Programa de Pós-Graduação Desenvolvimento Regional mestrado e doutorado

DOI: 10.17058/redes.v29i1.17909

Dietary changes in animal protein consumption during the Covid-19 pandemic in Southern Brazil

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Resumo
A população global teve que adotar mudanças na rotina em razão da pandemia Covid-19, implicando em alteração sobre o local de compra de alimentos, o tipo de alimento ingerido e o preparo desses. Diante do cenário de crise econômica e sanitária, principalmente decorrente da pandemia, o objetivo desse estudo é descrever as características do consumo de proteínas de origem animal durante a vigência da pandemia de Covid-19 na Região Sul do Brasil. Os dados foram coletados por meio de um questionário online anônimo, buscando identificar aspectos da ingestão alimentar de proteína de origem animal com 997 participantes dos três estados da região Sul do Brasil. Os resultados mostram que o confinamento causado pela pandemia influenciou os hábitos alimentares com relação ao consumo de proteínas de origem animal. A principal mudança observada está no aumento do consumo de carnes de aves e de ovos, em detrimento a uma redução no consumo da carne bovina. Concluímos que a ingestão de proteína não mudou em quantidade, mas sim no tipo de proteína ingerida.
Palavras–chave: Carnes. Consumo. Hábitos alimentares. Pandemia. Segurança alimentar.

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Abstract
The global population has had to adopt changes in routine due to the Covid-19 pandemic, implying changes in where food is purchased, the type of food eaten and how it is prepared. Given the scenario of an economic and health crisis, mainly due to the pandemic, the aim of this study is to describe the characteristics of animal protein consumption during the Covid-19 pandemic in southern Brazil. Data was collected through an anonymous online

questionnaire, seeking to identify aspects of dietary intake of animal protein with 997 participants from the three states of the southern region of Brazil. The results show that the lockdown caused by the pandemic has influenced eating habits in relation to the consumption of animal proteins. The main change observed is an increase in the consumption of poultry and eggs, to the detriment of a reduction in the consumption of beef. We conclude that protein intake has not changed in quantity, but rather in the type of protein ingested.
Keywords: Food. Meat. Consumption. Pandemic. Food habits. Food security.

Cambios alimentares en el consumo de proteínas animales durante la pandemia de Covid-19 en el sur de Brasil

Resumen
La población mundial tuvo que adoptar cambios de rutina debido a la pandemia de Covid-19, lo que implicó cambios en el lugar de compra de alimentos, el tipo de comida que se consume y su preparación. Ante el escenario de crisis económica y sanitaria, principalmente debido a la pandemia, el objetivo de este estudio es describir las características del consumo de proteínas animales durante la pandemia de Covid-19 en la Región Sur de Brasil. Los datos fueron recogidos a través de un cuestionario anónimo en línea, buscando identificar aspectos de la ingesta dietética de proteínas de origen animal con 997 participantes de los tres estados de la región sur de Brasil. Los resultados muestran que el confinamiento provocado por la pandemia influyó en los hábitos alimentarios en cuanto al consumo de proteínas de origen animal. El principal cambio observado es el aumento del consumo de carne de ave y huevos, en detrimento de la reducción del consumo de carne de vacuno.
Palabras clave: Comida. Carne. Consumo. Pandemia. Hábitos alimentares. Seguridad alimentar.

1 Introduction

The global population has had to adopt changes in routine due to the Covid-19 pandemic, directly affecting the relationship with the place of purchase, source and frequency of consumption, as well as the method of preparation. With regard to food purchases, the data points to an increase in sales through e-commerce, as well as a change in the type of food purchased (Botelho; Cardoso; Canella, 2020; Rezende et al., 2020; Steele et al., 2020; Santana; Costa; Shinohara, 2021).

One of the main, if not the most important, changes brought about by the Covid-19 pandemic was the population lockdown measures, in order to curb the number of cases/contagion. The establishment of the lockdown by several countries as a way of containing the rapid spread of the virus and a potential collapse in public health care, has led to the need to reorganize family groups due to work and the new dynamics of the home.

In this scenario, local fairs and markets ended up having their activities interrupted and the places to buy food were restricted to supermarkets, making it difficult to access fresh food, leading to a shortage of certain food products (Ruiz-Roso et al., 2020; Cullen, 2020). Against this backdrop, the World Health Organization (2020) states that ensuring a healthy diet can help prevent and treat diseases, which makes it even more important to be concerned about balanced and healthy diets.

