IMPACTS OF COVID-19 ON BRAZILIAN MEAT CONSUMPTION

ABSTRACT: in recent years, the meat consumption profile of Brazilians has changed significantly with a switch from beef to chicken and pork, seeking lower prices and healthy consumption. Nine hundred and ninety-one responses from the 5 Brazilian macro-regions were analyzed, involving the preference and consumption of different meats, before, during and after the COVID-19 pandemic. Participants were grouped into 4 groups called “Clusters” through the Non-Hierarchical Clustering Method (grouping), by the K-Means algorithm of the Scikit-Learn library in Python language. The analysis reveals a similar consumption among all groups (clusters), before the pandemic with predominant consumption of beef, however, during and after the pandemic, consumption was reversed, with respondents consuming more chicken meat. The group with the highest participation in the Northeast region (Cluster 3), formed only by women and the one with the lowest income (Up to 1 minimum wage), had the highest consumption of chicken before the pandemic (30.08%), and also had the highest protein consumption during the pandemic (75.43%). It is concluded that there was a relevant
change in the consumption profile of the interviewees in the pre, during and post pandemic periods in the 5 Brazilian regions, with the main occurrence being the exchange of beef for chicken and pork.

Keywords: Brazil. Consumer profile. Economy. Pandemic.

IMPACTOS DA COVID-19 NO CONSUMO DE CARNE NO BRASIL

RESUMO: nos últimos anos, o perfil de consumo de carne do brasileiro mudou significativamente com a substituição da carne bovina pela de frango e suína, buscando preços mais baixos e consumo saudável. Foram analisadas 991 respostas das 5 macrorregiões brasileiras, envolvendo a preferência e consumo de diferentes carnes, antes, durante e após a pandemia de COVID-19. Os participantes foram agrupados em 4 grupos denominados “Clusters” através do Non-Hierarchical Clustering Method (agrupamento), pelo algoritmo K-Means da biblioteca Scikit-Learn em linguagem Python. A análise revela um consumo semelhante entre todos os grupos (clusters), antes da pandemia com consumo predominante de carne bovina, porém, durante e após a pandemia, o consumo se inverteu, com os entrevistados consumindo mais carne de frango. O grupo com maior participação na região Nordeste (Cluster3), formado apenas por mulheres e de menor renda (até 1 salário-mínimo), tinha o maior consumo de frango antes da pandemia (30,08%), e teve o maior consumo da proteína durante a pandemia (75,43%). Conclui-se que houve mudança relevante no perfil de consumo dos entrevistados nos períodos pré, durante e pós pandemia nas 5 regiões brasileiras, sendo a principal ocorrência a troca da carne bovina por frango e suína.


IMPACTOS DEL COVID-19 EN EL CONSUMO DE CARNE EN BRASIL

RESUMEN: el perfil de consumo de carne de los brasileños cambió significativamente, pasando de la carne de res a la de pollo y cerdo, buscando precios más bajos y un consumo saludable. Se analizaron 991 respuestas de las 5 macroregiones brasileñas, que involucran la preferencia y el consumo de diferentes carnes, antes, durante y después de la pandemia de COVID-19. Los participantes fueron agrupados en 4 grupos denominados “Clusters” a través del Método de Clustering No Jerárquico (agrupación), mediante el algoritmo K-Means de la librería Scikit-Learn en lenguaje Python. El análisis revela un consumo similar entre todos los grupos (clusters), antes de la pandemia con un consumo predominante de carne de res, sin embargo, durante y después de la pandemia, el consumo se invirtió, consumiendo más carne de pollo los encuestados. El grupo de mayor participación en la región Nordeste (Cluster3), formado solo por mujeres y también el de menores ingresos (Hasta 1 salario mínimo), tenía el mayor consumo de pollo antes de la pandemia (30,08%), y también tuvo el mayor consumo de proteínas durante la pandemia (75,43%). Se concluye que hubo un cambio relevante en el perfil de consumo de los entrevistados en los períodos pre, durante y post pandemia en las 5 regiones brasileñas, siendo el principal evento el intercambio de carne de res por pollo y cerdo.

