Features and behaviours associated with meat consumption in Brazilian university students

Fatores e comportamentos associados ao consumo de carne por universitários brasileiros

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ABSTRACT

We sought to analyse meat consumption and its association with a set of sociodemographic and behavioural variables among university students at the Federal University of the Southern Border/ Brazil. Eight hundred and fifteen university students answered a structured questionnaire and statistical correlation and logistic regression analyses were carried out. Meat consumption is associated ($p<0.05$) with gender, religion, undergraduate course, income, race, self-control, pro-environmental behaviours and issues related to the meat industry. Regarding adherence and maintenance of a reduced meat consumption pattern, there was a positive correlation with greater ease in preparing food and eating out, motivations linked to the environment, animal causes and the meat industry. Antecedent and consequent behavioural factors are key points for dietary changes in favour of sustainability.

Keywords: Plant-based. Vegetarianism. Sustainability. University students. Diets.

RESUMO

Buscou-se analisar o consumo de carne e sua associação com um conjunto de variáveis sociodemográficas e comportamentais em universitários da Universidade Federal da Fronteira Sul/Brasil. Oitocentos e quinze universitários responderam a um questionário estruturado, e foram realizadas análises de correlação estatística e regressão logística. O consumo de carne está associado ($p<0,05$) com gênero, religião, curso de graduação, renda, raça, autocontrole, comportamentos pró-ambientais e questões

relacionadas à indústria da carne. Em relação à adesão e manutenção de um padrão de consumo reduzido de carne, houve correlação positiva com maior facilidade em preparar alimentos e comer fora de casa, motivações ligadas ao meio ambiente, causas animais e indústria da carne. Fatores comportamentais antecedentes e consequentes são pontos-chave para mudanças alimentares em prol da sustentabilidade.

Palavras-chave: *Dietas à base de plantas. Vegetarianismo. Sustentabilidade. Estudantes universitários. Dietas.*

1 INTRODUCTION

Food systems and different diets interfere in various ways with the health of the population, culture, economy, food and nutritional security and the environment (FAO, 2013). According to Willett *et al*. (2019), climate change is on the verge of a point of no return, and obesity and malnutrition pandemics threaten the food security of most of the world's population. The combination of these crises generates a Global Syndemic (Swinburn *et al*., 2019), which makes it urgent to reformulate our food systems. Changes in dietary patterns and eating habits may be the most promising path to address this. In this sense, Willett *et al*. (2019) define a planetary health diet by emphasising zero or reduced consumption of meat as it considers health and sustainability.

These references are in line with recent concerns about sustainable diets. According to the FAO (2010), they are diets with low environmental impact, which contribute to maintaining food and nutritional security and to a healthy life for future generations, respect ecosystems, are economically viable and fair, and offer adequate nutrition while saving natural and human resources.

There is a confluence in the literature pointing to plant-based diets as those that would best respond to climate change mitigation and also contribute to health (Hemler and Frank, 2019; Hopwood *et al*., 2021). In the case of meat, especially red meat, there are a series of studies that show that this is the product that emits the most greenhouse gases (GHG) and uses the most water and land in its life cycle (Garzillo *et al*., 2019). According to Hargreaves *et al*. (2023), a plant-based diet is a dietary pattern in which animal-based products are avoided or excluded from the usual diet. In general terms, two levels of meat "avoiders" could be identified: (1) flexitarians, who partially limit their meat intake; and (2) vegetarians/vegans, who completely exclude meat from their diets.

According to Krizanova *et al*. (2021), although studies are identifying the reasons why people adhere to a plant-based diet, few analyse the factors related to its adherence and maintenance. According to the authors, a lifestyle with pro-environmental behaviours, the defence of animal rights, or other motivations can lead people to adhere to a more sustainable diet. However, adherence to this type of diet is still considered low and the time that people remain on it is also low. It is worth noting that not all of those who claim to follow a plant-based diet avoid meat at the same intensity.

Regarding Brazil, according to the Sustainable Development Goals of the Brazilian Institute of Geography and Statistics (IBGE, 2017), the country is among those that emit the most GHG into the atmosphere, which contributes to the extinction of species, irregular deforestation, fires, and contamination of rivers, which are partly related to livestock farming and oilseed production for animal feed. In turn, concerns related to meat consumption and the discussion about sustainable diets in the country are still in their infancy and need to be studied further (Martinelli; Cavalli, 2019; Triches, 2020).