Allied to this, the Brazilian Research Network on Food and Nutritional Sovereignty and Security (PENSSAN Network, 2021), released the results of a national

survey on food insecurity in the context of the Covid-19 pandemic in Brazil, carried out in December 2020. The results show that the pandemic, combined with the economic and political crises of recent years, has had a negative and significant impact on the human right to adequate and healthy food for the Brazilian people. When looking at the data for the South and Southeast regions, analyzed together in the survey, it can be seen that 53.1% of households in these regions have food security, while 6.0% have experienced hunger, expressed by severe food insecurity. At a national level, the study illustrated that this situation was even worse among residents of rural areas, where hunger was a reality in 12% of households (Rede PENSSAN, 2021, p. 36).

When analyzing dietary change during the pandemic in Brazil, Steele et al. (2020) recorded an increase in the diet classified as healthy by the authors, including that with the presence of vegetables, fruits and legumes. On the other hand, they also identified an increase in unhealthy eating (mainly ultra-processed foods) in the North and Northeast regions, and among people with less schooling, suggesting, according to the authors, social inequalities in the response to the pandemic. In a study carried out among adolescents aged 10 to 19 in Spain, Italy, Brazil, Colombia and Chile, a change in eating habits was observed, including an increase in the consumption of vegetables and fruit, to the detriment of a reduction in the frequency of fast food consumption (Ruiz-Roso et al., 2020). On the other hand, according to the study, the average intake of fried foods and sweets increased significantly during COVID-19 confinement.

As the amount of industrially produced and processed food grows, so does concern about its origin and the way it is processed. In this sense, in an official document released by the Food and Agriculture Organization of the United Nations (FAO), Cullen et al. (2020) reinforce that the fight against the coronavirus pandemic must involve political and governmental efforts to ensure the functioning of the gears that move the chains of production and distribution of food to the population.

In this regard, Büsher et al. (2021) list five pillars to be considered for global planning once the COVID-19 pandemic has been overcome. These include the need to transform towards a more regenerative agriculture that promotes the conservation of social interaction, by encouraging the production and consumption of mainly local diets that take into account the climatic and cultural conditions of that context (Büsher et al., 2021; Litre et al., 2022; Matte, Silva, Ceretta, 2022).

In particular, what the studies presented so far have in common is the existence of a set of changes in consumption habits, generated by the economic and political crises that Brazil was experiencing, and aggravated by the Covid-19 pandemic. On the other hand, there have been no studies to date analyzing changes in the consumption of animal proteins in particular. In part, the lack of studies focusing on this type of food, compared to the record of studies on the consumption of fruit, vegetables and legumes, is mainly related to the lack of record of meat in studies that mention what a healthy and sustainable diet is (Matte; Maciel, 2019).

The consumption of animal protein has changed globally. On the one hand, there has been an increase in the number of people who no longer consume this type of food (Boukid et al., 2021; Boer & Aiking, 2021; Hötzel & Vandresen, 2022), while in other contexts per capita consumption is increasing, motivated especially by

improvements in income (Henchion et al 2021) and through access to information about the origin of the food (Sasaki et al 2022).

The Food Guide for the Brazilian Population (Brazil, 2014) considers the consumption of meat and proteins of animal origin to be adequate for a healthy diet, especially when purchased fresh. According to the Guide, the use of meat, fish and eggs is part of the country's traditional cuisine, adding flavor to food when prepared alongside other side dishes and improving the nutritional composition of the final preparation. According to data provided by the Family Budget Survey (POF, 2021), the frequency of food consumption for proteins of animal origin for the southern region of the country is 41.2% for beef (above the national average of 38.2%), 10.5% pork (above the national average of 6.7%), 25.4% poultry (below the national average of 30.8%), 3.1% fresh fish (below the national average of 5.7%) and 12.7% eggs (below the national average of 13.9%). Therefore, these protein sources are part of the diet of this public, which aroused interest in verifying the existence of a specific influence caused by the pandemic.

