

RESEARCH

Open Access



How unequally is consumption of products harmful to health distributed between Iranian households?

Maryam Moeeni¹ , Faezeh Arjvand^{2*} , Koen Ponnet³ and Shirin Nosratnejad^{4*}

Abstract

Background Products harmful to health encompass a wide range of goods, including tobacco, high-fat, high-salt, and high-sugar foods, alcoholic beverages, addictive substances, unlicensed food supplements, and certain cosmetic products. This study aimed to assess the extent of inequality in the consumption of such health-harmful products among Iranian households.

Methods This secondary analysis utilized data from Iran's 2019 Households Income and Expenditure Survey, comprising a representative sample of 38,328 households. Expenditures on harmful products were identified following guidelines from Iran's Ministry of Health. The Gini coefficient measured inequality in absolute household expenditure, while the concentration index assessed inequalities in expenditure on harmful products across households with varying socio-economic status, using household income, education level, and occupation of the household head as separate proxies.

Results The Gini coefficients indicated significant inequality in both absolute and relative household expenditures across all categories of harmful products. Concentration indices for subcategories of harmful products remained below 0.2 across income, education, and occupation groups, with income-related inequalities slightly exceeding those related to education or occupation.

Conclusion Expenditures on harmful products exhibit notable but not extreme inequality across different socio-economic groups. Policymakers should consider all income, education, and occupation strata when designing interventions to reduce spending on unhealthy products, with particular focus on lower-income households.

Keywords Products harmful to health, Unhealthy eating habits, Gini coefficient, Concentration index

*Correspondence:

Faezeh Arjvand

farjvand@gmail.com

Shirin Nosratnejad

sh_nosratnejad@yahoo.com

¹Social Determinants of Health Research Center, Isfahan University of Medical Sciences, Isfahan, Iran

²Department of Health Economics, Tabriz University of Medical Sciences, Tabriz, Iran

³Faculty of Social Sciences, Imec-Mict-Ghent University, Ghent, Belgium

⁴Department of Health Economics, Tabriz Health Services Management Research Center, Tabriz University of Medical Sciences, Tabriz, Iran



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

Background

In recent years, the relationship between lifestyle choices and overall health has garnered increasing attention from researchers, healthcare professionals, and policymakers alike. As the prevalence of chronic diseases continues to rise, understanding the multifaceted influences of dietary habits, substance use, and consumer product safety has become paramount. This article explores the critical link between unhealthy eating patterns, tobacco use, and the potential health risks posed by everyday products, highlighting the urgent need for informed public health interventions. Products that pose hazards to health include a diverse range of goods including tobacco, high-fat, high-salt, and high-sugar foods, alcoholic beverages, other addictive substances, unlicensed food supplements, and some cosmetic products[1]. These health-threatening products exert adverse effects on individuals, families, and society at large, in terms of increased incidences of diseases and more healthcare costs[2].

A growing body of evidence suggests that eating habits strongly affects human health. An unhealthy eating habit is among the risk factors for many diseases. The overconsumption of fat, salt, sugar, and fast foods contributes to heightened energy intake and subsequent obesity, a global health concern with escalating prevalence[3]. Obesity poses serious risks to diverse demographic groups, including children and the elderly, and is frequently associated with hypertension, diabetes, obstructive sleep apnea (OSA), and metabolic syndrome—all of which significantly contribute to cardiovascular issues. Currently, the risk of sudden cardiac death (SCD) has become a serious challenge among obese patients[4]. Moreover, unhealthy dietary patterns may lead to early satiety, lack of appetite, meal skipping and, as a result, malnutrition, especially among children and adolescents[5]. Tobacco use and addiction to substances are other health risk factors. Smoking increases the risk of cardiovascular and respiratory diseases, cancer, mental problems and complications during pregnancy. The compounds present in tobacco cause detrimental changes in blood vessels, airway inflammation, tumor formation and psychological disorders. Smoking adversely affects sexual health, contributes to childbirth problems, low birth weight, and heightens the risk of respiratory diseases and developmental disorders in children [6, 7]. Some cosmetic products are also fall within the category of health-threatening items. Their usage may result in skin sensitivity, inflammation, as well as injuries to hair and nails. Cosmetics containing chemicals such as parabens and phthalates may elevate the risk of hormonal disorders, respiratory issues, and even cancer [8, 9].

