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RED MEAT CONSUMPTION AS A BENCHMARK FOR FOOD SECURITY DURING CRISES: CASE STUDY OF MEAT CRISIS AND COVID-19 PANDEMIC IN IRAN

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Red meat consumption as a benchmark for food security during crises: Case Study of Meat Crisis and COVID-19 pandemic in Iran

Summary

Red meat plays an essential role in Iranian cuisine, both as a source of protein and as an integral component in eating behaviours based on religious and cultural factors. Economic challenges, including high inflation and low incomes, have affected red meat consumption in Iran in the last decade. In early 2019, the sharp jump in red meat prices led to fundamental changes in the Iranians' dietary intakes. This price crisis was directly followed by the COVID-19 pandemic, which affected Iran's under pressured economy and food markets. This study investigated the changes in red meat consumption in Mashhad, the second-most populous city and a centre of red meat production in Iran, during these two crises. The data analysis shows that meat consumption decreased among the low-, middle and high-income groups after the price crisis. During the COVID-19 pandemic, the per capita consumption of red meat decreased among low- and middle-income groups, while it increased among the upper-class groups. Moreover, low-income groups were more than the other groups affected by eliminating red meat from their diet or substituting it with non-protein sources. As a conclusion, the two crises have increased food insecurity and weakened social sustainability. To help vulnerable groups, government and civil society need to develop targeted strategies that enable lower-income consumers to cope with nutrition shortages during crisis periods.

Keywords: Red meat crisis, COVID-19 pandemic, food security, social sustainability

1. Introduction

The accessibility of proper food for people from all walks of society plays a crucial role in ensuring physical and mental health. According to FAO (1996) food security is given "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". In particular, food security is defined by the four dimensions: availability, access, food utilization and stability. Thus, the disruption or instability of any of the four dimensions can threaten food security at the micro, meso or macro-level (GRINBERGA-ZALITE et al., 2021), which, in turn, affects the sustainability of the food system. Furthermore, a sustainable food system also considers the social and economic dimension besides the environmental aspect of sustainability (BLAY-PALMER et al., 2020). Especially, the social dimension of FS is defined as "product or process aspects that affect human safety and welfare, community development, and protection from harm" (KLASSEN and VEREECKE, 2012). The social impact on consumers as one of the main actors in a food supply chain, including health, safety and food security, would be categorized under social sustainability (Rafiaani et al., 2018; Accorsi, 2019). Hence, unequal access to healthy and nutritious food undermines social sustainability and increases the risk of marginalizing or even excluding certain social groups from the supply chain (Fan et al., 2021).

Eating behaviours and availability and affordability of essential nutrient differ between countries and regions, and consequently, the concept of food security and sustainable consumption do not target the same issues in different contexts. Therefore, dietary recommendations on plant and/or animal source food differ from one country to another. For example, in developing or low-income countries, the concept of food security is more concerned with meeting the basic nutritional needs of individuals, while in developed countries, it is more targeted at issues such as obesity (Thomas, 2010; Sadler, Gilliland, & Arku, 2016; Wishon & Rene Villalobos, 2016).

Red meat has always been an integral part of the Iranian cuisine. The popularity of red meat among Iranians is not only because of its taste and availability of domesticated animals but also its roots in the culture and traditions. Red meat consumption is not only a vital part of the daily diets of the Iranians, but its consumption is also highly regarded in religious festivities and cultural celebrations and ceremonies. However, due to the different eating habits/behaviours, the consumption of red meat as significant source of protein¹ is much lower compared to high-income countries². For instance, while in 2018 the per-capita consumption of red meat (lamb and beef) in Iran was 9.9 kg (OECD, 2020), it was 45 kg in Germany³ (FLEISCHER-VERBAND, 2019).

Animal source foods as a composition of micro⁴- and macronutrients⁵, containing higher quality protein⁶, all essential amino acids and fatty acids, more bioavailable vitamin A, vitamin D3, vitamin B12, and all essential minerals including iron, iodine, zinc, calcium, folic acid, has advantage over plant source foods. poor growth, stuning, low intelligence quotient, autism, depression, and dementia are examples of these nutrients' deficiency. In this regard, the importance of meat in preventing undernutrition in low- and middle-income countries is undeniable (ADESOGAN et al., 2020).