Thus, given the scenario of economic and health crises, and especially those resulting from the pandemic, the aim of this study is to describe the characteristics of animal protein consumption during the Covid-19 pandemic in the southern region of Brazil. Our hypothesis is that the consequences of the pandemic, such as social isolation and the consequent coexistence in family nuclei, salary reductions, loss of employment and job stability and increased concern for health care may influence the presence of these foods in the diet of families. In order to achieve this objective, the work is divided into four additional parts, including information on the study method, followed by a presentation of the results and a discussion section. Finally, the main conclusions drawn from the initial analysis of this research are presented.

2 Method

This research has a descriptive scope, in that it allows us to consider the components of the phenomenon studied, identifying variables that lead to trends in certain groups (Hernández Sampieri et al., 2013). This is because the guiding question seeks to answer whether there has been a change in the consumption of animal protein during the Covid-19 pandemic in 2020.

Data was collected from June 13 to October 26, 2020, totaling 997 participants distributed in the three southern states of Brazil, Santa Catarina, Paraná and Rio Grande do Sul. The selection method followed a non-probability sample, since the choice of elements does not depend on probability, but on causes related to the characteristics of the research (Hernández Sampieri et al., 2013). A non-probability sample is appropriate for this study, since it is an exploratory study and aims to document the dynamics of animal protein consumption during the Covid-19 pandemic. This form of sampling takes into account the restriction of conducting empirical research, since the country was and remains restricted in terms of social contact.

The main instrument used to collect information was an online questionnaire. This tool was chosen for two main reasons: secure access to the survey's target audience and the instrument's effectiveness in responding to the study's objective. The questionnaire is an appropriate instrument for asking a set of questions about

one or more variables to be measured, facilitated by the speed of participation and the possibility of covering a variety of profiles (Hernández Sampieri et al., 2013).

The questions were organized into three stages. The first consisted of a characterization of the respondent and the family nucleus. The second sought to identify the place of purchase and preferences in the consumption of proteins of animal origin using a Likert scale, and the third sought to ascertain whether there had been any changes and the reasons if they had altered their eating habits with the onset of the pandemic. The nature of the variables is qualitative (nominal and ordinal) and quantitative (discrete). In the case of this study, our dependent variable - which is the variable that is affected by an independent variable (Volpato; Barreto, 2016) - is the consumption of animal protein, in our study represented by the consumption of beef, pork, poultry, fish and eggs. The independent variable is the period of the Covid-19 pandemic, since during the research period the virus was distributed in the three southern states.

The initial analyses presented focus on descriptive statistics. Descriptive statistics are suitable for this study, as they allow us to summarize specific values, characterize a set of data and compare them using objective criteria (Volpato; Barreto, 2016). The type of analysis adopted includes frequencies, central tendency (mean) and variability (standard deviation).

3 Results

The results of the survey are organized into three subsections. The first covers the socio-economic profile of the survey participants. The second seeks to understand the place of purchase and preferences in the consumption of animal proteins. The third concerns information on the consumption of animal proteins during quarantine.

3.1 Socio-economic profile of survey participants

For the southern region, 997 interviews were collected from the online questionnaire. The largest stratum is located in the state of Rio Grande do Sul, with 63.8% (636) of the interviewees, followed by Paraná, with 27.6% (275), and the state of Santa Catarina, with 8.6% (83) of the participants. Of the total number of interviewees, 9% are located in the three capital cities of the states that make up the southern region.

As for gender, 29.8% of those interviewed declared themselves as men, 70.2% as women and 0.2% chose not to define. With regard to the number of residents per property, the average was three people, with a maximum of 10 people in the same home and a minimum of just one resident, and the standard deviation was around 4.7 in relation to the average. The age range of the group of participants was a maximum of 81, a minimum of 18 and an average of 32, with a standard deviation of 33. The belief variable showed a predominance of Catholics, with 47% of responses, followed by evangelicals (14.9%), others (14%), spiritualists (12.5%), atheists (9.3%) and agnostics (2.1%). There are religious customs and habits that influence the consumption of certain sources of animal protein to a certain extent. For this study, this variable was not correlated, since the questionnaire did not address other factors that culminate

in the doctrines of these beliefs. As for the form of housing, 52.8% of the respondents lived in their own home, followed by 27.5% renting, 19% living with family and 0.8% renting.