It is expected that world meat production will reach around 374 Megatons - Mt by the year 2030, to meet the animal protein demand of a projected population of 8.5 billion in the same period. Despite the projected growth of 5.9% in beef available for consumption, changes in eating habits and consumer preferences will lead to greater demand and supply of chicken, pork and lamb meat, growing 17.8%, 13.1% and 15.7%, respectively (OECD-FAO, 2021). In this scenario, Brazil remains one of the main players to meet the international demand for animal protein and the strong domestic market, currently responsible for providing 92 kg/inhabitant/year of chicken, beef and pork (CONAB, 2021).

Brazil is a country of continental dimensions, with a population of more than 200 million divided into 5 regions (South, Southeast, Midwest, Northeast and North), with each region and state having its cultural, environmental and socioeconomic particularities (IBGE, 2022). Factors such as species, price, sociodemographic differences, quantity of consumption, preferred place of purchase, daily routine, presence of growth promoters, packaging, ease of cooking and race interfere in the decision-making when choosing and buying meat (Verbeke et al., 2004; Armengol et al., 2019; Alanís et al., 2021).

The consumption of meats extends beyond the mere provision of high-biological value proteins, vitamins, and minerals; it is intricately tied to cultural and social factors. Consequently, the state intervenes to sustain internal supply and maintain prices at levels accessible to the Brazilian consumer (Vieira et al., 2021). According to the Household Budget Survey (POF) census, the most consumed meats by Brazilians during the period of 2017-2018 were as follows: Beef (50.2 g/day), followed by poultry (47.4 g/day), pork (15.8 g/day), and fresh fish (13.1 g/day) (IBGE, 2021). Estimates provided by CONAB (2021), the apparent consumption or internal availability of chicken, beef, and pork in 2021 were, respectively, 51 kg/capita/year, 25.8 kg/capita/year, and 15.2 kg/capita/year.

However, in recent decades, the profile of Brazilians spending on food has changed due to sociodemographic, economic and behavioral changes (Vaz & Hoffmann, 2020). With the COVID-19 pandemic, there was an increase in the number of unemployed, and a strong loss of purchasing power demonstrated by the high National Consumer Price Index - NCPI, in parallel with the high Chinese demand for beef, and consequently, its price increase. And in this context, Brazilians stopped consuming beef to consume meat of lower financial value, such as chicken and pork (Malafaia et al., 2020; IBGE, 2022a).

The COVID-19 has brought about numerous changes in the dietary behavior of both young individuals and adults, whether aspiring towards a healthier diet through, for example, the reduction of fast-food consumption and increased intake of vegetables, or seeking ways to alleviate issues such as anxiety, resulting in an augmented consumption of sweets, particularly among women (Alomari et al., 2022; Lamy et al., 2022).

Therefore, knowing and obtaining information about consumer preferences is vital for maintaining, scaling and marketing businesses. The data obtained can be translated into knowledge, development of new products, innovation and demystification of anti-meat ideologies (Boccia et al., 2018; Malafaia et al., 2020a), in addition to seeking to meet the specific needs of each region since there are great cultural and socioeconomic differences in Brazil. Therefore, the present research aims to understand the impacts of the COVID-19 pandemic on meat consumption by Brazilians from different regions of the country.
MATERIALS AND METHODS

The research was carried out by the Meat and Animal Products Laboratory at the Agricultural Sciences Center (CCA) at the Federal University of Santa Catarina (UFSC) Florianópolis, SC.

A questionnaire with 24 open and closed questions was developed to survey the socioeconomic profile, preferences and habits related to meat consumption by Brazilians from different federal regions of Brazil. The questionnaire was structured in digital format by Google Forms, and sent through social networks (Instagram, Facebook, Twitter, Telegram, WhatsApp...) and emails, seeking to reach the five regions of the country. Responses from other countries, which were incomplete or which stated that they did not consume meat, were withdrawn for a better analysis of the data.