Given these arguments, the problem to be investigated is: what is the relationship between lower meat consumption and the factors and behaviours that encourage or discourage it in Brazil? For such purpose, the selected audience was university students, since young people tend to be more open and receptive to new alternative lifestyles and cultural trends, as well as more likely to adopt vegetarian-oriented behaviours when compared to older adults (Janda; Trocchia, 2001).

Thus, the objective of this study was to analyse meat consumption and its association with a set of sociodemographic and behavioural variables among university students at the Federal University of the Southern Border (UFFS). To achieve this, we characterised the sociodemographic profile of the sample, verified the reasons and difficulties reported for adhering to and maintaining reduced-meat diets, and established associations between meat consumption profiles and other variables.

2 THEORETICAL FRAMEWORK

During the 1980s and 1990s, nutritional epidemiology studies documented the potential benefits of vegetarian and plant-based diets (Appleby *et al*., 1998; Tonstad *et al*., 2013), in particular the reduction in the risk of chronic degenerative diseases (NCDs including obesity, heart disease, diabetes and certain types of cancer) and total mortality as well as increased longevity. However, other studies have shown that reducing the consumption of animal-based products could result in nutritional deficiencies (Neufingerl; Neilander, 2022) and also the increased intake of pesticides, GMOs and ultra-processed foods from plant sources.

In recent decades, more emphasis has been placed on plant-based diets due to their lower environmental impact. According to the United Nations, a global shift towards a plant-based diet is necessary to counteract climate change. It also reports that livestock is responsible for 14.5% of global greenhouse gas (GHG) emissions – some estimates show this is over 30% (IPES FOOD, 2022) – in addition to the extensive use of land and water, energy demand and loss of biodiversity.

Given these considerations, consumers have a vital role in becoming more responsible citizens, who are willing to balance hedonic consumption with healthy and sustainable long-term behaviours, such as reduced meat consumption (De Bakker; Dagevos, 2012).

For Carvalho (2012), eating behaviour implies an idea that can be deeply specific to a way of eating but is not concerned with the duration of the action and may or may not be successive. On the other hand, the concept of habit entails repetition and a link to time, so it is expected that someone will develop an equivalent behaviour and that this will then become an eating habit. From a psychological perspective, Skinner (1982) considers that, in operant behaviour, people act upon the environment and the environment acts back on them. In addition, for some behaviour to continue or stop, there is a need for a certain type of reinforcement, according to the author. According to this idea, there are positive reinforcers that strengthen behaviours and negative reinforcers that reduce or stop them (Skinner, 1982, p. 43).

Furthermore, all operant behaviours, whether simple or complex, are analysed according to the triple contingency, that is, considering an antecedent stimulus, a response and a consequent stimulus. In other words, functional behaviour analysis consists of verifying under what circumstances the behaviour occurs and what consequences maintain it (Moreira; Medeiros, 2019).

Therefore, understanding eating behaviours requires understanding what factors precede them and what their consequences are. When considering motivations first, one of them would be ecological, linking awareness of one's food choices to their environmental impact. In a study by Kalof, Dietz, Stern and Guagnano (1999), the belief that vegetarianism benefits the environment emerged as the strongest predictor of self-identification as a vegetarian, which suggests that food choices are largely influenced by environmental values and beliefs.

Other studies (Hoffman *et al*., 2013; Rothgerber, 2014) show that vegetarians motivated by ethical concerns involving environmental and animal welfare are more likely to develop a robust ecological identity and remain vegetarian longer than health-oriented vegetarians.

Studies linking ideological beliefs and sustainability have reported that people prone to the political left wing are more likely to commit to sustainable consumption behaviour through political action on ecological concerns than those who hold morally binding values associated with the political right-wing (Watkins; Aitken; Mather, 2016). Thus, vegetarianism as an ecological identity considers not only environmental concern, universalism and food integrity but also political ideology as a relevant factor (Lindeman; Sirelius, 2001).