The socio-economic profile outlined in the questionnaire shows an average income of R$3,292.20, with a maximum of R$10,000.00, and a standard deviation of R$5,026.29. As for the working situation of the participants at the time of the survey, shown in Table 1, fixed work with a commute leads the way with 33.6%, followed by remote work with 23.6%. In addition, 3.8% perform informal services sporadically, 6.9% rely on retirement income and 1.6% report that they are earning income from assistance policies, such as emergency aid.

Table 1 – Employment status of participants during the Covid-19 pandemic, absolute number and percentages

Participants' employment relationship	***n***	***%***
I work remotely from home	235	**23,6%**
I commute to work	335	**33,6%**
I don't have a permanent job and I leave home for temporary work when I need to	38	**3,8%**
I've been unemployed since the quarantine began	36	**3,6%**
I have been unemployed since before the quarantine began	42	**4,2%**
I am being supported by the state	16	**1,6%**
Retired	69	**6,9%**
Student	182	**18,3%**
Other	44	**4,4%**

Source: Prepared by the authors based on survey data (2021).

In addition to these groups, there are 18.3% of students, whose income may come from family members or student aid. Finally, 7.8% of the participants are unemployed, 3.6% of them during quarantine. Regarding the emergency aid offered by the Brazilian government during the Covid-19 pandemic, 70.6% reported not receiving any form of financial support from the state, 25.4% reported receiving it after the pandemic began and 4% reported receiving some form of aid before the pandemic began.

3.2 Place of purchase and animal protein consumption preferences

After outlining the socio-economic profile of the participants, the next step was to identify the supply channels for animal proteins, as shown in Table 2. Of the total number of participants, 86% said they obtained these products through local markets, which was the most recurrent answer among the participants, while 14% reported purchasing directly from producers. It is worth noting that the questionnaire allowed more than one answer to be ticked regarding supply channels, which resulted in a concentration on local markets, not differentiating between small markets, large wholesale chains, butchers, among other types of trade.

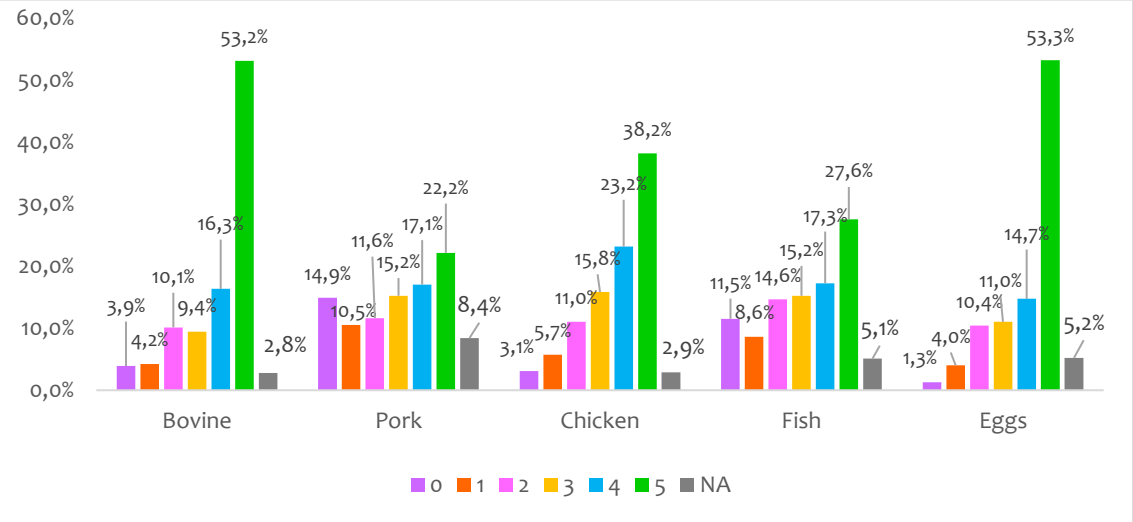
Table 2 – Supply channels for meat (beef, pork and poultry) and fish, expressed in absolute numbers and percentages

Supply channels	*n*	*%*
Free markets	117	**12%**
Local markets	859	**86%**
Bodegas or grocery stores	109	**11%**
Direct with producers	143	**14%**
Gifts	41	**4%**
Hunt yourself	14	**1%**
You fish yourself	40	**4%**
NA	15	**2%**

Source: Prepared by the authors based on survey data (2021).