The questionnaire, approved by the Human Research Ethics Committee (CEPSH) of the Federal University of Santa Catarina, under protocol number 60190822.5.0000.0121, was applied for 50 days, starting on 07/14/2022.

Data were collected and organized anonymously, thus ensuring the safety and freedom of expression of all participants, and being self-administered.

Questions involving the selection of one or more specific meats presented beef, pork, poultry, fish, goat and sheep meat as a choice. If other types of meat were consumed, they would be included in the “other” category.

To understand the purchasing power of the interviewees, the monthly income was surveyed, being 1 minimum wage - MW (R$ 1.212). As a comparison, R$ 1 = US$ 5, always changing daily.

The organization, treatment and analysis of data were performed using the Jupyter Notebook, an open source tool in Python used to create and organize workflows and codes, in addition to analyzing and visualizing data (Randles et al., 2017). Microsoft Excel 2019 software was also used to tabulate and plot the graphs.

CLUSTERING OF PARTICIPANTS

Clustering is an unsupervised technique for segmenting different objects, with similar characteristics from a heterogeneous collection. It is unsupervised in that we do not determine the characteristics that will be used to group the data. Such segmentation can be used by the industry to understand the market and structure marketing strategies seeking customer loyalty and prospecting for new ones (Barman & Chowdhury, 2019).

Non-hierarchical clustering was performed using the Jupyter Notebook using the K-Means algorithm from the Scikit-Learn library. Clustering was performed 3 times, maintaining standard sociodemographic data in the 3 repetitions, varying only the most consumed meat before, during and after (currently) the pandemic.

The ideal number of clusters (k) was calculated using the Elbow method (or “elbow”), which demonstrates the variability of the data in relation to the number of clusters, and this relationship is presented in a decreasing curve. The ideal number of clusters is close to the “elbow” curve, where subsequently the curve follows a uniform linear movement (Syakur et al., 2018; Santana et al., 2021). All variables were dichotomized, that is, they were converted to binary variables, accepting values 1 when the consumer has that characteristic or 0 when not.
RESULTS AND DISCUSSIONS

SOCIODEMOGRAPHIC AND ECONOMIC PROFILE OF INTERVIEWEES

The database had 991 responses after removing incomplete responses, with 62.56% self-declared female and 37.44% male. This greater participation of the female public in research on consumer habits and preferences has been observed in other studies, both in Brazil and abroad (Escriba-Péres et al., 2017; Magalhães et al., 2021; Battagin et al., 2021; Alanís et al., 2022).

![Regional distribution of the interviewed](image)

**Figura 1**: Regional distribution of responses obtained and analyzed.
Source: Authors

Regarding the socioeconomic profile (Table 1), most interviewees are between 20 and 30 years old (49.75%), in terms of education, there was a predominance of incomplete higher education (40.86%). A relevant point in the results is that 21.49% of the interviewees have completed postgraduate studies, a fact that may have occurred due to the request for answers to other research groups and universities. As for income, 39.05% reported receiving between 1 and 3 Minimum Wages (MWs), and 29.77% received up to 1 MW. Similar information was found by Magalhães et al. (2021), in a survey carried out on the profile of meat consumers in Fortaleza - CE. This high percentage of participants receiving up to 3 MWs (68.82%), can be attributed to factors such as the high number of academics among the respondents and/or the growth of people working informally. Recent data released by the IBGE (2022b) show that the number of informally employed workers in the 2nd quarter of 2022 was 39.3 million Brazilians, the highest number in the historical series.
Table 1: Socioeconomic profiles of interviewed meat consumers

