 | 36      | 16.7 | 0.79   | (0.49–1.28)  | 0.331      |
| Biological and Natural Sciences               | 122   | 19.0 | 22      | 18.0 | 0.87   | (0.50–1.51)  | 0.626      |
| Exact Sciences                                | 59    | 9.0  | 9       | 15.3 | 0.71   | (0.33–1.54)  | 0.391      |
| Education and Humanities                      | 258   | 39.0 | 52      | 20.2 | 1      |              |            |
| <b>Self-rated health</b>                      |       |      |         |      |        |              |            |
| Very good and good                            | 303   | 46.6 | 34      | 11.2 | 1      |              |            |
| Fair, poor, and very poor                     | 347   | 53.4 | 82      | 23.6 | 2.44   | (1.59–3.78)  | <0.001     |
| <b>Perceived stress (PS)</b>                  |       |      |         |      |        |              |            |
| Low level of stress                           | 211   | 32.5 | 31      | 14.7 | 1      |              |            |
| Moderate level of stress                      | 04    | 31.4 | 39      | 19.1 | 1.37   | (0.82–2.30)  | 0.230      |
| High level of stress                          | 234   | 36.1 | 48      | 20.5 | 1.50   | (0.91–2.46)  | 0.110      |
| <b>Frequency of meal delivery consumption</b> |       |      |         |      |        |              |            |
| 1 to 2 days per week                          | 147   | 22.5 | 26      | 17.7 | 1.17   | (0.68–2.00)  | 0.563      |
| 3 to 4 days per week                          | 35    | 5.4  | 12      | 34.3 | 2.85   | (1.31–6.15)  | 0.008      |
| 5 or more days per week                       | 7     | 1.1  | 2       | 28.6 | 2.18   | (0.41–11.61) | 0.361      |
| Once per fortnight                            | 111   | 17.0 | 17      | 15.3 | 0.99   | (0.53–1.82)  | 0.964      |
| Once per month                                | 83    | 12.7 | 20      | 24.1 | 1.73   | (0.95–3.16)  | 0.074      |
| Almost never or never                         | 271   | 41.4 | 42      | 15.5 | 1      |              |            |
| <b>UR utilization</b>                         |       |      |         |      |        |              |            |
| No  | 110   | 16.8 | 34      | 30.9 | 2.42   | (1.52–3.85)  | <0.001     |
| Yes   | 544   | 83.2 | 85      | 15.6 | 1      |              |            |

Source: Developed by the author, 2023. \* Value corresponding to one minimum wage in Brazil during the data collection period: BRL 1212.00. \*\* Remains for entry into the multivariate model,  $p$ -value < 0.20 and considering biological plausibility. \*\*\* All reference categories are indicated with OR = 1.

### 3.3. Factors Associated with Overweight and Obesity

Factors associated with overweight among undergraduate students at UFAC were age group, use of the university restaurant (UR), gender, and self-rated health (Table 3). Regarding age group, overweight showed a negative association in adolescents (18 and 19 years old; OR: 0.36; 95% CI: 0.19–0.66) and a positive association in older adults (30 years and older; OR: 3.64; 95% CI: 2.23–5.93) compared to the age group of 20 to 29 years.

Overweight showed a positive association with students who did not use the UR (OR: 1.69; 95% CI: 1.07–2.66) and self-rated health as fair, poor, or very poor (OR: 1.69; 95% CI: 1.21–2.37). The female gender showed lower odds of overweight (OR: 0.66; 95% CI: 0.48–0.93). The variables race/skin color, receive university aid, and courses by areas were not eligible for the model for overweight as they did not present a *p*-value up to 0.20.

**Table 3.** Factors associated with overweight in undergraduate students at the Federal University of Acre, obtained through multiple logistic regression. Rio Branco, 2023.

| Variables                 | Included in the Analysis (n) | Missing Cases (n) * | OR ** | 95% CI      | p-Value (<0.05)  |
|---------------------------|------------------------------|---------------------|-------|-------------|------------------|
| <b>Age Group</b>          |                              |                     |       |             |                  |
| 18 to 19 years            |                              |                     | 0.36  | (0.19–0.66) | <b>0.001</b>     |
| 20 to 29 years            |                              |                     | 1     |             |                  |
| 30 years and older        |                              |                     | 3.64  | (2.23–5.93) | <b>&lt;0.001</b> |
| <b>UR utilization</b>     | <b>648</b>                   | <b>7</b>            |       |             |                  |
| No                        |                              |                     | 1.69  | (1.07–2.66) | <b>0.024</b>     |
| Yes                       |                              |                     | 1     |             |                  |
| <b>Gender</b>             |                              |                     |       |             |                  |
| Male                      |                              |                     | 1     |             |                  |
| Female                    |                              |                     | 0.66  | (0.48–0.93) | <b>0.017</b>     |
| <b>Self-rated Health</b>  |                              |                     |       |             |                  |
| Very good and good        |                              |                     | 1     |             |                  |
| Fair, poor, and very poor |                              |                     | 1.69  | (1.21–2.37) | <b>0.002</b>     |

Source: Developed by the author, 2023. n = sample size; OR = odds ratio; CI = confidence interval. \* Missing cases: individuals who did not report age, self-rated health. \*\* All reference categories are indicated with OR = 1.