Eating pleasure is directly related to each individual's eating habits. For this reason, we sought to measure the level of preference in the consumption of beef, pork, poultry and fish, and chicken eggs, as shown in Graph 1. The results show that beef and eggs were the products with the highest percentage of acceptance among the participants. Both products were rated highly (five), with 53.2% for beef and 53.3% for eggs.

Graph 1 - Level of consumption preference for beef, pork, chicken and fish, and chicken eggs, expressed in relative value



Source: Prepared by the authors based on survey data (2021).
Legend: 0 = Does not consume, 1 = Does not like, 5 = Likes a lot, NA = No answer.

The least preferred products were pork and fish, with 25.4% and 20.1% indicating that they don't consume or don't like these meats (attributes zero and one). Beef, poultry and eggs were the most preferred products among those interviewed, with each holding more than 60% of the total responses in grades four and five. As this is an extract from the South, the high rejection of pork is noteworthy, given that this is the region in the country where this source of animal protein is most consumed, as pointed out in the POF (2021, p. 40), in which the frequency of pork consumption is 10.5% in the South, compared to only 6.7% in the national average. Some factors that may explain this result are: the distribution of participants in the states, so our hypothesis is that consumption of this protein may be higher among

rural residents; and the socio-economic profile of the interviewees, since they have an average income above three minimum wages, which may influence their choice of other meats over pork.

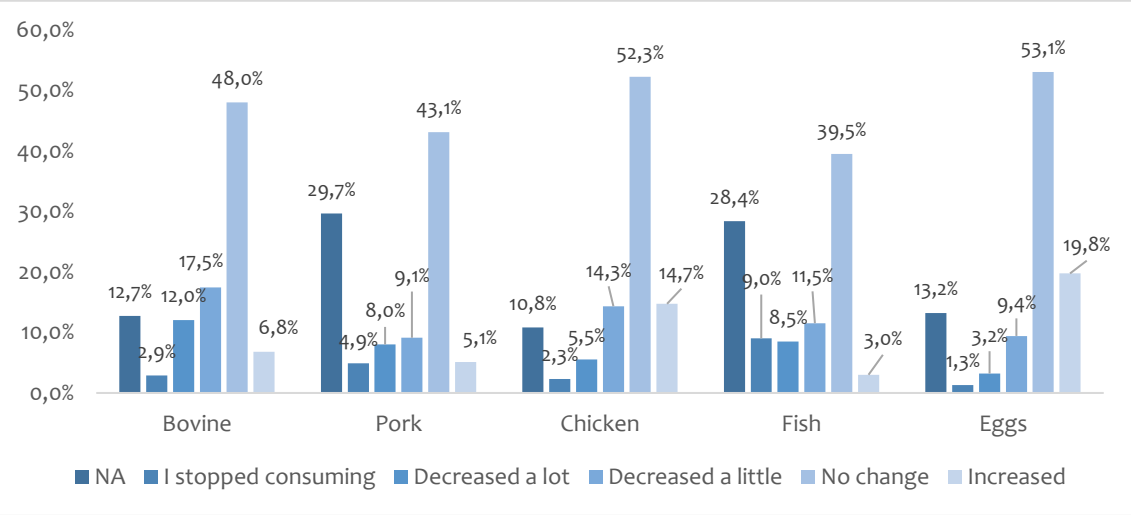
3.3 Consumption of animal proteins during quarantine

The state of quarantine adopted by several countries as recommended by the World Health Organization (WHO) to curb the spread of Covid-19 has had a direct impact on the population's way of life, their work dynamics, social interaction and consequently their eating habits, be it in terms of frequency, quantity or even availability of consumption.

As for the protein sources of animal origin that saw a drop in consumption, fish came out on top with 9%, followed by pork 4.9% and beef 2.9%, while the other products showed figures below 3% (Graph 2). As for those whose consumption has fallen significantly, beef leads the way with 12%, followed by fish meat (8.5%) and pork (8%). Poultry meat (5.5%) and chicken eggs (3.2%) had the lowest percentages in this group. In the small decrease category, beef took the lead with 17.5%, followed by chicken (14.3%) and fish (11.5%).

Chicken eggs and poultry meat had the highest percentages of respondents who claimed not to have changed their consumption (53.1% and 52.3%, respectively), followed by beef (48%), pork (43.1%) and fish meat (39.5%).