According to the Statistical Center of Iran (2019), the per-capita consumption of red meat has decreased from 8.3 kilograms to 6 kilograms over the last decade. A severe decline in household red meat consumption occurred in Iran in early 2019 (for urban households by 4.3 kg per capita and rural households by 5.3 kg). During that time, the red meat market in Iran encountered a crisis during which the price of lamb and beef increased by almost 130% compared to the same period the year before (Statistical Center of Iran, 2019). Interestingly, a 188% increase in meat imports (JAVANN.IR, 2019) and the distribution and selling of subsidized, imported frozen red meat by the state, cheaper than domestic meat supply, could not solve the 2019 crisis. Moreover, subsidized meat was not only of low quality but also unfairly and unequally distributed in different cities and even in various areas of each county. Therefore, rising red meat prices and shortages in the red meat supply have affected consumers by increasing food expenditures and forcing changes in their dietary intake. According to some government experts, this crisis is affected by economic and political problems. To be more precise, the devaluation of the Iranian Rial boosted livestock smuggling to neighbouring countries due to the high profits for sellers. Additionally, financial resources from the Iranian government that had been allocated for meat imports were suspended in April 2019 after the implementation of the US sanctions. lack of integrated management in meat supply chain, volatility in prices, increasing input and production costs for livestock breeders, lack of control of trafficking of livestock from the border areas, hoarding in warehouses, concentration and monopolization of production and distribution have amplified this crisis.

Although the consumption of red meat has been slightly replaced by poultry in recent decades, this replacement is not feasible on a mass scale as a solution to the red meat price crisis. The poultry industry mainly operates at a large scale and is struggling with a lack of required inputs, overuse of hormones and even bankruptcy of many private poultry farms. In contrast, red meat, and particularly lamb, is produced mainly in rural areas by many smallholders, meaning it's a

¹ Recommended daily protein intake value (g protein/kg body weight per day): infants <4 months: 2.5-1.4, children: 1.3-0.8, adults <65 years: 0.8, adults >65 years: 1.0(RICHTER et al., 2019).

² In this regard [meat consumption], Iran is a typical country in MENA region (OURWORLDINDATA, 2017).

³ Since pork is forbidden in Islam, the statistics of Iran excludes and of Germany includes it.

⁴ Micro-nutrients include vitamins, minerals and fiber which are required by human body in small amount.

⁵ Macro-nutrients include proteins, fats and carbohydrates and human body requires them in large amounts.

⁶ Raw red meat contains on average 20–24 g protein per 100 g

very crucial component of rural livelihoods. It must be added that the manure produced by livestock is used by farmers nearby, significantly reducing the need to use chemical fertilizers. In 2020, the world faced the COVID-19 pandemic, which directly affected food supply and demand. Furthermore, it also indirectly affected purchasing power and the capacity to produce and distribute food. These effects were more severe among vulnerable and poorer social groups (CFS, 2012; Grinberga-Zalite et al., 2021). The particular circumstances associated with the pandemic as "a systemic shock that has critically impacted food systems" (Rivington et al. 2021, 90), lockdown and various restrictions have worsened Iran's red meat crisis, with one of the most significant changes being an exacerbation of social inequalities. COVID-19 pandemic caused economic challenges while Iran's economy was already suffering from different causes such as US sanctions, high inflation and recession (WB, 2020). Moreover, it weakened the FSCs' performance and exacerbated the vulnerabilities in different parts of the red meat chain.

Hence, this study investigates the changes in red meat consumption among Iranian consumers (in three groups of low-, middle-, and high-income) in the pre-crisis era (2019), during the rising meat price crisis (2019-2020) and also during the COVID-19 pandemic crisis. Such a study could investigate how one of the most important parts of the food system (consumers in this case) are affected by these crises and how they responded to critical situations. Thus, it helps to develop strategies to reduce the risks of food insecurity among different social groups. This comparison and its relationship to food security and social sustainability justified the novelty of the present article. In this study, statistical analysis of quantitative information which were collected through questionnaire are used. Furthermore, we have used repeated-measures ANOVA approach to compare the differences between groups of interest to find the changes through different crisis period. This methodology aims to understand the social world by observing phenomena or processes that affect individuals, which is in line with the objective of our study (BURRELL and GROSS, 2017).

