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Household Food Demand Elasticities in Urban and Rural Iran, 2020–2022: Policy Insights on Essential Goods

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ABSTRACT

Background: Rising food prices and inflation have posed major challenges for household food security in Iran. Understanding how households respond to price changes is essential for nutrition and policy planning. This study aimed to estimate and compare the price elasticity of demand for major food groups among urban and rural households in Iran during 2020–2022. **Methods**: Household food consumption and price data were obtained from the National Center for Statistics of Iran. Price elasticities were calculated for eight food groups using standard demand elasticity models, with separate analyses for urban and rural households. **Results**: Across all three years, most food groups exhibited inelastic demand (elasticity values between 0 and 1), confirming their essential role in household diets. Oils and fats were the only group with elasticity greater than 1, indicating high sensitivity to price changes. Overall demand elasticity was consistently higher in urban households compared to rural households. **Conclusion**: The predominance of inelastic demand for staple foods highlights their essential nature despite rising inflation. These findings provide important insights for food and nutrition policy, particularly in designing subsidies and support programs for vulnerable groups.

Introduction

Today, society's increasing need for food, excessive population growth, and decreasing food resources are among the most fundamental issues that have come to the attention of scientists, researchers, and government officials (Ghahremanzadeh and Ziaei, 2014). The direct relationship between food and the health of society, on the one hand, and the ability to create jobs and a high willingness to invest in this regard,on the other, has made food particularly important (Barikani and Amjadi, 2022). The role of nutrition in health, increased efficiency, and economic development has been proven by extensive research worldwide (Ghahremanzadeh *et al.*, 2022). Therefore, given that one of the basic human rights is access to healthy nutrition, governments are obligated to ensure food security (Yazdi-Feyzabadi *et al.*, 2025).

One of the primary objectives of economic development in any country is to alleviate poverty

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and hunger, thereby ensuring food security and economic well-being for all individuals (Ranjbar *et al.*, 2023). Thus, access to sufficient and desirable food and nutritional health are among the key axes of development, community health, and the infrastructure that future generations of a country require (Ghahremanzadeh and Ziaei, 2014). Studying the consumption behavior of households and analyzing how they allocate their limited income to various goods and services is one of the most important topics needed for economic policymaking (Vaez *et al.*, 2021). The main issue facing demanders is how to allocate their limited income among various goods and services to maximize utility. This group will always adjust its demand proportionally to changes in the relative prices of goods and services (Ghahremanzadeh *et al.*, 2022).

The study of household consumption behavior and the analysis of how households allocate their limited income to various goods and services are among the fundamental issues for economic policymaking (Vaez *et al.*, 2021). In economic analysis, concepts such as price elasticity of demand are examined as fundamental factors for understanding and analyzing market behavior (Ghahremanzadeh *et al.*, 2022). This concept describes the ability of changes in the price of a good or service to affect demand. Given its importance in economic decision-making, the factors affecting the price elasticity of demand are examined and analyzed. These factors include consumer expectations, changes in consumer tastes, the existence of significant substitutes in the market, and general economic conditions. These factors can significantly impact the sensitivity of demand to price changes and influence consumer decisions (Vaez *et al.*, 2021).

Previous studies in both developed and developing countries have highlighted the critical role of food demand elasticity in shaping household welfare and guiding policy interventions (Vaez *et al.*, 2021). For example, international evidence shows that staple foods often exhibit inelastic demand, while luxury or substitutable items are more price-sensitive (Taskin and Ahammad, 2022). In Iran, several studies have examined household expenditure patterns, yet comprehensive comparisons between urban and rural households in recent years remain limited (Taskin and Ahammad, 2022).

This gap underscores the need for updated empirical evidence to inform food security and subsidy policies (Daneshyar and Abbasiyan, 2024).

Another key factor affecting the price elasticity of demand is the role and importance of household income expenditure. Directly, purchasing power and the decision to use a product or service are related to household income. Hence, any change in household income can have a direct impact on food demand. For example, inflation, exchange rate, domestic and foreign economic policies, labor market conditions, and housing market are among the factors that affect household expenditure and income in Iran (Motallebi and Pendell, 2013). Studies show that household income in Iran faces challenges due to factors such as the disproportionate wage rate with the inflation rate, the low employment rate, and the lack of improvement in the country's economic efficiency, which can lead to an increase in the cost of living and a decrease in household purchasing power (Ira *et al.*, 2020). In general, fluctuations in the exchange rate, as well as increases in the prices of raw materials and food products, are other factors that affect household expenditure and income in Iran (Ghahremanzadeh and Ziaei, 2014).