On the other hand, there are difficulties in adhering to this type of diet. Negative predictors include social factors and current meat consumption habits (Salonen; Helne, 2012). Not surprisingly, factors that hinder the ability to maintain a vegetarian diet include a lack of self-control and a sense of self-efficacy, including feeling inexperienced in preparing vegetarian meals and perceiving the vegetarian diet as not tasty (Schenk *et al*., 2018). In fact, according to Rosenfeld and Tomiyama (2019), 51% of self-identified vegetarians reported having eaten meat at least once since they became vegetarian. Therefore, even among individuals who declare themselves vegetarian, actual adherence to a meat-free diet is not guaranteed.

Sociodemographic factors such as gender and income have also been reported as predictors of the amount of meat consumed. For example, the Family Budget Surveys (POFs, in Portuguese) in Brazil indicate that there was a reduction in the purchase of beef and pork in the 2017-2018 survey, compared to the previous one in 2007, which may have reflected the increase in product prices in that period and the stagnation of family income. Regarding gender, Carvalho *et al*. (2013) indicated differences in meat consumption between men and women in the country, and research by Rosenfeld and Tomiyama (2021) showed that there is a predominance of women in vegetarian dietary patterns.

It is worth noting that, according to Vandresen and Hotzel (2022), meat production, trade and consumption are very important for Brazil, for economic, nutritional and also cultural reasons, and the livelihoods of a considerable proportion of the population are related to this sector. As a result, meat consumption is a sensitive issue in the country, mainly because differences in biomes, production and producers have to be taken into account. Publications such as Glatzle (2014) and, more recently, IPES FOOD (2022) criticise how this debate has simplified the issue, arguing that the differences between livestock systems, the multifunctionality of extensive livestock systems and livelihoods are not being taken into account. According to IPES FOOD (2022), livestock contributes to the livelihoods of around 1.7 billion small farmers in the Global South and plays a crucial economic role for approximately 60% of rural households in developing countries. Litre *et al*. (2007) referred to livestock farming in the Pampa biome in the State of Rio Grande do Sul as an example of this.

3 METHODOLOGY

This study has a quantitative approach and cross-sectional design. It was performed between March and April 2023, with university students from three campuses of one University: Chapecó (State of Santa Catarina), Realeza and Laranjeiras do Sul (State of Paraná).

The sample size was calculated considering a confidence interval of 95%, statistical power of 80%, and prevalence and outcome of 10%, which resulted in 359 individuals. Another 50% were added for the effect of the sample design and 15% for potentially confounding factors, resulting in 619 individuals. In addition, 10% were added for potential losses and refusals, thus totaling 681 individuals (132 in Realeza, 140 in Laranjeiras do Sul, and 409 in Chapecó). The collection reached a total of 815 people, which is above the required sample number. The division of subjects among the locations was 617 in Chapecó, 133 in Laranjeiras, and 65 in Realeza.

A structured questionnaire was built and adapted based on a study by Krizanova *et al*. (2021). Regarding sociodemographic data, gender, colour, religion, areas of knowledge, race, income, who they live with,

and marital status were verified. Regarding political ideology, the response options were far-left, left, centre-left, centre, centre-right, right, and far-right.

Meat consumption was assessed through a 24-hour questionnaire in which participants described their meat consumption in household measurements. Then these household measurements were converted into grams. To identify the total amount consumed on the previous day, all types of meat (beef, poultry, pork, and sausages) were considered together. To dichotomise into high and low meat consumption, the study by Willett *et al*. (2019) was used as a reference, which defines the limit of 86 grams per day of red meat (beef and lamb), pork, and poultry altogether as the most appropriate, considering health and environmental issues.

Pro-environmental behaviours included questions on keeping the TV on standby at night; turning off the lights in rooms when not used; keeping the tap open or closed while brushing one's teeth; wearing more or less clothing when it is hot or cold to reduce turning on the air conditioning; not buying products because one thinks they have too much packaging; buying recycled products; taking one's own shopping bag to the supermarket; separating waste; using public transportation; walking or cycling for short trips; sharing vehicles with other people; rarely flying; signing petitions on environmental issues; participating in rallies or public events showing support for environmental protection; not consuming meat or animal-based products; buying food products with an environmental seal; buying other products with an environmental seal; buying more local products; avoiding throwing away or wasting food; and reducing the purchase of unnecessary products in one's routine. Each of these questions had a Likert scale with five options to choose from (never; rarely; sometimes; often; always). The scores of these questions were summed up, resulting in a single variable between 20 and 100, where higher scores indicate a higher frequency of pro-environmental behaviours.