The factors associated with obesity were similar to those associated with overweight, except for the variables gender, race/skin color, receive university aid, and courses by areas, which did not show significance in the model for obesity (Table 4). Regarding age group, obesity showed a positive association with older adults (30 years and older; OR: 2.71; 95% CI: 1.65–4.45) but did not show a significant association with adolescents when compared to the age group of 20 to 29 years. Obesity also showed a positive association with students who did not use the UR (OR: 2.17; 95% CI: 1.30–3.60) and self-rated health as fair, poor, or very poor (OR: 2.94; 95% CI: 1.84–4.67).

**Table 4.** Factors associated with obesity in undergraduate students at the Federal University of Acre, obtained by multiple logistic regression. Rio Branco, 2023.

| Variables                 | Included in the Analysis (n) | Missing Cases (n) * | OR ** | 95% CI      | p-Value (<0.05)  |
|---------------------------|------------------------------|---------------------|-------|-------------|------------------|
| <b>Age Group</b>          |                              |                     |       |             |                  |
| 18 to 19 years            |                              |                     | 0.26  | (0.08–0.85) | <b>0.026</b>     |
| 20 to 29 years            |                              |                     | 1     |             |                  |
| 30 years and older        |                              |                     | 2.71  | (1.65–4.45) | <b>&lt;0.001</b> |
| <b>UR utilization</b>     | <b>648</b>                   | <b>7</b>            |       |             |                  |
| No                        |                              |                     | 2.17  | (1.30–3.60) | <b>0.003</b>     |
| Yes                       |                              |                     | 1     |             |                  |
| <b>Gender</b>             |                              |                     |       |             |                  |
| Male                      |                              |                     | 0.99  | (0.64–1.53) | 0.949            |
| Female                    |                              |                     | 1     |             |                  |
| <b>Self-rated Health</b>  |                              |                     |       |             |                  |
| Very good and good        |                              |                     | 1     |             |                  |
| Fair, poor, and very poor |                              |                     | 2.94  | (1.84–4.67) | <b>&lt;0.001</b> |

Source: Prepared by the author, 2023. n = sample; OR = odds ratio; CI = confidence interval. \* Missing cases: individuals who did not report age, self-rated health. \*\* All reference categories are indicated with OR = 1.

#### 4. Discussion

Our results indicate that the likelihood of overweight and obesity among university students is higher among older students, those with poorer self-rated health, and those who do not frequent university restaurants.

This study revealed that the frequencies of overweight and obesity among university students were higher than those observed in previous studies. For example, Al-kazemi (2019) [25] reported 38.4% and 15.7% overweight and obesity, respectively, among university students in Kuwait. Barros et al. (2021) [26], studying populations in Southeast Brazil (27.8% overweight and 7.6% obesity), and Guedine et al. (2023) [27], in the UFAC with only nutrition students (45.3% overweight and 13.9% obesity), also found lower prevalences than in the present study.

The increase in overweight and obesity is a global trend [28], especially among young adults [10,29,30]. The growing availability and consumption of ultra-processed foods are also contributing factors to the increase in overweight and obesity [31]. The telephone survey of VIGITEL (2022) [32] corroborates these significant increases in recent decades, found mainly in age groups typical of university students. Furthermore, a temporal analysis in Rio Branco showed a worrying growth in these conditions over the past decades, with upward trends in both weight-related health conditions [29].

Studies highlight insufficient consumption of fruits, vegetables, and legumes, as well as an increase in the consumption of ultra-processed foods [33,34]. Academic routines and new social contexts can negatively influence food choices, leading to a diet of low nutritional value [35]. Therefore, it is essential to promote approaches aimed at improving dietary habits and combating overweight and obesity among university students.

A study conducted in 2014 at the same institution and campus pointed out that variables such as meal location and BMI were associated with unsatisfactory diet quality [36]. In a study conducted at a university in the central region of Minas Gerais, it was found that in relation to BMI, university students who were overweight had a 1.34 times greater likelihood of having negative diet quality compared to those without overweight [36]. Data like these only reinforce the indispensable need for approaches focused on promoting physical and mental health in university students, in order to mitigate misunderstood judgments about their own well-being, as the broad concept of health proclaimed by the WHO encompasses a state of complete physical, mental, and social satisfaction, and not just the absence of illness [37]. Thus, from this concept, we must problematize the contemporary discourse that relates the ideal body and the individual's health for the development of culturally sensitive public health policies that address the complex triad of the interaction between the body, health, and social context [38].