This study contributes to regional planning and policymaking by providing valuable insights into health-related behaviors and trends. It identifies factors that can inform

targeted interventions and resource allocation. Additionally, the findings can guide the development of public health initiatives aimed at improving dietary habits and reducing the prevalence of obesity and related diseases within the community. By understanding the specific health challenges faced in the region, policymakers can create more effective strategies that promote overall well-being and enhance the quality of life for residents. However, consumption of products harmful to health varies within societies[2]. Several studies have demonstrated that certain subgroups within societies exhibit a higher susceptibility to engaging in health-risk behaviors, primarily the consumption of such harmful products. For instance, statistical analyses have revealed disparities in the distribution of unhealthy dietary habits among various social groups, including uneven patterns of excess fat and sugar intake, as well as the consumption of items such as sugar-sweetened beverages and fast foods [10–13]. Evidence-based data on inequalities in the consumption of products harmful to health among different groups could provide policymakers and researchers with better understanding of consumption of unhealthy products within the societies[14]. The present study aims to assess the extent of inequality in the consumption of products harmful to health among Iranian households. By doing so, it aimed to contribute valuable insights that can inform targeted interventions and policies aimed at addressing these disparities and promoting healthier behaviors.

The policy of banning advertising and imposing taxes on harmful goods is a measure by the Iranian Ministry of Health aimed at reducing the consumption of health-damaging products. This approach seeks to discourage usage through financial disincentives and limit exposure to marketing that promotes such goods.

This study presents innovative insights by adopting an integrated approach that examines dietary habits, substance use, and the effects of consumer products on health simultaneously. Focusing on diverse demographic groups highlights the need for tailored interventions. The incorporation of community engagement fosters relevance and ownership of health initiatives. Additionally, assessing the impact of existing policies identifies gaps and informs future policymaking. By exploring the interconnections among various health determinants, this research addresses critical scientific gaps, emphasizing the necessity for comprehensive strategies that bridge the divide between research, policy, and practice.

Methods

This secondary analysis utilized data from Iran's 2019 Household Income and Expenditure Survey (HIES), which included a representative sample of 38,328 households. The objective was to assess expenditures on

products deemed harmful to health, following the guidelines established by Iran's Ministry of Health.

To quantify inequality in absolute household expenditure, we employed the Gini coefficient, a widely recognized measure that ranges from 0 to 1, where 0 indicates perfect equality and 1 signifies maximum inequality. This coefficient provides a clear indication of the distribution of expenditures among households, allowing for an assessment of disparities in spending patterns.

For a more nuanced understanding of inequalities across different socio-economic statuses, we utilized the concentration index. This index also ranges from -1 to 1, reflecting the degree to which health-related expenditures are concentrated among higher or lower income households. A positive concentration index indicates that higher expenditures are disproportionately borne by wealthier households, while a negative value suggests the opposite.

In our analysis, we employed household income, education level, and the occupation of the household head as distinct proxies for socio-economic status. These variables were carefully selected to capture the multifaceted nature of socio-economic disparities. Household income was categorized into quintiles, allowing for a clear stratification of spending patterns. Education levels were divided into strata, including primary, secondary, and tertiary education, to gauge the impact of educational attainment on consumption behaviors. The occupation of the household head was classified according to standard occupational categories, providing insights into how

employment type influences expenditure on harmful products.

Statistical analyses were conducted using appropriate software, with significance levels set at $p < 0.05$. Descriptive statistics were calculated to provide an overview of the sample characteristics, while inferential statistics were employed to explore the relationships between socio-economic variables and expenditure patterns. Additionally, sensitivity analyses were performed to assess the robustness of our findings, ensuring that the results were not unduly influenced by outliers or data anomalies. Absolute Cost refers to the total monetary expenditure incurred in acquisition of goods and services without considering any other factors. It represents the actual amount spent. Relative Cost, on the other hand, compares the cost of one option to another, often expressed as a ratio or percentage. It provides context by showing how much more or less expensive one choice is compared to another.