Regarding motivations, the study assessed what would make college students adopt a low-meat or meat-free diet. This section included eight questions concerning animal rights; boycotting the meat industry; health; religion; weight loss; influence of friends; influence of family; and not liking the taste of meat. Responses were also based on a five-point Likert scale (strongly disagree; disagree; neutral; agree; strongly agree).

Regarding difficulties, seven topics were assessed, namely, difficulty in becoming a vegetarian; in staying vegetarian; in eating out; in finding vegetarian foods, both in supermarkets and restaurants; in preparing foods without meat protein; in facing prejudice; and in having self-control. The five-point Likert scale included the following options: very difficult; difficult; moderate; easy; and very easy.

The instrument was applied in classrooms at the beginning of classes, before the break or 15 minutes before the end of classes.

The following tests were used for data analysis: Chi-square to relate meat consumption (in categorical format – lowest consumption and highest consumption) and sociodemographic variables; Pearson correlation (considering that the variables presented normal distribution based on the Kolmogorov Smirnov test) for the variables meat consumption (in continuous format in grams) and variables on difficulties and motivations (continuous format – Likert scale); and multivariate logistic regression using the Forward Stepwise method, considering the assumptions of multicollinearity. The outcome variable was the consumption of beef, pork and chicken less than 86g/day (number 0) and more than 86g/day (number 1), using as reference the consumption of the previous day, reported by the participants. All variables were tested one by one and those that best explained the outcome were chosen. The free software PSPP was used, and a significance level of $p<0.05$ was considered for hypothesis testing.

The research was submitted to the Ethics Committee (CAAE: 63863122.2.0000.5564), and participants were asked to sign the informed consent form.

4 RESULTS

Regarding meat consumption among university students who are not vegetarians or vegans, beef was the most consumed (minimum of 12 grams and maximum of 1.2 kg) per day, with an average of 185 grams per capita. Chicken was the second most consumed (minimum of 20 grams and maximum of 800 grams) with an average of 145 grams per capita a day, and pork was the third most consumed (minimum of 15 grams and maximum of 420 grams), with an average of 110 grams per capita. Finally, the average of egg consumption was 116.98 grams, with a minimum consumption of 20 grams and a maximum consumption of 600 grams.

Considering the reference diet for this study, with consumption of up to 86 grams of meat, only 200 subjects or 24.5% of the sample reported this limit, while the remaining 615 (75.5%) reported consumption above this amount.

Table 1 shows the relationship between meat consumption and sociodemographic data.

Table 1 – Sociodemographic data and meat consumption among university students, March and April 2023

Variables	*Meat consumption (≤86 g/day)*		*Meat consumption (>86 g/day)*		P value
	N	*%*	*N*	*%*	
Campus					
Chapecó	150	24.3%	467	75.7%	0,010
Laranjeiras do Sul	25	18.8%	108	81.2%	
Realeza	25	38.5%	40	61.5%	
Areas of Study					
Health Sciences	74	31.6%	160	68.4%	0,017
Agricultural Science	34	20.4%	133	79.6%	
Applied Social Sciences	14	16.9%	69	83.1%	
Sciences and Engineering	48	25.9%	137	74.1%	
Humanities and Languages	30	20.5%	116	79.5%	
Gender					
Female	153	30.8%	343	69.2%	0,000
Male	47	14.7%	272	85.3%	
Age					
Up to 20 years	72	25.5%	210	74.5%	0,388
20-30 years	109	23.1%	362	76.9%	
Above 30 years	19	30.6%	43	69.4%	
Marital status					
Single, divorced, widowed	172	24.2%	540	75.8%w	0,505
Married, Brazilian Civil Partnership	28	27.2%	75	72.8%	