To accurately assess the impact of these factors on consumer behavior, this study examines the price elasticity of demand for food among urban and rural households in Iran from 2019 to 2021. The results of this research can pave the way for economic policies aimed at managing household costs through factors such as subsidies, support baskets, and similar items for vulnerable groups (Ranjbar *et al.*, 2023).

To accurately assess the impact of these factors on consumer behavior, this study examines the price elasticity of demand for food among urban and rural households in Iran from 2020 to 2022. The specific objective is to estimate and compare the demand elasticity of major food groups,

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thereby providing empirical evidence that can guide economic policies aimed at managing household costs through instruments such as subsidies, support baskets, and similar programs for vulnerable groups (Ranjbar *et al.*, 2023).

Materials and Methods

Design of study

This study employed a cross-sectional, descriptive-analytical design to clarify the study type.The target population of this study includes all ordinary households and groups living in urban or rural areas. These sample households were selected from 387 cities in urban areas and 395 cities in rural areas of the entire country. 18,251 rural households and 19,306 urban households in 2020, 18,370 rural households and 19,618 urban households in 2021, and 18,384 rural households and 19,567 urban households in 2022, making a total of 55,005 rural households and 58,491 urban households included in the study. Inclusion criteria were ordinary households with complete records of food consumption and expenditure. Exclusion criteria included households with missing data, incomplete questionnaires, or outlier values.

In this study, data from eight food groups were considered, including cereals, bread, flour, noodles and their products, meat, milk and dairy products, poultry eggs, fruits, fresh and dried vegetables and legumes, nuts, and oils, fats, and butter, each group including different subgroups.

Price elasticity of demand measures the change in demand for a good or service resulting from a change in its price. In other words, it measures consumers' sensitivity to price changes. The formula for price elasticity of demand is:

Percentage change in quantity demanded ÷ Percentage change in price = Price elasticity of demand

In short, price elasticity of demand indicates how much the quantity demanded of a good or service changes when its price changes by 1%. To calculate price elasticity, it was necessary to have access to the amount of food groups consumed by households and the price of food separately. The aforementioned information was extracted from the portal of the National Center for Statistics of Iran, which includes data on household consumption and food prices during this period. This source is considered valid and reliable, as data are collected through standardized national questionnaires. Food consumption data were extracted from official statistical reports and recorded in Excel format. To standardize the information, all food items were identified using specific codings that were employed in statistical questionnaires. Then, each food item was categorized into its respective group to allow for more detailed analysis. For better data comparison, the food consumption amounts were converted to the same unit (gram). This conversion was made based on the standards commonly used in similar studies to facilitate accurate analysis of the price elasticity of demand.

Data analysis

For data analysis, the price elasticity of demand formula was used to determine the relationship between price and quantity consumed for each food group. Additionally, the results were analyzed separately for urban and rural areas to identify any potential differences in consumer behavior. All calculations were performed in Stata 17 software. The use of Stata ensured accuracy, reproducibility, and consistency in handling large-scale household datasets.

Ethical considerations

This study used secondary data from the National Center for Statistics of Iran. No personal identifiers were included, and the dataset was anonymized prior to analysis. Therefore, ethical approval was not required, but the study adhered to national guidelines for the use of official statistical data.

Results

Food and tobacco expenses for rural and urban households in 2020 were calculated to be 40% and 26%, respectively. In 2021, these percentages were 40% and 27%, and in 2022, they were 41.7% and 27.5%, respectively. **Table 1** shows the food and tobacco expenses of an urban and rural household from 2020 to 2022.

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The price elasticity of demand for urban and rural households in all food groups except for the oil group was between 0 and 1. Price elasticity was calculated separately for food groups and also together, and the results were summarized by year and food group in the following **Tables 2** and **Figure 1**.