Overall, this methodological framework allows for a comprehensive examination of inequalities in harmful product consumption among Iranian households, offering valuable insights for policymakers and public health advocates aiming to address these disparities. The sample of 2019 HIES included 38,328 households, with 19,898 and 18,430 urban and rural households, respectively, living in 31 provinces of the country.[15]. This study was approved by the ethical committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1400.601).

Variables

In 2019, the Ministry of Health in Iran categorized health-harmful products into distinct groups, encompassing meat products and fast foods, beverages, oils, sugars, tobacco, harmful cosmetic goods and services, and prescription drugs with potential for misuse[16]. As previously mentioned, the HIES collects detailed expenditure data for various goods and services on a monthly basis, specifically for the month preceding the survey interview. In this study, household expenditures related to harmful products were extracted following the guidelines provided by the Ministry of Health. The harmful products available in the HIES dataset are delineated in Table 1.

We established two distinct categories of outcome variables based on household expenditures for products harmful to health in the month preceding the survey interview. The first category, referred to as "absolute expenditure," encompassed the total household expenditure on specific subgroups of health-harmful products. The second category, termed "relative expenditures," involved calculating the proportion of household expenditure allocated to subgroups of health-harmful products

Table 1 Products harmful to health available in HIES dataset

Products	
Food	Sausages
	Processed pizza cheese, pizza toppings
	Cooking oil
	High-fat sauces
	All kinds of fried products based on potatoes and grains (potato and grain chips)
	Toffee and candy, fresh sweets
Beverages	All kinds of carbonated soft drinks with/without sugar
	Flavored malt beverage
	A variety of carbonated and non-carbonated fruit beverages containing 25% fruit juice
	Edible ice products
Fast foods and Restaurant meal	All kinds of instant drink powder
	All kinds of sandwiches and pizzas with sausage and ham
	All kinds of samosa and falafel cooked by dipping in the oil
Cosmetic products	Hair straightening, curling and keratinizing products
	Skin, hair color and cosmetic products
Tobacco & cigarette	Tobacco products
	Domestic cigarettes
	Foreign cigarettes

relative to the total household expenditure, commonly known as the household budget.

In addition, we constructed three stratifying variables based on household demographic data, namely income, education, and occupation quintiles. For income stratification, we utilized two variables available in the HIES dataset as proxies for income deciles. One variable assessed each household's expenditure decile within the sample households residing in the province, while the other variable assessed each household's expenditure decile among all sample households at national level. It is noteworthy that both proxies had fairly similar deciles to sample households. Using each of these variables, we segregated the sample households into five income quintiles as follows: households with the lowest income (first and second deciles); low-income households (third and fourth income deciles); lower-middle-income households (fifth and sixth income deciles); upper-middle-income households (seventh and eighth income deciles); and households with the highest income (ninth and tenth income deciles) [17]. For education stratification, we ranked households based on the education level of the household head: the first stratum represented no schooling; the second stratum included primary school; the third stratum included secondary school; the fourth stratum included high school, and the fifth stratum encompassed households with a head who had completed college or attained a higher level of education [18]. Furthermore, we constructed the occupation strata using occupation of the household head. In this context, households' heads in the first stratum were typically non-working, often pensioners and unemployed individuals. The second stratum included unskilled laborers, machine operators/assemblers, vehicle drivers, and industry workers. The third stratum comprised skilled agricultural, forestry, fishery workers, as well as service and sales workers. The fourth stratum included clerical support workers, technicians, and associate professionals. Finally, the fifth stratum represented households with heads engaged in professional and managerial occupations [19].