This article consists of four consecutive sections: A review of the relevant literature that shows the severe impact of rising price crises on the consumer and declining food accessibility in the COVID-19 pandemic. The methodology section includes the application of one-way ANOVA and comparing consumption variance among different income groups in pre-crisis (2019), within price crisis (2019-2020) and during the COVID-19 pandemic crisis. This section is followed by the results, which show a sharp decline in red meat consumption among low- and middle-income groups during the two crises. Finally, a discussion and conclusion are provided.

2. Food Price Crisis and Food Security

Food security can be threatened by various factors, from which the purchasing power is crucial, specifically for the lower-income groups. The effects of rising prices on food consumption are illustrated and discussed in several studies. A systematic review on the impact of rising food prices on food consumption in 162 countries shows that food consumption in low-income countries is much more reduced by increases in the price of all foods compared to high-income countries. Furthermore, such a price increase most adversely affects poorer households (GREEN et al., 2013). Results of an investigation about the effects of the food price crisis 2007/08 on eleven developing countries show that an increase in the price of essential tradable staple food commodities adversely affects poorer households, regardless of the country, region and location (urban or rural) (ZEZZA et al., 2009). In a more specific study on a developing country, an investigation about the effects of the food crisis on urban Ethiopian households indicates that urban poor households with low levels of assets were adversely affected by the food price shock (ALEM and SÖDERBOM, 2012).

Some studies are available with a specific focus on meat consumption during various crises. A survey about the impact of higher food prices on urban households in Riyadh city in Saudi Arabia indicates that such an increase in costs led to a decrease in the consumption quantities of major food commodities. Although this impact is not so significant for some commodities such as wheat flour, sugar, rice, and beef that the Saudi government subsidizes, it is much greater for non-subsidized commodities, especially mutton, poultry and camel meat (ABDEL KARIM YOUSIF and AL-KAHTANI, 2014). Due to cultural differences and eating habits in different societies, the price crisis can affect the consumption of various food differently. Nevertheless, in many contexts, meat has been one of the items whose price increase has the most significant impact on the consumer. A systematic review of 160 US-based studies on the price elasticity of demand for major food categories between 1983 and 2007 indicates that meat, compared to other categories, has a very high price elasticity and is most responsive to price changes (ANDREYEVA et al., 2010). A study on the impact of the sudden retail price increases for beef products on the consumer behaviours in Canada shows that higher prices compelled about 38 per cent of the sample to reduce or stop their beef consumption (CHARLEBOIS et al., 2016). Furthermore, in Turkey, a country that is geographically and culturally close to Iran and has similar eating habits, price increases in fresh meat negatively impact the consumption and the impact on red meat consumption are much higher (DEMIRTAS, 2018) by decreasing consumers' purchasing power (ÖZEN, TEKİNDAL and ÇEVİRİMLİ, 2019).

The COVID-19 pandemic and the consequent lockdown have negatively influenced food security and purchasing power. These effects have been more significant in underdeveloped and developing countries that have low and middle-income (EROKHIN and GAO, 2020). Due to the importance of the aftermath of the start of this latest international crisis, it has been the topic of some studies. A global assessment of the impacts of COVID-19 on food security shows that accessibility is the major dimension of food security that has been affected mainly by the COVID-19 pandemic (BÉNÉ et al., 2021). In a meta-analysis, Éliás and Jámor (2021) have systematically reviewed 51 articles (published in the period Oct. 2020 - April 2021) examining COVID-19 pandemic effect on food security in the first year. They conclude that household food insecurity has increased in 78% of the cases. Their study was conducted based on the FAO's conceptualization of food security⁷. The results show that food access is the most vulnerable dimension during the COVID-19 pandemic. People who belonged to a low-income household were more influenced because of losing their source of income and experiencing food price increases at the same time.