In 2020, the oil group and the milk and dairy products group had the highest and lowest price elasticities, respectively, in both urban and rural areas. Comparing urban and rural areas, the price elasticity of demand for most groups was similar, and only for the cereal group was the price elasticity of demand higher in urban areas than in rural areas. The price elasticity of demand for all food groups was higher in urban areas than in rural areas.

In 2022, as in 2021, both the oil group and the milk and dairy products group had the highest and lowest price elasticities, respectively. In comparing urban and rural areas, the price elasticity of demand for most groups was similar, except for the bird eggs group, where the price elasticity of demand was higher in urban areas than in rural areas, and for the cereals group, where it was higher in rural areas than in urban areas. The price elasticity of demand for all food groups was higher in urban areas than in rural areas.

In 2022, as in previous years, the oil group and the milk and dairy products group had the highest and lowest price elasticities, respectively. In comparing urban and rural areas, the price elasticity of demand for most groups was similar, except for the cereal group, for which the price elasticity of demand in urban areas was higher than in rural areas. The chart below shows the trend of changes in the price elasticity of demand of different groups by year:

Over the three years, the price elasticity obtained for all goods was between zero and 1, so they are classified as inelastic or relatively inelastic goods. Oil has a price elasticity greater than 1, indicating that this food group is highly elastic. The absolute value of the price elasticity of total demand obtained in 2020, 2021, and 2022 was 0.056, 0.051, and 0.060 in urban areas, respectively, and 0.046, 0.044, and 0.036 in rural areas. Based on the calculations, it was determined that the total number in all three years was higher in urban areas than in rural areas.

Milk and dairy products group: The price elasticity of demand in all three years was higher in urban areas than in rural areas, and the price elasticity also increased over time. The highest price elasticity was observed for this group in 2022.

Fruits group: Over the three years, the price elasticity of demand was higher in rural areas than in urban areas, and the highest and lowest price elasticity was observed in 2021 and 2022, respectively.

Fresh and dried vegetables, legumes group: In 2020 and 2021, the price elasticity of demand was higher in urban areas than in rural areas; in 2022, however, the price elasticity of demand was higher in rural areas than in urban areas. The highest and lowest price elasticity were observed in 202 and 2022, respectively.

Bird eggs group: In all three years, the price elasticity of demand was higher in urban areas than in rural areas. The highest and lowest price elasticity were observed in 2021 and 202, respectively.

Grains group: In 2020 and 2022, the price elasticity of demand was higher in urban areas than in rural areas; in 2021, however, the price elasticity of demand was higher in rural areas than in urban areas. The highest and lowest price elasticity were observed in 2021 and 2020, respectively.

Meat group: In 2020 and 2021, the price elasticity of demand was higher in rural areas than in urban areas; in 2022, however, the price elasticity of demand was higher in urban areas than in rural areas. The highest and lowest price elasticity were observed in 2020 and 2022, respectively.

Dried fruit group: In 2020, the price elasticity of demand was higher in rural areas than in urban areas, but in 2021 and 2022, the price elasticity of demand was higher in urban areas than in rural areas. The highest and lowest price elasticity were in 2020 and 2022, respectively.

Oil, fat, dried fruit group: Over three years, the

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price elasticity of demand was higher in urban areas than in rural areas. The highest and lowest price elasticity of demand were in 2020 and 2022, respectively.

Table 1. Composition of food and tobacco expenses of an urban and rural household based on percentage in 2020, ,2021 and 2022

Food group	Urban`			Rural		
	2020	2021	2022	2020	2021	2022
Flour, pasta, cereals, bread and their derivatives	25	20	18.5	22	22	20.4
Meat	21	21	20.7	22	21	20.7
Milk and its derivatives and bird eggs	10	11	11.8	10	10	10.9
Oils and fats	4	3	5.7	4	4	7.2
Fruits and vegetables	17	19	18.3	18	18	17.2
Nuts and grains	5	7	6	5	6	5.8
Sugar, sugar, sweets, tea, coffee and cocoa	9	9	8.3	9	9	8.7
Spices, seasonings and other food ingredients	3	4	3.7	4	4	3.6
Beverages, prepared foods and tobacco	6	7	7.1	7	6	5.4

Table 2. Price elasticity (Coefficient) of demand for urban and rural households in study years.