Graph 2 - Changes in animal protein consumption with the start of quarantine, expressed in relative values



Source: Prepared by the authors based on survey data (2021).
NA = Not applicable or did not answer

The category of no change in consumption had the highest percentages compared to the other alternative answers, and this pattern was repeated for all the products targeted in the survey. Among the products analyzed, chicken eggs (19.8%) and poultry meat (14.7%) recorded the greatest increase in consumption during quarantine. The average price per kilogram of these products may have directly influenced the results of this variable, considering that some of the participants were unemployed or received income from family members or government support. When

the data on the frequency of consumption of eggs and chicken meat was correlated with the income of the survey participants, the results showed a weak correlation of 0.09 and 0.093 respectively. Our hypothesis is that this change is not just related to income, but to two other factors: ease of preparing meals with these proteins and a scenario of uncertainty, which leads to more economically accessible choices. The justifications for the changes in consumption are illustrated in Table 3.

Table 3 - Reasons for changes in meat consumption during quarantine

Justifications	***n***	*%*
The price of meat increased	268	**26,9%**
I lost my job	37	**3,7%**
My salary has gone down	78	**7,8%**
I'm afraid of getting sick	49	**4,9%**
There's less meat now	16	**1,6%**
My meat consumption hasn't changed	495	**49,6%**
N	143	**14,3%**

Source: Prepared by the authors based on survey data (2021).
NA: Not applicable or did not answer

The majority of participants reported not having noticed any change in their consumption of beef, pork and poultry. This does not mean that there were no dietary changes, since the protein base of the diet may have been replaced by a cheaper one in the same quantity. As for the reasons for the drop in consumption, 26.9% of the participants justified the change by the increase in prices, followed by the reduction in salaries - 7.8%. This information provides a basis for understanding changes in food consumption during quarantine.

3.3.1 Price paid for animal proteins during quarantine

The pandemic caused by Covid-19 has had a direct impact on the production processes of various food chains, affecting their availability and, consequently, their final price to consumers. For this reason, we sought to identify how the participants in this survey felt about these changes and how they may have affected their food choices.

Among the interviewees who eat beef, the most common price paid per kilogram was 16-20 R$/Kg, followed by 21-25 R$/Kg and 26-30 R$/Kg (Table 4). It is essential to bear in mind that the cut and origin of the product directly influence the final price passed on. The most common price ranges per kilogram of pork were 11-15 R$/Kg and 16-20 R$/Kg. Even though pork is a more financially accessible protein compared to beef, the results still indicate low consumption. This low demand deserves further investigation, and may be influenced by cultural consumption habits, as well as potential myths surrounding pork (Anjos; Gois; Pereira, 2018; Moura; Ribeiro, 2021).

Table 4 - Price paid for meat (beef, pork, chicken and fish) and chicken eggs

Real (R$)	BovinE kg	Pork kg	Chicken kg	Fish kg	Eggs mold with 30 eggs
1 - 10	2,9%	8,3%	31,8%	4,1%	29,0%
11 - 15	11,1%	20,2%	36,6%	11,9%	36,9%
16 - 20	22,3%	18,9%	9,3%	20,0%	9,6%
21 - 25	19,9%	7,7%	4,1%	15,8%	2,2%
26 - 30	15,4%	4,5%	0,7%	5,4%	0,1%
More than 30	9,0%	0,4%	0,3%	4,8%	1,4%
Not informed	19,5%	40,0%	17,2%	38,0%	20,8%

Source: Prepared by the authors based on survey data (2021).

These results are directly related to the practicality of preparing food, especially the versatility of the egg, which can not only be eaten in savory dishes, but also in cakes, cookies, etc. During the pandemic, people started cooking at home a lot more, and there was also an increase in the use of delivery and ultra-processed foods (Truong, Truong, 2022; Lemes et al., 2023; Galanakis, 2023). This implies the preparation of sweet and savory recipes, in which eggs, due to their versatility, were often more present than meats. Although pork has a longer shelf life than eggs under ideal storage conditions, the popularization of this ingredient outweighs its fridge life.