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 20 years</td>
<td>100</td>
<td>10.09</td>
</tr>
<tr>
<td>Between 20 and 30 years</td>
<td>493</td>
<td>49.75</td>
</tr>
<tr>
<td>Between 31 and 40 years</td>
<td>199</td>
<td>20.08</td>
</tr>
<tr>
<td>Between 41 and 50 years</td>
<td>107</td>
<td>10.80</td>
</tr>
<tr>
<td>Between 51 and 60 years</td>
<td>65</td>
<td>6.56</td>
</tr>
<tr>
<td>61 years or older</td>
<td>27</td>
<td>2.72</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fundamental level incomplete</td>
<td>11</td>
<td>1.11</td>
</tr>
<tr>
<td>Fundamental level complete</td>
<td>7</td>
<td>0.71</td>
</tr>
<tr>
<td>High school incomplete</td>
<td>16</td>
<td>1.61</td>
</tr>
<tr>
<td>High school complete</td>
<td>102</td>
<td>10.29</td>
</tr>
<tr>
<td>Higher education incomplete</td>
<td>405</td>
<td>40.86</td>
</tr>
<tr>
<td>Higher education complete</td>
<td>185</td>
<td>18.66</td>
</tr>
<tr>
<td>Post-graduation incomplete</td>
<td>52</td>
<td>5.25</td>
</tr>
<tr>
<td>Post-graduation complete</td>
<td>213</td>
<td>21.49</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 1 minimum salary</td>
<td>295</td>
<td>29.77</td>
</tr>
<tr>
<td>From 1 to 3 minimum salaries</td>
<td>387</td>
<td>39.05</td>
</tr>
<tr>
<td>From 4 to 9 minimum salaries</td>
<td>250</td>
<td>25.23</td>
</tr>
<tr>
<td>More than 12 minimum salaries</td>
<td>59</td>
<td>5.95</td>
</tr>
</tbody>
</table>

Source: Authors.

Only 2.52% do not participate in food purchases where they live, on the other hand, as can be seen in Table 2, 67.51% of participants always participate in purchases. Another relevant fact in Table 2 is that 64.58% consume some type of meat every day. In their work, Magalhães et al. (2021) found that 83.4% of respondents consume some meat every day.

Table 2: Participation in food purchases and frequency of meat consumption

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in Purchases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>669</td>
<td>67.51</td>
</tr>
<tr>
<td>Sometimes</td>
<td>297</td>
<td>29.97</td>
</tr>
<tr>
<td>Never</td>
<td>25</td>
<td>2.52</td>
</tr>
<tr>
<td>Frequency of meat consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once a week</td>
<td>22</td>
<td>2.22</td>
</tr>
<tr>
<td>Twice a week</td>
<td>35</td>
<td>3.53</td>
</tr>
<tr>
<td>3 times a week</td>
<td>85</td>
<td>8.58</td>
</tr>
<tr>
<td>4 times a week</td>
<td>76</td>
<td>7.67</td>
</tr>
<tr>
<td>5 times a week</td>
<td>116</td>
<td>11.71</td>
</tr>
<tr>
<td>Less than once a month</td>
<td>10</td>
<td>1.01</td>
</tr>
<tr>
<td>Every day of the week</td>
<td>640</td>
<td>64.58</td>
</tr>
<tr>
<td>Once a month</td>
<td>7</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Source: Authors.

Preference for species, cuts and criteria taken into account at the time of purchase.
In the 5 regions, consumers’ preferred meat is beef (69.70%), followed by chicken (16.44%) and pork (6.62%). As for the preferred cut, sirloin steak (13.42%) was the first option, followed by tenderloin (8.37%) and tender rump (6.86%). However, when asked about the most consumed cut currently, the participants said it was chicken breast (20.98%), chicken leg (8.57%) and drumstick (6.86%) (Figure 2).

![Figure 2: Meat cuts preferred and most consumed by respondents. Source: Authors.](image)

This antagonism is probably due to the loss of Brazilian purchasing power due to the economic crisis that hit Brazil and the world. Similar results were found by Nascimento et al., (2018) in Alto Pantanal Sul-Mato-Grossense, where the interviewees' preferred cuts were sirloin steak, tenderloin and beef shoulder. Furthermore, 53.88% of the participants would change the cut consumed if they had the opportunity.