Food group	2020		2021		2022	
	Urban	Rural	Urban	Rural	Urban	Rural
Milk and dairy products	-0.006	-0.005	-0.006	-0.003	-0.010	-0.009
Fruits	-0.023	-0.179	-0.772	-0.779	-0.718	-0.730
Fresh, dried vegetables and legumes	-0.618	-0.6	-0.630	-0.627	-0.574	-0.578
Bird eggs	-0.165	-0.129	-0.303	-0.138	-0.242	-0.177
Grains	-0.262	-0.006	-0.306	-0.493	-0.385	-0.061
Meat	-0.194	-0.209	-0.132	-0.174	-0.121	-0.115
Nuts	-0.023	-0.024	-0.022	-0.020	-0.021	-0.002
Oil, fat, butter	-1.08	-1.041	-1.080	-1.049	-1.110	-0.983
All food items	-0.056	-0.046	-0.051	-0.044	-0.060	-0.036

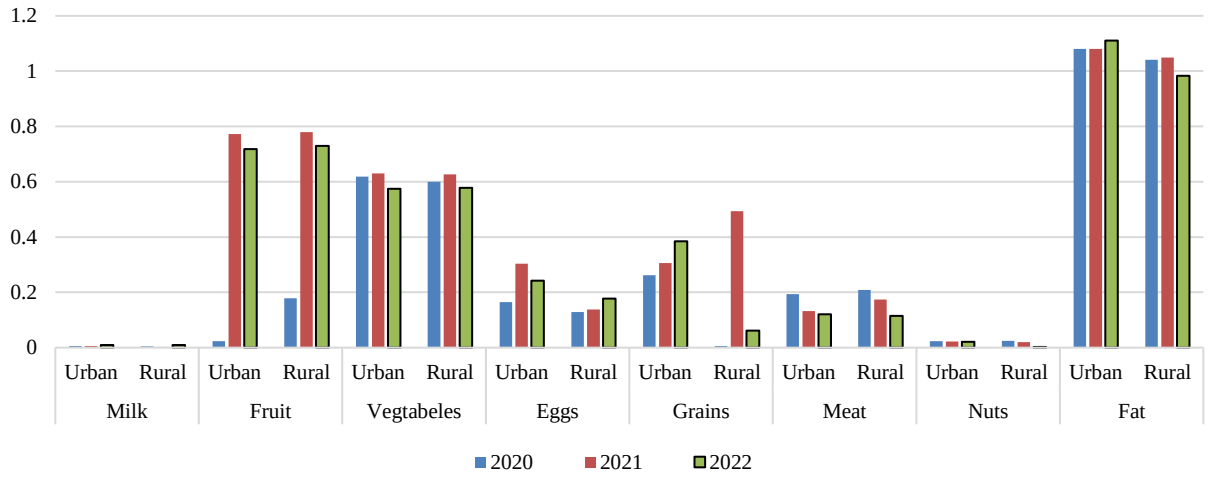

Figure 1. Price elasticity of demand for all food groups in 2020,2021 and 2022

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Discussion

Based on the existing interpretations of price elasticity of demand, the results obtained can be evaluated. The absolute values of the elasticities calculated in 2020, 2021, and 2022 for all food items (without separating food groups) and for each food group, except oil, are between zero and one. Therefore, it can be said that these goods are inelastic (Ghahremanzadeh and Ziaei, 2014). That is, for a one percent change in price, the demand for them changes by less than one percent. The results obtained for the fat group indicate that this food group is highly elastic, meaning that demand for this product fluctuates in response to price changes (as the price increases, demand decreases), and this product can be considered unnecessary (Ghahremanzadeh *et al.*, 2022).

In the case of milk and dairy food group, the price elasticity increased slightly in 2022 compared to previous years, which indicates that this product has become more elastic over time in both rural and urban areas (Vaez *et al.*, 2021). The willingness of people to buy this product in 2022 was lower than in previous years. The increase in price elasticity in 2022 may be attributed to factors such as a decline in people's purchasing power, rising prices due to inflation, or shifts in household consumption patterns (Ghahremanzadeh and Ziaei, 2014). In the case of the three groups of fruits, vegetables, and bird eggs, the price elasticity of demand in both urban and rural areas increased in 2021 and then decreased in 2022 (Daneshyar and Abbasiyan, 2024). People's willingness to buy these products decreased in 2021 and increased again in 2022 (Interagency Agricultural Projections Committee, 2023). The increase in price elasticity in 2021 and its subsequent decrease in 2022 may have been due to seasonal changes, pricing adjustments, or shifts in household consumption habits (Ira *et al.*, 2020).