Like other sources of animal protein, chicken meat comes in different cuts and by-products, but the price variance between them is low compared to beef cuts. For this reason, the lowest price strata per kilogram of chicken account for more than 60% of all respondents. In the case of fish, the most common prices paid were 16-20 R$/Kg and 21-25 R$/Kg, but 38% of those interviewed didn't answer, which means they didn't consume or didn't know. Poultry meat and chicken eggs proved to be a popular and low-cost source of protein. The lowest price ranges had the highest percentages of respondents, 29% of whom reported paying between one and 10 reais, while 36.9% said they paid between 11-15 R$/tray in the case of eggs.

4 Discussion

Understanding the consumption habits of meat and other animal proteins, especially in the midst of the health and economic crisis caused by the Covid-19 pandemic, has made it possible to highlight the existence of changes in protein consumption. For Schlindwein (2014), understanding the influence of socio-economic and demographic factors combined with food consumption indicators is essential when drawing up public policies associated with food security, health, well-being and economic development.

The socio-economic and demographic results showed that the higher proportion of women in the survey can be explained by the fact that it is mostly women who organize household meals (Barbosa, 2007; Matte, Silva, Ceretta, 2022; Al-Jaberi et al., 2023). The same was found by Matte, Silva and Ceretta (2022), when analyzing food acquisition channels during the pandemic in the state of Paraná. The most recurrent family structure was three people living in the same place, with more

than half claiming to have their own home and an income of more than three minimum wages. The most common belief was Catholic Christianity, but this variable did not have a significant impact on the results relating to consumption of the products targeted in the research.

Not only have family and social relationships changed with the advent of isolation measures, the working day and the way it is viewed has also undergone several transformations. An example of this is the concept of the Home Office, which has emerged as an alternative to enable some professional activities to be carried out directly from home (Schirigatti; Kasprzak, 2007). Of the total number of participants found in our survey, more than half claimed to have a job, of which 23.6% work remotely (Home Office) and 33.6% need to travel to their place of work, exposing themselves to the risk of contagion from the new coronavirus.

The practicality and convenience found especially in urban lifestyles influence consumers to look for the products of their diets mainly in just one place of sale (Lima Filho et al., 2013). Buying at open-air markets (12%) and directly from producers (14%) represented an important income-generating activity, especially in mostly rural municipalities in the south of the country. For example, a study by Matte, Silva and Ceretta (2022), carried out in a mostly rural municipality in Paraná, found that 36.8% of beef was purchased directly from the producer, 31% from pork, 31% from chicken and 49.4% from fish.

In the midst of the popularization of veganism and the recurring debates about the negative impacts caused by the meat production chain, the pleasure in consuming this food certainly ensures its popularity over the long term (Ribeiro; Corção, 2013). The results of the survey indicate that beef 53.2% and chicken eggs 53.3% are the products that most evoke the pleasure of consumption among the participants. The aforementioned result was already predicted for beef, since the noblest cuts, as well as being tasty, are widely consumed at festivities, referring to social interactions or even projecting status through the consumption of a high value-added product.

The product with the least preference for consumption was pork, with 25.4% of participants claiming not to consume or appreciate this food. According to Falleiros et al. (2008), the problems linked to the image of pork, such as its high fat content, unpleasant taste, association with diseases and poor sanitary management are myths that have been spread over the years, and are perhaps the main vector that has generated this "negative publicity", as the author characterizes it. In a study of the Chinese reality, Shen and Zhong (2023) found that during the pandemic pork consumption was affected by the increase in prices.

Through the Food Guide for the Brazilian Population, the Ministry of Health recommends consuming one portion of meat a day. In a study carried out by Schneider et al. (2014), the authors found that 1/3 of those interviewed did not eat meat as often as recommended. The authors also highlight the complexity of the variables preference and frequency of consumption, as these are influenced by personal, cultural and cost factors. Even so, it is essential to recognize that, roughly speaking, there is a global overconsumption of animal proteins (Berners-Lee et al., 2018). The fact is not in the quantity ingested, but in the distribution and access to some of these proteins, especially by vulnerable populations.

Some results regarding the frequency of consumption before the quarantine began, shown in Graph 1, are worth highlighting. Beef (29%) and eggs (37.1%) had the highest percentages of daily consumption. Pork and fish were the most consumed options on festive dates, and the hypothesis for this is the influence of religious dates in the Brazilian calendar.