Variables	Meat consumption (≤86 g/day)		Meat consumption (>86 g/day)		P value
	N	%	N	%	
Racial category					
White	146	25.0%	439	75.0%	0,016
Black	22	38.6%	35	61.4%	
Multiracial (Pardo)	29	17.8%	134	82.2%	
Others	3	30.0%	7	70.0%	
Lives with					
Parents	48	21.1%	179	78.9%	0,702
Grandparents or relatives	10	28.6%	25	71.4%	
Alone	53	25.4%	156	74.6%	
With friends	55	26.3%	154	73.7%	
With partner/ children	34	25.2%	101	74.8%	
Income					
Not declared	9	18.8%	39	81.3%	0,001
Up to 1 minimum wage	50	36.0%	89	64.0%	
2-3 minimum wages	80	26.2%	225	73.8%	
Above 3 minimum wages	61	18.9%	262	81.1%	
Religion					
Catholic	92	21.7%	331	78.3%	0,000
Evangelical	20	14.9%	114	85.1%	
Adventist	5	27.8%	13	72.2%	
African-derived	3	20.0%	12	80.0%	
Agnostic	20	31.2%	40	68.8%	
Atheist	28	35.9%	50	64.1%	
Others	32	38.6%	51	61.4%	

Source: Prepared by the authors, 2023.

Table 2 shows the correlation between the motivational variables of behaviour and adherence to and maintenance of reduced-meat diets.

Table 2 – Motivations of university students for a reduced-meat diet

Variable	*Meat Amount*	*Maint*	Become	Envir	Animal	Industry	Health	Weight	Family	Friends
Meat Amount										
Maintain	-0.20*									
Become	-0.20*	0.80*								
Pro-environment	-0.10*	0.29*	0.27*							
Animal Cause	-0.19*	0.38*	0.39*	0,30*						
Against Big Industries	-0.14*	0.34*	0.37*	0,30*	0.55*					
Health	-0.05	0.13*	0.17*	0,13*	0.18*	0.16*				
Lose weight	-0.02	0.03	0.03	0,03	0.03	0.08**	0.34*			
Family	-0.06	0.10**	0.07	0,04	0.11**	0.16*	0.19*	0.37*		
Friends	-0.01	0.13*	0.15*	0,06	0.15*	0.22*	0.12*	0.35*	0.62*	
Preference	-0.13*	0.30*	0.28*	0,13*	0.28*	0.27*	0.22*	0.18*	0.23*	0.22*

**p<0.001 ** p<0.05*

Source: Prepared by the authors, 2023.

Besides motivations, behaviour is also influenced by difficulties or factors that reduce the likelihood of reducing or eliminating meat consumption. Therefore, Table 3 presents the correlation between the factors that hinder this adherence and maintenance.

Table 3 – Difficulties of university students in following a reduced-meat diet

Variable	*Meat Amount*	*Maintain*	*Become*	*Out*	*Find*	*Preparation*	*Prejudice*
Meat Amount							
Maintain	**-0.20***						
Become	**-0.20***	**0.80***					
Eating out	**-0.11***	**0.34***	**0.36***				
Find foods	-0.03	0.15*	0.17*	0.36*			
Preparation	-0.09**	**0.34***	**0.38***	0.35*	0.46*		
Prejudice	0.00	0.12*	0.16*	0.19*	0.22*	0.21*	
Self-control	**-0.21***	**0.65***	**0.65***	0.30*	0.10*	0.33*	0.16*

**p<0.001 ** p<0.05*

Source: Prepared by the authors, 2023.

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Table 4 presents the logistic regression and the behaviours associated with meat consumption.

Table 4 – Logistic regression model highlighting the main sociodemographic and behavioural variables associated with meat consumption by university students.

Variable	*Exp (B)*	*Confidence interval (95%) Exp (B)*		*p*
Disagrees in following to boycott meat industry	2.33	1.02	5.32	0.044
Less often pro-environmental behaviors	1.59	1.04	2.44	0.032
Self-control to avoid meat consumption - Very difficult - Difficult - Moderate"	 13.21 10.07 12.01	 5.27 3.94 4.66	 33.13 25.97 30.94	 0.000 0.000 0.000
Male gender	3.88	2.41	6.24	0.000
Evangelical	3.32	1.54	7.16	0.002
Areas of study – Humanities and Languages	2.40	1.36	4.25	0.003
Income of up to 1 minimum wage Income of 1-3 minimum wages	0.52 0.60	0.30 0.39	0.89 0.93	0.016 0.024
Black racial category	0.44	0.21	0.90	0.024

Source: Prepared by the authors, 2023.