However, to create campaigns to encourage meat consumption, it is necessary to know the criteria that influence consumers in their decision-making process. For respondents from the 5 regions, the main criterion at the time of purchase is the price, later the appearance and types of cuts (Figure 3).

![Figure 3: Main criteria pointed out by respondents in the survey for the decision to purchase meat. Source: Authors.](image)
Velho et al. (2009), in a survey carried out with consumers in Porto Alegre, RS, reported that the main criterion for choosing meat was appearance, followed by price. In research carried out by Vessoni et al. (2019), the main criterion used in the purchase was quality (50.3%), followed by price (28.7%). Thus, in the present research it was possible to observe a change in the criteria used when buying meat, where the price had the greatest impact on consumer choice.

Regarding the place of purchase of meat, the 5 regions have similar choices, with supermarkets and butchers, 71.95% and 20.60%, respectively.

Despite sheep production being cultural in the Northeast and South, and goats in the Northeast, both production and consumption is still much lower when compared to other species. In this context, 50.66% of the Brazilians interviewed had never tried goat meat, and 30.77% lamb meat. The Southern region concentrates 37.45% of interviewees who have never consumed goat meat, and 22.95% of those who have never consumed sheep meat. According to research by EMBRAPA (2018), about 12% of the Brazilian population has never consumed lamb meat. When asked if they would be willing to try the uneaten options, 76.08% said yes, and 33.19% justified non-consumption due to lack of habit (33.19%) or because they could not find it in their city (16.64%). Thus, such proteins have a great growth potential to be explored.

Regarding consumers' perception of which protein is healthier, 69.12% reported it being fish, followed by 43.49% chicken, 27.54% beef and 21.89% pork (Figure 4). Pereira & Elias (2021), analyzing the profile of fish consumers in Gaspar, SC, found that 26.29% of interviewees consume fish to have a healthier diet. Still in this perspective, Mangas et al. (2016), reports that 81.5% of consumers in Belém - PA are motivated to consume fish meat because it is considered healthy. Furthermore, Faria et al. (2006), evaluating the consumer behavior of pork meat and its derivatives by the population of Belo Horizonte - MG, found that 70.8% consider chicken meat the healthiest.

Of the meat most consumed by Brazilians, pork is considered the least healthy, being harmed by numerous myths. Health risk, high amount of fat, calories and cholesterol are some points pointed out by consumers as limiting consumption (Fonseca & Salay, 2008; Souza et al., 2021). However, prejudice against pork is not limited to Brazil. A survey by the World Animal Protection (2016), shows that 17% of the population of Mexico, 15% of Chile and 10% of Colombia would never buy pork. In addition, consumers' perception that pigs are raised in poor conditions weighs on their choices. According to Thoms et al. (2010), 60% of respondents in their survey believe that pigs are raised and slaughtered in worse conditions than poultry (26%) and cattle (14%).

![Figure 4](image-url)
Regarding fish overall, 46.82% of the participants want to maintain their current consumption of meat, 36.12% want to consume more and 17.05% would like to stop consuming meat (Figure 5). Fonseca & Salay (2008), in a survey with consumers in the city of Campinas, SP, evaluated the safety relationships and nutritional concerns with meat consumption.

Consumers' willingness to stop, reduce, maintain or increase consuming meats (beef, chicken and pork) were 4.76%, 16.6%, 71.13% and 7.7%, respectively, were evaluated.

![Figure 5: Percentage of interviewees who want to maintain consumption, consume more or stop consuming meat. Source: Authors.](image)

GROUPING OF INTERVIEWEES IN CLUSTERS

The presentation of the results was carried out by grouping the interviewees, a method called clustering. In the description of each cluster, there was none that was composed only of one region, and in general, all were very homogeneous. However, the region that had the greatest participation in the composition of each group will be the region described for it in the tables.

Thus, a number of 4 clusters were used for before, during and after the pandemic, with the average number of respondents per cluster being 257 (Cluster 1), 265 (Cluster 2), 235 (Cluster 3) and 234 (Cluster 4), as shown in Figure 6.