Schneider, Duro and Assunção (2014), with the support of the Family Budget Survey (POF), found that the amount of calories coming from meat in the diet has become increasingly important. However, the authors point out that meat is the most expensive item in the diet, representing 15.1% of food expenditure in 2008-2009. The predominant frequency of purchase before the start of the social distancing measures was weekly, for the items most preferred by the interviewees. As for the quantity of items purchased in kilograms, the 1-2 kg weight range was the most reported among the participants, which provides an initial parameter on the pre-pandemic purchasing profile of consumers in the southern region. It is worth noting the high number of responses understood as not applicable or just did not answer (NA), suggesting that a portion of the participants are not aware of the average amount they consume between purchase intervals. The amount spent on food is still the second most important among family expenses,

The consequences of the pandemic, along with social restriction measures, which raised unemployment rates to 14% and the strong economic recession, dictated changes in the way we relate to food during this period. Trade restrictions, demand from foreign markets, the low competitiveness of the real against the dollar and the increase in the cost of production chain processes have all had an impact on the final price of animal proteins for consumers. Consumption decisions are dictated by economic and social factors, but income is the main variable conditioning meat consumption (BERTASSO, 2000).

As for changes in consumption of the items targeted by the survey, pork and fish were the items with the biggest drop in consumption. The hypothesis behind this result is based on the banning of places where these products are sold, usually open-air fairs and municipal markets with large numbers of people. The reduction results show beef as the most affected, with almost 30% of the survey participants claiming to have reduced consumption to some degree. One of the reference works that help us understand these results was devised by Hoffmann (2000), who calculated the elasticity of meat consumption influenced by income. The author used data from various editions of the Family Budget Survey (POF) and concluded that prime beef and pork are more susceptible to variations in consumption to the detriment of income. We can also highlight the presence of informal markets in the purchase of proteins not investigated in our research, such as sheep meat. This protein, in particular, is well known for the informality of its markets (Matte; Waquil, 2021) and deserves attention in future studies.

As for changes in consumption, the category with the highest percentage was no change in consumption during the quarantine, with an average of 47.2%. This result is supported by two hypotheses: the first is that the participants simply changed their cuts to cheaper options without changing the quantity consumed, and the second questions the effectiveness of the web-based questionnaire in reaching different audiences, with a recurring majority of individuals from better socio-economic backgrounds taking part. And finally, the increase in consumption, which was led by

chicken eggs with 19.8%, followed by poultry meat with 14.7%, was expected, since both products are the cheapest and most accessible sources of animal protein.

The pandemic led to an even greater drop in food security levels, with an increase in moderate and severe food insecurity indicators (characterized by malnutrition/hunger) to the level recorded in 2004, the level of these indicators combined with the economic, health and political crisis reflected negatively on the Brazilian population's right to food (Rede PENSSAN, 2021). In order to justify the factors that led to changes in meat consumption during the quarantine, the participants chose one or more answer options. As illustrated in Graph 2, consumption remained unchanged with almost half of the participants. Recurring price increases accounted for ¼ of the justifications. Reducing salaries, a common practice at the start of the pandemic to maintain staff numbers in companies, accounted for just under 7.8% of responses. The low numbers of responses referring to food insecurity cannot be taken as a parameter for the entire national scenario, perhaps even for the regional one, since the low number of responses associated with reduced consumption and unemployment show the difficulty that the survey questionnaire had in reaching social strata with lower purchasing power.

4 Conclusion

The results show that there have been changes in the consumption of proteins of animal origin during the quarantine. The main change was observed in the increased consumption of poultry meat and chicken eggs, to the detriment of a reduction in beef consumption. It is associated with different factors, including the increase in price and financial insecurity as a result of the uncertainty of the timing of the pandemic, especially given the presence of participants in the survey who are in a financially dependent situation.

The survey also made it possible to understand the preference for consuming animal proteins before the quarantine. These results allowed us to see that in the South of Brazil, the main proteins of animal origin consumed daily are chicken eggs and beef, while the least consumed source was fish. Our research, contrary to others, allowed us to observe and affirm that the daily consumption of chicken eggs is higher than the consumption of meat, with 37.1% of those interviewed indicating this.

In general, the results allow us to conclude that there has not necessarily been a change in the amount of animal protein consumed, but rather in the type of protein that has been ingested. Therefore, the presence of these foods is relevant to the composition of the diet of the Southern Region, with adjustments occurring and the redistribution of the components representing this food category, but ensuring their presence in the dietary structure of the population.

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