5 DISCUSSION

Regarding meat consumption, beef and chicken were the most consumed. The study carried out by Schneider, Duro and Assunção (2014), in the city of Pelotas (Brazil), points to chicken as the most consumed meat, which shows some similarities between the studies. The authors suggest that the increase in chicken consumption can be explained by the growing poultry production in the country, leading to a decrease in the cost of this food and making it more accessible for consumption. Trindade *et al*. (2016) also carried out a study among university students to identify the consumption of animal protein in commercial self-service restaurants. It found that the most consumed meats were also beef and chicken and that the daily protein consumption exceeded the daily limit of 0.8-1.2 kg for people over 18 years old.

According to the 2014 Guia Alimentar para a População Brasileira (Dietary Guidelines for the Brazilian Population), red meat is an excellent source of nutrients but is also related to an increased risk of cardiovascular diseases when consumed in excess. In addition, low-meat diets are a direct link between human health and sustainability and, among the types of meat, the consumption of white meats such as fish and poultry is healthier and more sustainable when compared to red meats. The World Cancer Research Fund (2007) recommends that the consumption of animal-based foods, including processed and red meats, should not exceed 500 grams a week per person. Meat consumption of this study's sample differs greatly from these recommendations, indicating an excessive consumption of these foods (an average of 185 grams per day, totalling 1.295 kg/week of red meat alone). In addition, the study by Carvalho *et al*. (2012) with data related to the high consumption of red and processed meats corroborates this research. In their study, more than 80% of the Brazilian population consumes high amounts of red and processed meat, especially beef.

Regarding the behaviours that predict this consumption, the logistic regression shows eight significant variables. Regarding sociodemographic factors, male students were 2.41 to 6.24 times more likely to have a high meat consumption when compared to female students. Ruby and Heine (2011) associated omnivorousness with masculinity and strength as well as vegetarianism with femininity and weakness, suggesting that healthier diets have a moral importance and are more attractive, whereas high-meat

diets are considered more brutal and strongly linked to masculinity. According to Barros *et al*. (2018), who conducted a study with university students in southern Brazil, men were 42% less likely to be vegetarians when compared to women. In addition, there are several studies evidencing that women are more likely to adhere to dietary patterns such as vegetarianism when compared to men (Orlich, 2013; Ponzio *et al*., 2015).

Another factor that showed a statistical association was religion. Evangelicals are 1.54 to 7.16 times more likely to have a high consumption of meat than people from other religions. According to Carneiro (2017), religions have always had a historical importance in the formation of eating habits. Many religious beliefs have brought dietary restrictions to humanity, including the prohibition of the consumption of certain meats, the practice of fasting, and the non-consumption of foods containing blood. However, more recent studies (Cabral, 2022) show that Catholic and Evangelical followers are the most omnivorous. There are few studies on this topic, which reveals the need to further explore the current relationship between meat consumption and religions as well as the interference of other variables.

Humanities and Literature courses stood out for having a greater chance of predicting high meat consumption among university students. In the research conducted with linguistics, literature and art students from the other universities (Brazil), students were 2.59 times more likely to be vegetarians, when compared to Applied Social Sciences and Humanities students (Barros *et al*., 2018). In the study by Hackbarth *et al*. (2018) (Brazil), in 2014-2015, an assessment carried out among university students revealed that the vast majority of vegetarians were concentrated in the areas of Social Sciences and Humanities, which differs from the data presented in this research.

Regarding income, it was found that individuals with an income of up to three minimum wages eat less meat than those with a higher income. According to Hotzel and Vandresen (2022), the lower-income Brazilian population spends less money on food, but the proportion of expenditure is higher. The richest population spent more money on food, but in a smaller proportion of income. Census information shows that upper-class households spend on average 7.6% of their income on food and lower-income families spend 22% (IBGE, 2019). Due to the increase in food prices, there was a significant reduction in the consumption of several foods in 2021, especially beef and other meats, mainly among lower-income people. Thus, one can presume that in Brazil, income largely defines meat consumption, which differs from developed countries, where income does not have such an impact. In a study with vegetarians in Porto Alegre (Brazil), Doneda *et al*. (2020) relate vegetarianism with individuals who earn more than two minimum wages, pointing out that the upper classes are more prone to vegetarianism because they have more access to information, and not because of the price of food.