In the adult population and especially among university students, the consumption of ultra-processed foods has been increasing in general. To minimize these prevalences, some barriers need to be overcome in favor of healthy eating. There are policies in favor of improving nutrition in this population. Brazil has the National Program for University Student Assistance (PNAES), established by decree No. 7234 of 19 July 2010, which aims to offer meals to low-income students through URs at public universities in the country. When included in the PNAES, university students are exempt from the meal fee, and for other higher education students, meals are offered at a low cost [35,39].

Therefore, it is necessary to revive actions that encourage the consumption of fresh or minimally processed foods through projects, seminars, workshops, and partnerships with health-related courses to provide guidance on healthy practices and implement nutritional education programs and initiatives. Providing a multidisciplinary team for regular health care for students and encouraging preventive care in the educational environment should be encouraged and carried out by management in partnership with other entities.

Regarding food sale locations, institutional management can reinforce the need for more varied options of these food groups considered healthy. Reaffirming the importance of URs through dissemination is suggested, considering the hypothesis that this food environment may be suggestive of better dietary quality [40–42] for the prevention of



overweight and obesity. However, this hypothesis needs to be confirmed in longitudinal studies for better inferences about specific policies and strategies to mitigate overweight and obesity in the academic population.

Studies conducted on various university campuses in the Americas have pointed to the need for activities that sensitize nutritional education, as the use of playful approaches that highlight the overall quality of foods has achieved prosperous results regarding healthier choices when compared to just presenting nutritional information [43–45]. Additionally, a policy and management approach regarding the availability of these financially accessible foods in institutions, providing healthier options, would be beneficial [15].

It is a fact that the university environment has the potential to host health promotion actions capable of providing a space for food and nutritional education that fosters the development of individuals conscious of the importance of healthy food choices and regular physical activity for their well-being, considering that these behaviors, when imbalanced, promote inadequate nutritional status [46,47].

The starting point for changing scenarios of diseases caused by overweight and obesity is the recognition that collective spaces, embedded in different social sectors, such as university restaurants, act as potential health promoters. Intersectoral public initiatives in environments such as URs can be effective in consolidating health education strategies, food and nutrition education, and food and nutrition surveillance to combat the epidemic of metabolic diseases in Brazil [15].

In Brazil, one of the dilemmas faced by public higher education institutions is the lack of knowledge about the real socioeconomic conditions of their students, coupled with the difficulty of making individual contact with them [48]. Campos et al. [49] suggest that groups of professionals and managers should be implemented for the development of collective actions that combine three areas of action: incentive, protection, and support in health promotion [50]. These actions should not only aim to respond to the demands of chronic conditions, focusing exclusively on the rehabilitation of an already established health condition, but mainly focus on continuous, humanized, and comprehensive health care in educational environments [49].

Analyses of current prevalences of overweight and obesity in university students that explore the use of URs and self-rated health have been scarce, especially in Brazil and in the context of the Western Brazilian Amazon. Few studies on these variables for discussion with our findings were found, and when identified, they either had a small sample or did not consider BMI as an outcome, limiting comparison with our results. Thus, this study becomes pioneering in presenting the positive association between the use of URs and the lower frequency of overweight and obesity in the university population. Similarly, it is also the first study in the region to present data on the relationship between BMI and self-rated health among students. Our findings can complement other studies, contributing to better monitoring of overweight and obesity in the university population.

Some limitations of this study may be associated with possible confounding, as some variables could be influencing the results of the final model, such as family income; however, considering the sample size, care was taken to control for factors like this to reduce the risk of this error. Another limiting factor could be information bias, as self-reported data on weight and height could lead to inaccuracies in BMI measurement. However, other surveys also use self-reported anthropometry, especially VIGITEL, which has been conducted annually in Brazil for over 15 years. Additionally, studies demonstrate the validity of self-reported data compared to data from face-to-face surveys [51,52], thus self-reported weight and height information is widely used and recommended in health research [10,32,53], including in Rio Branco [52]. Other limitations include the use of a cross-sectional design, which restricts the ability to establish causality between the identified factors and overweight and obesity. The fact that it is a convenience sample may also limit the interpretation of statistical inferences. However, it is worth noting that there was participation from all courses offered by the university.

It is hoped that the results of this study will be presented to academic, health, scientific, and community management spheres, revealing the importance of both projects in the field of physical and mental health and investments in accessible and quality nutrition, further strengthening government resources made available through URs.

## 5. Conclusions

The findings of this study pointed to a higher prevalence of overweight and obesity among older university students, those who reported unfavorable self-rated health, and those who reported not consuming meals offered at the UR. Finally, this study emphasizes the importance of understanding the factors associated with overweight and obesity in university students. By addressing this growing public health problem comprehensively and multidisciplinary, we can expect the results of this work to translate into significant improvements in the health of this population, promoting a healthier life and reducing the socioeconomic and NCD burdens associated with obesity. It is expected that the data and conclusions presented can influence the creation of interventions and policies aimed at promoting healthier lifestyles among university students. By addressing the factors linked to overweight and obesity identified in this research, such initiatives can contribute to a healthier and more balanced future for university students, and by extension, for society as a whole.

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