Consequently, such an impact has been particularly adverse on more vulnerable groups like women, people with low socioeconomic status, informal workers and who relied on daily wages (PICCHIONI et al., 2020). In South Africa, the COVID-19 pandemic has jeopardized the food security of low-income households dependent on labour income (ARNDT et al., 2020). Another study about the impacts of the COVID-19 pandemic on household food security in Jordan suggests that food insecurity is associated with household incomes. It also revealed that among different food groups, carbohydrates and the meat group were significantly connected to food insecurity (ELSAHORYI et al., 2020). Another investigation about the effects of the COVID-19 pandemic on beef consumption in Colombia shows that the decrease in revenues or the loss of employment and the subsequent financial restrictions are the most decisive factor in consuming beef meat. It is primarily true in the households with the lowest income (RAMÍREZ et al., 2021). Also, the impact of the pandemic and lockdown on the meat consumption pattern in India has been significant, and the consumption of meat and meat products for the majority of the respondents decreased during that time. The main reasons were increases in costs and decreases in the availability of livestock (FASLU RAHMAN et al., 2021). Finally, a study on the effects of the COVID-19 pandemic on meat consumption habits of Turkish adults shows that the

⁷ The FAO's definition is provided in section 1.

consumption of red meat, poultry meat and fish did not alter among the majority of the participants during the pandemic time. However, the consumption of red meat, poultry meat and fish reduced among 13%, 11%, and 31% of the participants, respectively. According to this study, the reason behind the first two was being unemployed or losing the job, but the case of fish is a bit different, and the reason was mainly due to difficulties in the supply chain. Also, 12% of the respondents had concerns about their access to meat and meat products if they lost their job after the COVID-19 pandemic (HASKARACA et al., 2021).

This study will focus on meat consumption changes among different income groups similar to many studies above. Although some researchers have examined food security in Iran during the Covid 19 pandemic, neither Khorasan Razavi province nor the changes in meat consumption during this period have been investigated. As a contribution, our study considers two consequent crises in Iran and their effects on red meat consumers. Furthermore, this study has been conducted for the two periods of crisis in Iran, and there is no similar study to our knowledge. In this study, we test the hypothesis that if the average per-capita red meat consumption is different between three social groups with distinct income levels who are living in three city quarters (1, 2 and 3) of Mashhad across the three time periods of pre-crisis and during two crises of rising meat price and COVID-19 pandemic.

3. Data and Methodology

The fieldwork was carried out in two stages in summer 2019 and spring 2021 in Mashhad, the second-most-populous city (with more than 6.4 million inhabitants) in Iran and the capital of Razavi Khorasan's eastern province, with a strategic position both geographically and in terms of red meat production, with the meat mainly marketed to domestic markets. Nevertheless, the distribution rate of subsidized imported frozen red meat for domestic consumption has increased five times since the beginning of 2019 compared to the same period last year. This province has a 450 km border with Afghanistan, facing a food security crisis (FAO, 2022).

In Mashhad City, the city quarter of residence can reflect the social class of individuals. So, the primary data was collected within a survey of 296 participants, which were randomly selected in three different city quarters: quarter one (low-income), quarter two (middle-income) and quarter three (high-income). To determine the required sample, stratified random sampling was used, in which the importance of diversity between groups in the population is considered in addition to the sample size (SINGH, R., & MANGAT, 1996). Therefore, to increase the accuracy of the mean estimation, sampling was started by dividing the population into a certain number of strata so that the diversity within them in terms of income and place of residence is minimum and between these strata is maximum. Finally, we selected smaller samples from each group or strata so that the total number of units in all strata were equal to the total sample size.

The questionnaire applied in the first stage of the fieldwork was organized into two identical sections. The first section of the questionnaire was devoted to the pre-crisis period (before early 2019). In contrast, the second section of the questionnaire was devoted to gathering the same information covering the red meat price crisis (2019-2020). The same questionnaire was used for the same individuals in the second fieldwork stage, focusing on the COVID-19 pandemic period (2020 onward).