Regarding colour or race, it was found that black people tend to adhere more to reduced-meat consumption, showing again a relationship with income. According to the IBGE (2022), colour is a relevant factor in differentiating the average monthly income of workers in the country in 2021. According to the survey, white people earn R$ 3,099 a month on average. This income is 75.7% higher than that among black people, which is R$ 1,764 a month. On the other hand, according to Asher and Cherry (2015), coloured people in developed countries are disadvantaged, as they do not have access to healthy and affordable food, which makes vegetarianism unattainable. According to studies by Rosenfeld, Brannon and Tomiyama (2021), in the United States, there was strong evidence suggesting the association of vegetarianism with the white racial category. However, this study explored the reduction or elimination of meat from diets, whereas the Brazilian study shows an involuntary plant-based dietary pattern, that is, it is followed by the black and poor population because they cannot afford meat, and not for other reasons.

Finally, the sociodemographic characteristics of university students showed that political ideology (although it was not maintained in the logistic regression model) also has some relationship with meat consumption. Those who claim to be more right-wing were more likely to eat meat than those more

supportive of the left-wing. European and North American research shows that people who support liberal ideas are more likely to encourage policies related to climate change than conservatives (Gilg *et al*., 2005; Hall *et al*., 2018) and, therefore, are more motivated to go meat-free and choose plant-based diets (Nezlek; Forestell, 2020). According to the study by Nezlek and Forestell (2019), vegetarians were more liberal than omnivores when it came to political views.

Among the motivations of students to adopt and maintain a diet with less meat, pro-environmental behaviours and the boycott of big meat industries stood out. Those who reported a lower frequency of pro-environmental behaviours were 1.04 to 2.44 times more likely to be in the group with less meat consumption. Pro-environmental behaviours include the use of public transportation, waste segregation, and not wasting food, among others. Fox and Ward (2008) argue that motivations have to do with the growing concern of people about the impact of excessive meat consumption on the environment and have a connection with vegetarianism. Therefore, people who are more concerned about the environment and have pro-environmental behaviours are prone to follow a more balanced diet and they eat less red meat (Fox; Ward, 2008).

In the research carried out by Doneda *et al*. (2020), it was found that ethics and animal rights were the main reasons for individuals to adopt vegetarianism (92%), followed by concerns with the environment (56%) and health (35%). Fox and Ward (2008) also report that the most frequent motivations for adopting vegetarian diets are related to the slaughter of animals and people's health. However, in this study, the animal cause was related to the outcome and correlated with adherence and maintenance of lower meat consumption, but it did not remain significant in the logistic regression model. According to Miki *et al*. (2020), an ethical motivation including animal and environmental issues is quite evident among individuals who declare to be vegetarians. However an important difference in this research is that the assessment included both those who still eat some amount of meat and those who do not; therefore, discourses on ethics and animal rights do not affect everyone to the same extent.

Another significant motivation in this research was the boycott of the meat industry. Individuals who responded that they would refuse to follow a diet with less meat consumption due to boycotts of the meat industry were 1.02 to 5.32 times more likely to belong to the group that consumes more meat. It is worth noticing that most of the sample was from the campus in Chapecó, which is a large producer of pork, poultry and their derivatives nationally and internationally. The western region of Santa Catarina, as a whole, contributes significantly to Brazil’s position as one of the world’s largest exporters of poultry and pork (IBGE, 2017). In this case, it seems more like activism in reverse, for people promote meat consumption and value the robust meat industry, and not the opposite as in the literature, where politicised movements use boycotts to reduce the production and marketing of certain products.

Among the difficulties in adhering to and maintaining a low-meat dietary pattern, self-control stands out. College students who reported having some degree of difficulty (moderate, difficult or very difficult) in self-control were more likely to consume more meat, and there was a significant correlation with difficulty in adhering to or maintaining the pattern. According to Cruz (2006), self-control is closely linked to the interdependent relationship that each organism maintains with the various existing environmental variables. Using Skinner's analysis of behaviour and the three-term contingency, the behaviour or operant response is given by antecedent conditions and the consequence of the action (reinforcing or punishing stimulus). It has been found that there are several variables related to higher consumption of meat by college students (male gender, white race, evangelical religion, income above three minimum wages, lower frequency of pro-environmental behaviours and in favour of the meat industry), which are the antecedent conditions. These set the occasion in which the response (higher meat consumption) would be most likely to occur and, therefore, reinforced. It should be noted that many of these variables are related to biology, culture and the social environment where the individual lives and, therefore, more difficult to change or control.