Data analysis

To assess inequalities in the consumption of products harmful to health, we utilized both the Gini coefficient and the concentration index. In the initial step, the Gini coefficient was employed to gauge inter-household disparities in the expenditure on health-harmful products. This coefficient is derived from the Lorenz curve, where the vertical axis represents the cumulative percentage of households based on the outcome variable, and the horizontal axis denotes the cumulative proportion of households based on their expenditures on health-harmful products, ranked in ascending order. A Gini coefficient of 0 signifies perfect equality, where all values are identical,

while a Gini coefficient close to 1 indicates high inequality. In the subsequent step, we utilized the concentration index (CI) to measure between-household inequalities in expenditures on products harmful to health. The CI provides insights into the distribution of expenditures across households. It usually considers the socio-economic position of households, indicating whether health-harmful product consumption is concentrated among those with higher or lower socio-economic status. While attempts had been done on quantifying the socio-economic concept, it is still difficult to measure socio-economic position of households in different contexts [20–23]. In the current study, we considered household income, in addition to education level and occupation of the household head separately as proxies for socio-economic status of households.

Results

Table 2 provides the descriptive statistics for the sample households. The majority of household heads were male, with an average age just over 51 years. A notable proportion of household heads fell within the first education and occupation strata.

Table 3 displays the calculated Gini coefficients for household expenditures on products deemed harmful to health. We assessed the Gini coefficients for both absolute and relative expenditures. The results indicate significant inequalities in household spending on these products across all subgroups, highlighting disparities in both absolute and relative expenditure levels. Figures 1 and 2 illustrate the Lorenz curves representing absolute and relative household expenditures on harmful products, respectively.

These findings underscore the importance of understanding the socioeconomic factors that contribute to disparities in health-related expenditures. The pronounced inequalities revealed by the Gini coefficients suggest that certain demographic groups may be disproportionately affected by the consumption of harmful products, raising concerns about public health and the need for targeted interventions. The Lorenz curves further emphasize the distribution of expenditure, providing a visual representation of the extent of inequality within the sample. Such insights are crucial for policymakers aiming to address health equity and formulate strategies that promote healthier consumption patterns among vulnerable populations.

Given that inequalities in absolute and relative household expenditures on harmful products were confirmed, we measured CIs for both categories of expenditures to analyze the potential reasons for these inequalities.

Table 4 and 5 present the CIs of absolute and relative household expenditures on subgroups of harmful products, for households' income, education and occupation

Table 2 Descriptive statistics of study sample

Variable		Frequency	Percentage
Gen-der of house-hold head	Male	32,840	68.85
	Female	5488	32.14
Mean age of house-hold head (SD)	51.51477 (15.61036)		
Educa-tion level of house-hold head	Illiterate	9376	24.46
	Unofficially educated and elementary school	11,043	28.81
	Middle school	6163	16.08
	Incomplete high school	487	1.27
	Diploma and pre-university degrees	6214	16.21
	Associate degree	1298	3.39
	Bachelor's degree	2495	6.51
	Master's degree and professional doctorate	791	2.06
	PhD	81	0.21
	Others	380	0.99
Em-ploy-ment status of house-hold head	Employed	25,140	65.59
	Having income without working	11,260	29.24
	Unemployed (seeking jobs)	860	2.24
	Student	16	0.04
	Housewife	607	1.58
Occu-pation class of house-hold head	Others	499	1.30
	Managers, high-ranking officials and legislators	487	1.27
	Specialists	1278	3.33
	Technicians/assistants	912	2.38
	Administrative/office clerk	527	1.37
	Service/shop clerk	3157	8.24
	Farming/forestry/fishing	5798	15.13
	Industrialists/relevant employees	3390	8.84
	Operators and assemblers of machines and devices/vehicle drivers	3710	9.68
	Labor	5551	14.48
	Others/not stated	330	0.86
	Having income without working/Unemployed (seeking jobs)/Student/Housewife/Others	13,188	34.41

strata. The concentration curves related to Tables 4 and 5 are presented in appendix1. The CIs for total household expenditure on products harmful to health indicated a higher concentration among households in higher income quintiles, as well as those in higher occupation strata. Conversely, a lower concentration was observed among households in lower education strata. However, all estimated coefficients were less than 0.2, with significance

Table 3 Gini coefficient of product harmful to health

Harmful product	Gini coefficients	
	Absolute household expenditure on each harmful product	Relative house-hold expenditure on each harmful product
Food	0.38	0.34
Beverages	0.43	0.48
Fast foods & Restaurant meal	0.44	0.46
Tobacco	0.43	0.44
Domestic cigarettes	0.37	0.42
Foreign cigarettes	0.35	0.42
Cosmetic products	0.47	0.43
All harmful products	0.60	0.62

mostly at the 10% level. Furthermore, the confidence intervals for subcategories of products harmful to health were also below 0.2 and predominantly significant at the 10% level across different income, education, and occupation classes. However, income inequalities in expenditure for these products were slightly higher compared to occupation and education inequalities.