The critical point is that we have studied the same sample in three different periods. Since one assumption of the analysis of variance or one-way ANOVA is the independence of the observations, it could not be applied to test the hypothesis. Therefore, repeated-measures ANOVA was conducted which compares means across one or more variables that are based on repeated observations. This method is statistically powerful. On the one hand, it controls the factors that make the difference between observations. On the other hand, it makes it possible to determine the size of the desired effect in a smaller number of samples.

In this study, we investigated the changes in per capita meat consumption in a sample of 296 people living in Mashhad in the age range of 18 to 65 years old belonging to three groups, low-income (up to 30 million Rials), middle-income (30-60 million Rials) and high-income (more than 60 million Rials) household over three different periods. Therefore, per capita meat consumption in each of the mentioned periods and also between different income groups is a dependent variable. In addition, each of these periods and selected areas in the city of Mashhad are independent variables.

4. Results

The characteristics of red meat consumption in our sample of 292 households are presented in Table 1. It becomes evident that red meat consumption mean differs between three periods of pre-crisis, price crisis and COVID-19 pandemic. Comparing these means indicates that red meat consumption has reduced on average after the price crisis; however, it has slightly increased during the COVID-19 pandemic. To examine the significance of this difference, we applied the repeated-measures ANOVA.

Table 1: Descriptive statistics of per capita red meat consumption means between pre-crisis, price crisis and COVID-19 pandemic

Variables	Mean (kg)	Standard deviation	Number of samples
Per capita red meat consumption 2019 (pre-crisis)	23.63	34.45	296
Per capita red meat consumption 2020 (price crisis)	11.06	16.48	296
Per capita red meat consumption 2021 (COVID-19 pandemic)	11.19	17.91	296

Source: Study findings

A repeated-measures ANOVA has made evident that red meat per-capita consumption means differ significantly across three periods (F Value equal to 44.725)⁸. A pairwise comparison using the Bonferroni correction shows that the per-capita consumption of red meat among the whole sample decreased almost by half after the price crisis compared to the pre-crisis period (11.06 kg vs 23.63 kg, respectively), which is statistically significant. Comparing the per-capita red meat consumption means during the COVID-19 pandemic period with the period before both crises show a significant similar trend (11.19 kg vs 23.63 kg, respectively). The results indicated that the mean of the dependent variable between the period of price crisis and the period of COVID-19 pandemic did not change significantly (11.06 kg vs 11.19 kg, respectively).

According to the results from Table 2, there were significant differences between the mean and standard deviation of the per-capita red meat consumption means between three city quarters with an F-test value equal to 59.65. Therefore, the null hypothesis of equal means has been rejected.

Table 2: Tests of between-subjects effects; the per-capita red meat consumption between three city quarters

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F-value	Significance level
Intercept	203529.490	1	203529.490	261.243	.000
City quarters	92958.248	2	46479.124	59.659	.000
Error	228271.067	293	779.082		

Source: Study findings

⁸ The results of repeated-measures ANOVA can be sent upon the request.

The results of Table 3, which include binary comparisons of quarters, approved a significant difference in the mean of per capita consumption of red meat between the inhabitants of quarter one (low income) and two (medium income), quarter one and three (upper income) and also between quarter two and three.

Table 4 shows that after the price crisis and COVID-19 pandemic, the per-capita red meat consumption mean has changed between three groups in the city quarters and among each group. While the low-income group had a consumption level of 5.85 kg of red meat per capita before the crises, this amount was 21.85 kg and 42.53 kg in the middle-income and high-income groups, respectively.