The price elasticity of the grain group in urban areas increased from 2020 to 2022, whereas in rural areas, it initially increased in 2021 and then decreased in 2022. In urban areas, the increase in price elasticity indicates that people have reduced their purchases as grain prices have increased. In rural areas, price elasticity initially increased in 2021, which may have been due to rising prices and reduced purchasing power. However, it decreased in 2022, which could be attributed to rural households adjusting to higher prices or changes in consumption patterns. The price elasticity of the meat group in both rural and urban areas has decreased from 2020 to 2022. The continuous decrease in the price elasticity of meat in both regions from 2020 to 2022 indicates that the demand for this product has become less sensitive to price changes (Motallebi and Pendell, 2013). In the case of the dried fruit group, the price elasticity of demand has exhibited a relatively constant trend in both rural and urban areas. The stability of the price elasticity of dried fruits in both urban and rural areas suggests that price changes have had little impact on demand. This could be due to reasons such as the position of these foods in the household consumption basket, the lack of suitable alternatives, or the inherent low consumption of this food group (Barikani and Amjadi, 2022).

In the case of the fat group in both regions, price elasticity remained stable in 2020 and 2021, but increased in 2012, reaching a value of more than 1. The increase in price elasticity in 2022, with its value exceeding 1, indicates that the demand for this product has become more sensitive to price changes. This could be due to the sharp increase in the prices of oils and fatty products, which caused households to reduce their consumption or choose cheaper alternatives (Taskin and Ahammad, 2022).

The novelty of this study lies in its comprehensive comparison of food demand elasticity between urban and rural households in Iran across three consecutive years (2020–2022). Unlike previous studies that focused on single years or limited food groups, theresults of this study provide updated evidence on how inflation and declining purchasing power differently affect household consumption patterns in urban versus rural settings (Taskin and Ahammad, 2022) .

As can be seen from the study's results, the response of food consumption to price increases

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over the past three years varies. However, in general, the elasticity of the product was evident only in the case of the fat group. According to previous studies, one of the most important factors affecting household spending is income. Different income deciles of society will have a significant impact on the increase in food prices and the consumption of various food groups . Additionally, the replacement and supplementation of food items with each other require further investigation. Also, based on previous studies at the community level, the cost that a family spends on food items and its food table is related to social, cultural, accessibility, living environment, advertising, as well as health and disease factors (Ira *et al.*, 2020). The inelasticity of demand for total food consumption in these years, despite the price increase, indicates the necessity of food items in household expenses and the existence of other important factors affecting household expenses (Ghahremanzadeh *et al.*, 2022).

The obtained results emphasize that while most food groups remain inelastic, fats and oils show high elasticity, which has direct implications for food security and nutrition policies. This finding suggests that subsidy programs should prioritize essential goods such as bread and cereals, while monitoring elastic goods like fats and dairy to prevent nutritional imbalances (Ghahremanzadeh *et al.*, 2022, Layani *et al.*, 2020). By highlighting these aspects, the study contributes new insights into household consumption behavior under inflationary conditions (UNICEF, 2024).

Many studies have examined the price elasticity of demand for various types of food. In a 2014 study by Pejouyan and Ahmadi on urban residents, the results showed that the food and beverage group had a positive income elasticity of less than 1, indicating that this group of goods is normal and essential (Pejouyan and Ahmad, 2014). However, as we move towards the high-cost deciles, the income elasticity becomes smaller, and in the tenth decile, it even becomes negative, making it a low-value commodity.