Discussion

This study aimed to examine inequalities in the consumption of products harmful to health among Iranian households by analyzing data from the 2019 national survey of the Household Income and Expenditure Survey (HIES). Surprisingly, the findings indicate that both absolute and relative expenditures on harmful products were not significantly distributed, exhibiting a high degree of inequality among households across different income, education, and occupation classes.

These results challenge some common assumptions about consumption patterns related to socioeconomic status. Typically, one might expect that households with higher income levels or educational attainment would exhibit lower expenditures on harmful products due to better access to information and resources promoting healthier choices. However, the lack of significant inequality in expenditure suggests that cultural factors, marketing practices, and social norms may play a substantial role in shaping consumption behaviors across all demographic groups.

Moreover, the observed uniformity in expenditures may indicate a widespread accessibility of harmful products, which can transcend income and education barriers. This raises important questions about the regulatory environment and the effectiveness of public health campaigns aimed at reducing the consumption of harmful products.

Furthermore, the findings highlight the necessity for tailored public health interventions that consider the unique cultural and socioeconomic contexts of different

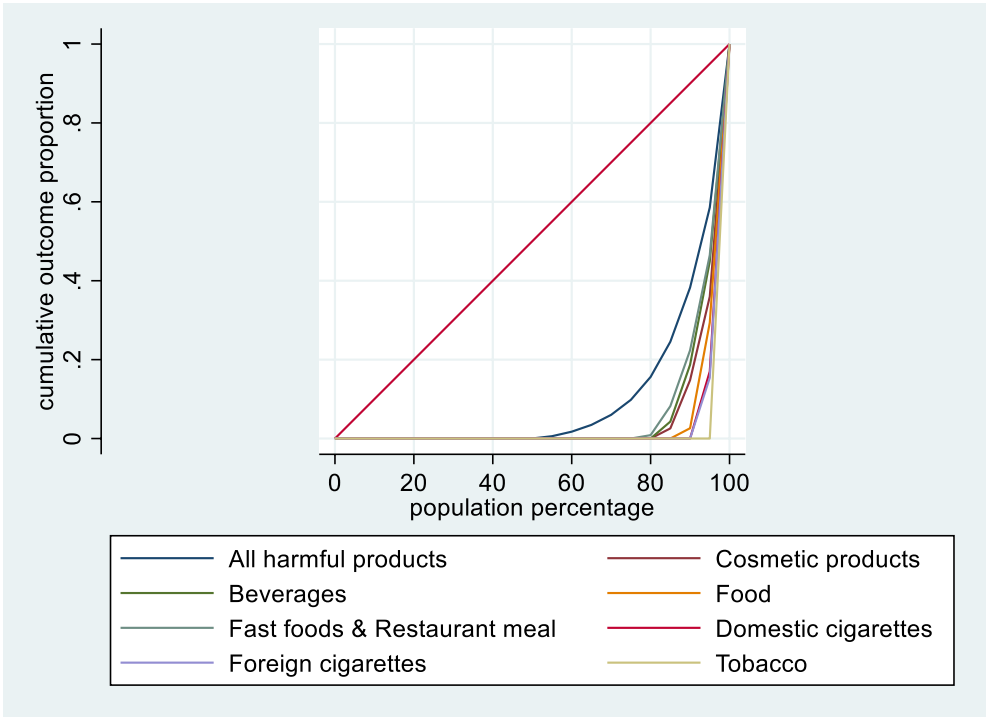


Fig. 1 Lorenz curves of absolute household expenditure on product harmful to health