Along with these variables, there is the lack of cooking skills in food preparation and the difficulty when eating out, which, although not maintained in the logistic regression analysis, were strongly correlated with the lower probability of reducing meat consumption and becoming or maintaining this pattern. People who adhere to vegetarianism end up facing many difficulties, mainly in their social life and daily life, often due to cultural issues of meat consumption, which directly impact food choices. In the study carried out by Doneda *et al*. (2020), the authors mention the lack of options in supermarkets and restaurants, the lack of time to prepare meals and the prices of vegetarian/vegan foods as the main difficulties in maintaining a vegetarian/vegan diet. They also mention social issues, especially with family members at home.

In behaviour analysis, in addition to antecedent conditions, subjects are also influenced by the consequences of their actions. Thus, the analysis includes the advantages and disadvantages that subjects have when eating less meat. Reinforcements are associated with the satisfaction of eating meat and its relationship with festive moments, its association with higher muscle mass (among others that were not investigated here) or even with a lower cost of food. Regarding taste, this research identified a significant correlation between aversion to the taste of meat and greater adherence to and maintenance of restricted diets, which is therefore related to a punishment. The punishment could also reflect greater environmental impact or harm to health or even in the slaughter of animals, among others. In this equation, between reinforcements or punishments, people make their choices and self-control is defined.

Cruz (2006) points to an essential aspect in the discussion on self-control, which is between the conflict of immediacy of positive reinforcement and the delay of punishment. Thus, immediate positive reinforcing consequences are produced first (satisfaction of a nice steak or barbecue), and these same behaviours produce delayed punitive consequences (cardiovascular diseases, climate changes), which end up becoming aversive stimuli in the future. These conflicts may generate the possibility of self-control in the person. However, the same author emphasises that the emergence of a conflicting contingency does not necessarily lead a person to emit self-control behaviour. Often, only powerful aversive stimuli are capable of originating a conflict strong enough for the emission of self-control behaviour (Cruz, 2006). Based on this analysis, self-control is not associated with willpower, inner power or being emotionally strong, but is linked to these external contingencies that, ultimately, would contribute or not to certain behaviors, in a two-way process.

6 CONCLUSION

The research found that the behaviours mostly associated with a low-meat dietary pattern are directly linked to factors such as gender, religion, undergraduate course, income, race, self-control, pro-environmental behaviours, and views related to the meat industry. Regarding adherence to and maintenance of this pattern, a positive correlation was found with easier food preparation and eating out as well as motivations related to the environment, animal rights, and the meat industry. Again, self-control significantly responds to the decision to adhere to and maintain a diet with less meat, and not enjoying its taste would be a punishment, which would make it easier to avoid it.

Eating habits and choices may include behavioural factors that are difficult to change. They depend on the environment in which individuals live and their contingencies, always in a dynamic relationship between antecedent factors and consequences of actions that may influence due to their punitive or reinforcing nature. Changing factors related to the individual's context can lead them to rethink their behaviours. Therefore, there are no immutable behaviours.

It is important to note that changes in food choices and diets need to be adopted by large portions of the population and for long periods of time when aiming to achieve environmental and health benefits. Thus, related discussions including nutritional and environmental education should be included in

the agenda of schools and universities. In addition, public policies and private sector initiatives to mobilise greater information, incentives for more sustainable products, taxes on foods with greater environmental impacts, promotion of more resilient, less polluting and destructive forms of food production and distribution, with rational use of natural resources, are essential for thinking about more sustainable food systems.

Therefore, considering the diversity of associated factors, interventions should also be diversified, by involving political, economic, institutional and cultural changes. Thus, a result of this research is the need for more in-depth research on environmental psychology, seeking to identify the most effective strategies for promoting more sustainable and healthy food consumption. Another very relevant issue is to pay attention to the different forms of livestock farming, identifying their different environmental and social impacts, which, depending on the situation, may be more viable than the current production of transgenic soybeans, produced using chemical inputs and pesticides, on large monoculture.

As limitations of this study, it should be noted that it refers to specific audiences and regions of the country with a cross-sectional design. Therefore, future research and theorising in different locations and audiences and with longitudinal approaches are necessary. In addition, qualitative research that deepens the discussion on behaviours and their antecedents and consequences could strengthen the scientific evidence on the topic.

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