Table 3: Pairwise Comparisons of the per capita red meat consumption mean between the inhabitants in three city quarters

(I) quarter	(J) quarter	Mean Difference (I-J)	Standard Error	Significance level	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
quarter 1	quarter 2	-10.849*	2.298	.000	-16.381	-5.316
	quarter 3	-25.173*	2.314	.000	-30.745	-19.600
quarter 2	quarter 1	10.849*	2.298	.000	5.316	16.381
	quarter 3	-14.324*	2.274	.000	-19.798	-8.849
quarter 3	quarter 1	25.173*	2.314	.000	19.600	30.745
	quarter 2	14.324*	2.274	.000	8.849	19.798

Source: Study findings

After the price crisis, red meat consumption decreased in all income groups, reaching 2.07, 10.85 and 19.89 kilograms for low, middle and high-income groups, respectively. The COVID-19 pandemic also affected red meat consumption, decreasing to 1.49 kilograms in the first and second groups to 9.25 kilograms. However, during this period, the average red meat consumption of the third group, in contrast, indicated an increase in consumption (22.49 kg vs 19.89 kg).

Table 4: Pairwise Comparisons of the per capita red meat consumption mean among and between the inhabitants in three city quarters during three time periods

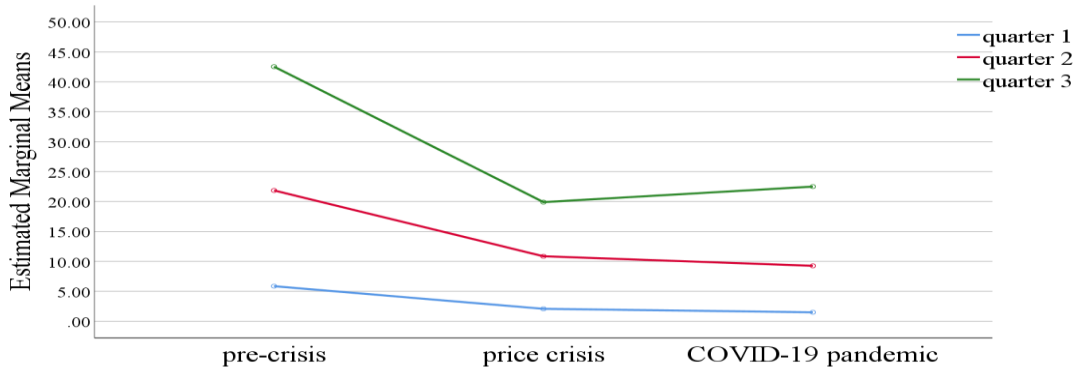
City quarter	Period	Mean	Standard Error	95% Confidence Interval	
				Lower Bound	Upper Bound
quarter 1	Pre-crisis	5.85	3.196	-.437	12.144
	Price crisis	2.07	1.525	-.928	5.073
	COVID-19 pandemic	1.49	1.616	-1.691	4.672
quarter 2	Pre-crisis	21.85	3.085	15.782	27.924
	Price crisis	10.85	1.471	7.956	13.748
	COVID-19 pandemic	9.25	1.560	6.188	12.329
quarter 3	Pre-crisis	42.53	3.131	36.377	48.701
	Price crisis	19.89	1.494	16.960	22.839
	COVID-19 pandemic	22.49	1.584	19.379	25.612

Source: Study findings

Figure 1 shows the estimated marginal meat consumption for three different income groups. As shown in Figure 1, the per capita consumption of red meat between the three groups of low, medium and upper incomes decreased by almost half during the rising meat price crisis compared to the pre-crisis period. Since the per capita consumption in the low-income group was much lower than the other two groups during pre-crisis, changes in consumption among this group have had a more severe impact on them due to the complete elimination of red meat from their diet.

The COVID-19 pandemic again led to decreased per capita consumption among the low- and middle-income groups. The slight change in the low-income group consumption, on the one hand, is because in the previous crisis (rising meat prices), consumption of this type of meat ceased among a large number of meat consumers in this group, and the COVID-19 pandemic practically affected only a small number of low-income households who could still afford red meat. On the other hand, during the COVID-19 pandemic crisis, the price of red meat was almost unchanged or, in some cases, slightly increased (nearly ten per cent) compared to the period of the price crisis. This also justifies the increase in per capita red meat consumption among high-income groups during the COVID-19 pandemic as they could adapt to the new conditions.