A study in China found that many food groups in China are considered essential goods, and the price elasticity for these goods is low in urban households (Ghahremanzadeh *et al.*, 2022). Many studies have considered the food group as an essential and priority commodity. A study in Romania examining food demand in urban and rural areas concluded that the cost elasticity in rural areas is higher than in urban areas, primarily due to the lower income of rural residents (Ira *et al.*, 2020). According to the results of another study in Iran (Layani *et al.*, 2020) that estimated the elasticity of food items in 2016 and 2018, bread is identified as an inelastic commodity. The price elasticity of dairy and meat in both years under study had values greater than one, thus indicating the elasticity of these two commodities (Layani *et al.*, 2020). The price elasticity of dairy and meat in the years under study indicates that these two commodities are elastic, suggesting that demand for them fluctuates sharply in response to changes in their prices. A similar situation exists for meat, although given the importance of this commodity in the household food basket, it can be expected that the intensity of demand fluctuations due to price fluctuations will not be as great as for dairy, since it is not simply possible to eliminate and find a suitable substitute for it in the household food basket (Daneshyar and Abbasiyan, 2024).

As expected, goods such as bread are inelastic and essential in the household basket, meaning people are forced to consume them under any circumstances (Layani *et al.*, 2020). In such circumstances, it is necessary to monitor the price of this good adequately and optimally, because people are forced to pay any price for it, and changes in this good can cause severe fluctuations in the household consumption basket. This is while some goods, such as meat in other studies and fats in this study, were elastic (Taskin and Ahammad, 2022). Given the importance of meat and fats in the household food basket, it seems that this issue can affect the quality of household nutrition.

The demand for meats, including beef, mutton, and chicken, using an approximately ideal demand function and seasonal time series data during the period 1980 to 2000 in Bangladesh, showed that all three types of meat are substitutes for each other

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and their demand is inelastic, which is in line with the results of this study (xxxxxTaskin and Ahammad, 2022). Bread, cereals, meat, fish, milk, and eggs are considered essential goods in the study by Molina et al. in Spain, which confirms the results of this study (Ira *et al.*, 2020). According to the study by Samadi *et al*. from 1964 to 1990, meats are considered an inelastic and essential good (Samadi, 2007) . In another study in Iran, using the Almost Ideal Demand System (AIDS) method and the Seemingly Unrelated Regressions (SUR) method, the food basket of urban households exhibited high self-price elasticity, and most food groups also showed high income elasticity (Ranjbar *et al.*, 2023).

In a study by Motallebi *et al*., which examined the demand for the main food groups, except for meat and nuts, other food groups are inelastic, meaning that they are less sensitive to changes in their prices, so that with a one percent increase in the price of these goods, the demand for them decreases by less than one percent (Motallebi and Pendell, 2013). Vaez *et al*. concluded that, after examining the demand function for wheat and various food products in Iran, in urban society, the price elasticity for poultry, red meat, dairy products, eggs, and fruits and vegetables was less than one . In urban and rural areas, the demand for livestock meat, poultry, fish, shrimp, and their products, as well as milk and its products, was inelastic (Vaez *et al.*, 2021).

The low elasticity of basic food items, despite the prevailing inflation in society and the increase in food prices in 2022. suggests that these food items are essential goods and that the country's population has limited sensitivity to changes in their prices (Ghahremanzadeh and Ziaei, 2014). This may seem pleasant at first, but it suggests that people spend most of their income on food and reduce their spending on other necessities (Ranjbar *et al.*, 2023).

Despite its high accuracy, this study has some limitations. These include the lack of access to individual data and the influence of other economic factors, such as household income, that may affect the price elasticity of demand. To mitigate these limitations, it is recommended that future studies utilize more detailed data and advanced econometric models.

Conclusion

A comparison of the estimated and calculated price elasticities of demand in this study with those of other countries reveals that the results are entirely within the range of numbers obtained globally. Therefore, no contradictions with other international studies are found. It can be noted that food items are among the essential household consumption items, and despite the increase in prices, households maintain them in their spending basket and may even increase their allocation. To effectively manage household spending for other consumer and service groups, the government should conduct a comprehensive study and utilize factors such as subsidies, support baskets, and other similar initiatives for vulnerable groups.

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Authors' contributions

Sarmadikia M contributed to the research design, data collection, analysis of results, writing, and final revision of the article. Abedi R contributed to the analysis of the data and revision of the manuscript, and Nabizadeh Y contributed to data collection.

Conflict of interest

The authors declared no conflicts of interest.

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