Cluster 1 is the only one composed of women and men, and it is the oldest group among respondents (31 to 40 years old), with a predominance of residence in the Southern region (33%), with complete postgraduate studies and with monthly incomes between 6 and 9 MWs. It is worth mentioning here that 19% of this group receives more than 12 MWs. Clusters 2 and 3 are formed only by female participants, who are mostly from the South/Southeast and Northeast regions, respectively, and both aged between 20 and 30 years and with incomplete higher education. Regarding income, Cluster 2 concentrates between 1 and 3 MWs, and Cluster 3 up to 1 MW. Finally, Cluster 4 is formed only by male participants, predominantly from the Southern region (36%), aged between 20 and 30 years and income between 1 and 3 MWs (Figure 6).
Before the pandemic, the 4 groups had beef as the most consumed meat, followed by chicken and pork (Table 3). This higher consumption of beef is linked to the preference of the Brazilian population, being identified as the favorite species in numerous studies (Thoms et al., 2010; Raimundo & Batalha, 2014; Lopes et al., 2016; Nascimento et al., 2018).

As for chicken consumption before the pandemic, Cluster 3 had the highest share of this protein (30.08%) (Table 3). Data from the Household Budget Survey (HBS), carried out during the period 2017-2018, points out that the Northeast region is the one with the highest consumption frequency and per capita consumption (g/day) of chicken meat (IBGE, 2020). This is probably due to the lower per capita income in the Northeast region and the lower sale value of poultry meat when compared to the value of other proteins. Pork consumption, on the other hand, was not very expressive before the pandemic, with Cluster 4 being the one that consumed the most (Table 3).

However, there was a significant change in the profile of protein consumption during the pandemic (Table 3). Cluster 1 was the one that least reduced its consumption of beef. This smaller reduction in consumption may be related to the higher income of the public and the fact that beef had increased significantly in price, making consumption unfeasible for other groups. Recent studies on the variation in product prices in the pandemic show beef as the product that had the highest real increase, with an appreciation of 133.70% between 03/20 and 10/21, discounting inflation for the period of 12, 53% (IBPT, 2022). This increase in the price of beef directly affected consumers in Cluster 3, who consumed the least beef (12.83%) during the pandemic, remembering that it was the lowest income group.

Except for the highest income group (Cluster 1), all the others reversed the high consumption of beef for chicken meat (Table 3), and the lowest income group (Cluster 3) is the one with the greatest participation in this process (75.43%). This exchange is reported in several works, and the main reason given for this substitution is the trade price relationship between the two species (Pes et al. 2012; Silva et al. 2015; Magalhães et al., 2022). Cipriano et al., (2021), in a survey on the profile of beef consumers in
the state of Roraima, reports that 52.3% of consumers have chicken meat as the best option to replace beef.

It is worth highlighting the behavior of consumers during the pandemic for pork (Table 3). Two groups of consumers (Clusters 1 and 2) considerably increased the amount of pork consumed. Both are made up of people who reside predominantly in the southern region, which is the region with the largest swine production in Brazil. In addition, this region has the highest frequency of consumption and the highest average consumption per capita (grams of meat consumed per day) in Brazil (IBGE, 2021). Only the group of consumers called Cluster 3 increased the consumption of pork in a timid way. This is probably due to the fact that it is the group with the lowest income, and that it is mostly made up of the Northeast region, which does not have a high consumption of pork (Table 3).

After the most critical period of the pandemic, there was a slight recovery in beef consumption, except for Cluster 1, which maintained consumption close to that during the pandemic (Table 3). Chicken meat ended up losing consumers who returned to beef with the country’s economic recovery, however, there was a greater migration to pork.

The 4 groups of interviewees (clusters) had a similar consumption of pork after the pandemic, with the male group (Cluster 4) with the highest participation in the Southern region, which increased the consumption of this protein the most (Table 3). This higher consumption of pork by men is observed in other works (Faria et al., 2006; Souza et al., 2021).