Figure 1: per capita red meat consumption means among and between the inhabitants in three city quarters during three time periods



Source: own study results

5. Discussion

Economic factors directly affect food security. Thus, economic challenges and crises are more likely to confront low-income classes with food insecurity. The size of the red meat consumption in pre-crisis (2019), within the rising meat price crisis (2019-2020) and during the COVID-19 pandemic crisis, shows that consumption of this vital source of protein has decreased dramatically among low and middle-income groups. During the rising meat price crisis period, the rapid price jump, high inflation and low-income levels forced many people to make fundamental changes in their diets, such as drastically reducing or even eliminating red meat, especially the low-income group whose quantity and quality of meat consumed are directly affected by the rising prices. This is in line with some other research findings (for instance (VAN DER HEIJDEN and TSEDU, 2008), As the results of the field research show, many people in the poor and lower-income deciles have eliminated red meat from their diet or replaced it with bread or pasta⁹, which are not protein substitutes. Some of them consumed low quality minced meat supplied at lower prices through unsanitary and illegal channels if they could afford it. In the upper-income deciles, such radical changes in food consumption habits were far more minor. Although the meat was marketed at a lower price during this period (under the Market Regulation Plan), its non-uniform distribution limited some people's access throughout the city.

Our field study results show that in contrast to upper classes whose red meat consumption even increased during the COVID-19 pandemic compared to the rising meat price crisis, the low-

⁹ Availability and affordability of nutritious plant-based alternatives in the particular region, socio-economic status, and cultural food habits have affected this replacement.

and middle-income citizens have experienced irreversible effects on their diet in the period of the COVID-19 pandemic. According to our findings, these crises have excluded some vulnerable groups from the meat supply chain. In addition, substitution with poultry meat is not possible due to the sudden price jump and shortage in the poultry market. It should be mentioned that the emphasis on meat as a source of protein in Iran owes to the fact that there is currently no suitable and affordable alternative in the food market for consumers. Additionally, to the extent that alternative protein sources are conceivable, changing food culture and eating habits takes time and presumably requires changes in the meanings associated with specific eating practices.

6. Conclusion

The crises of rising red meat prices and the COVID-19 pandemic has jeopardized food security dimensions (availability, accessibility, utility and stability), especially for socio-economically vulnerable groups in Iran. Low-, middle and upper-income groups coped with the rising prices by eliminating or reducing red meat consumption. The direct and indirect impacts of the COVID-19 pandemic on the economy and food systems exacerbated this problem. Red meat consumption decreased in low- and middle-income households during this period. However, it has increased among the upper-income classes during this period compared to the previous crisis. As a result of both crises, some consumers, especially those belonging to low-income groups, are excluded from this supply chain due to the unaffordability and inaccessibility of red meat. Thus, the risk of food insecurity has increased subsequently. “Protein undernutrition results in stunting, anemia, physical weakness, edema, vascular dysfunction, and impaired immunity”(WU, 2016). So, underestimating this can lead to serious health problems due to protein deficiency, which will be more severe among vulnerable groups. These forced changes can create many physical and mental health problems for the current young generation, who will be the future elderly population of society and children and adolescents who are in the age of development and puberty. Such a sudden intervention in individuals' nutrition can have long-term harmful effects. One of the strengths of this research is that reducing the consumption of red meat can impose a high cost on society because it can jeopardize social sustainability among certain social groups. Therefore, the results of this study show that the government and civil society need to develop targeted strategies that enable lower-income and vulnerable consumers to cope with crisis periods. For instance, access to red meat could be increased for the low-income people by distributing frozen meat in low-income neighbourhoods of the city during the crisis.

As a short-term suggestion, the government could subsidize some essential commodities, including meat, so lower-income groups are less likely to suffer from price fluctuations caused by different crises. As a long-term suggestion, there should be a plan by the government to introduce alternative sources of protein to meat so that people are not dependent on meat as the only source of protein.

Since the present study only includes urban households, it is suggested that future research investigate the impact of crises on rural households, whose meat is mainly supplied by themselves, and see if they are as severely affected as urban households. Also, it is suggested that the impact of crises on other crucial food items be examined in future research. Rice is an excellent example of another essential item in the Iranian food basket that - unlike meat - is mainly supplied through imports.

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