The high demand for chicken meat during the pandemic also contributed to raising its price, with an appreciation of 70.08% between 03/20 and 05/22, discounting the 19.90% inflation in the period (IBPT, 2022a). Despite this small increase in pork consumption, Nunes et al. (2022), points out that the changes in habits caused by the pandemic were not enough to change the preference for it. It should be noted that the Brazilian Association of Pig Breeders (ABCS) has been working for years to combat myths and encourage the consumption of pork in different extracts of society (ABCS, 2022).

Table 3: Number of interviewed (%) from each Cluster that had beef, chicken and pork as the most consumed meat before, during and after COVID-19.

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Before the pandemic</th>
<th>During the pandemic</th>
<th>After the pandemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>65.90</td>
<td>45.88</td>
<td>49.40</td>
</tr>
<tr>
<td>2</td>
<td>71.70</td>
<td>25.36</td>
<td>27.44</td>
</tr>
<tr>
<td>3</td>
<td>63.55</td>
<td>12.83</td>
<td>24.47</td>
</tr>
<tr>
<td>4</td>
<td>67.38</td>
<td>28.01</td>
<td>36.17</td>
</tr>
<tr>
<td>Chicken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>26.13</td>
<td>36.47</td>
<td>37.15</td>
</tr>
<tr>
<td>2</td>
<td>24.41</td>
<td>65.8</td>
<td>62.03</td>
</tr>
<tr>
<td>3</td>
<td>30.08</td>
<td>75.43</td>
<td>62.02</td>
</tr>
<tr>
<td>4</td>
<td>27.46</td>
<td>61.2</td>
<td>50.21</td>
</tr>
<tr>
<td>Pork</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.27</td>
<td>10.19</td>
<td>7.11</td>
</tr>
<tr>
<td>2</td>
<td>2.32</td>
<td>5.51</td>
<td>7.51</td>
</tr>
<tr>
<td>3</td>
<td>3.38</td>
<td>3.87</td>
<td>7.17</td>
</tr>
<tr>
<td>4</td>
<td>3.43</td>
<td>5.60</td>
<td>9.36</td>
</tr>
</tbody>
</table>

Source: Authors.
The movement of consumers before, during and after the pandemic can be seen in Figures 7, 8 and 9. It was noted that there were changes in the direction of the axes from before the pandemic to during the pandemic. The direction of the axes after the pandemic was the same as during the pandemic, however, there was a greater dispersion of interviewees, which may be linked to more diversified consumption. The abrupt change in direction is mainly due to the large shift from beef to chicken meat.

**Figure 7**: Dispersion of consumers before the pandemic, grouped in *clusters*
Source: Authors.

**Figure 8**: Dispersion of consumers during the pandemic, grouped in *clusters*
Source: Authors.

**Figure 9**: Consumer dispersion after the pandemic, grouped in *clusters*
Source: Authors.
CONCLUSIONS AND IMPLICATIONS

It is concluded that there was an abrupt change in the consumption of meat by the interviewees, switching from beef to chicken and pork. Meat prices and health issues may be the main influencers of these changes. The public in the Northeast region of Brazil proved to be the most sensitive to price changes, and the most dependent on chicken meat.

In general, consumer preferences regarding meat and preferred cuts, criteria considered at the time of purchase, place of purchase and meat never consumed were similar in the 5 regions.

It appears that many interviewees are vulnerable to events that increase economic uncertainty, with subsequent inflation of essential food items, and with that, starting to use the price and not the quality of the product as a purchase criterion.

Thus exposed, it is possible to work on marketing strategies seeking to serve different niches, demystify anti-meat ideologies, invest and seek scales of proteins that are little produced, such as sheep and goats, and work on different cuts and ways of packaging.

Future work is suggested relating the perceptions of Brazilians from different parts of the country about animal breeding systems, the use of additives such as antibiotics and how much they would be willing to pay for benefits to the environment and animals.

REFERENCES


ARTIGO DE DOSSIÊ
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