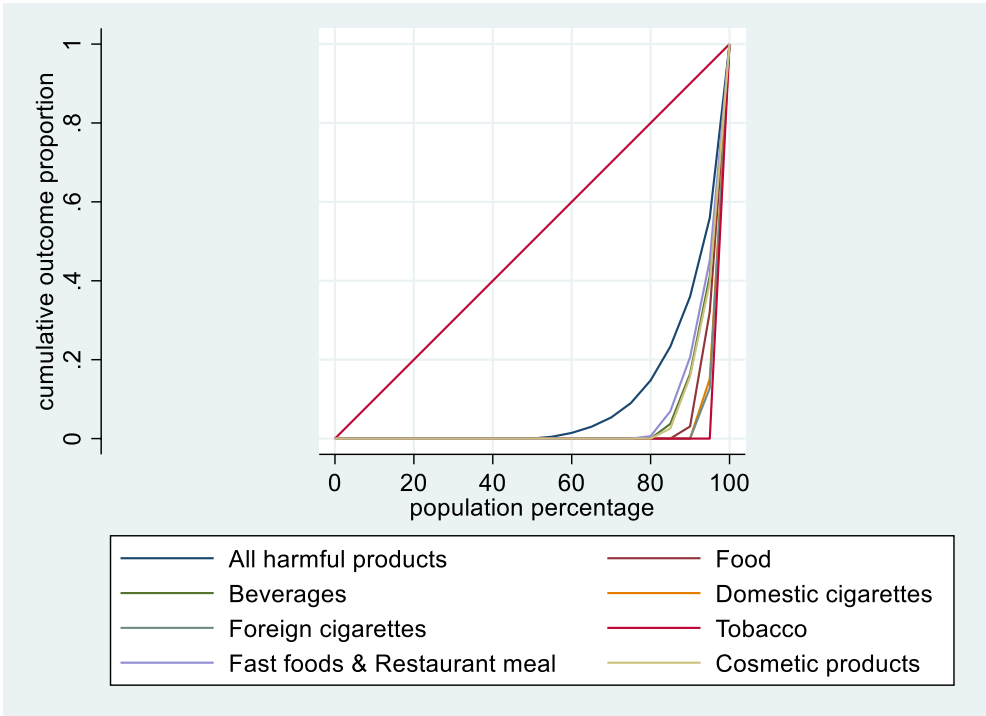


Fig. 2 Lorenz curve of relative household expenditure on product harmful to health

households. Understanding the nuances of why specific demographic groups consume harmful products at similar rates can help inform more effective strategies to mitigate health risks and promote healthier consumption patterns. While the study reveals a concerning level of expenditure on products harmful to health, it also opens up avenues for further research into the underlying factors influencing these consumption patterns,

Table 4 CIs of absolute household expenditure of products harmful to health

Products harmful to health	Stratifying variable			
	Provincial income quintiles	National income quintiles	Educa-tion strata	Occu-pation strata
Food	*-0.129	*-0.222	** -0.096	** -0.018
Beverages	*-0.106	*-0.131	*-0.175	***-0.004
Fast foods & res-taurant meal	**0.011	*0.032	*0.085	*0.096
Tobacco	*-0.149	*-0.25	*-0.301	** -0.127
Domestic cigarettes	*-0.113	*-0.119	*-0.169	***0.005
Foreign cigarettes	*-0.071	*-0.075	*-0.114	*0.049
Cosmetic products	*0.137	*0.143	*0.163	*0.094
All harmful products	*-0.085	*-0.117	*-0.123	**0.006

*P < 0.1, **P < 0.05, ***P ≤ 0.001

Table 5 CIs of relative household expenditure of products harmful to health

Products harmful to health	Stratifying variables			
	Provincial income quintile	National income quintile	Educa-tion strata	Occu-pation strata
Food	*0.167	*0.148	**0.013	*0.057
Beverages	*0.167	*0.170	*-0.111	**0.05
Fast food & Restau-rant meal	*0.279	*0.284	*0.189	**0.016
Tobacco	*0.113	*0.105	*-0.275	***-0.033
Domestic cigarettes	*0.115	*0.154	*-0.106	**0.042
Foreign cigarettes	*0.169	*0.211	** -0.047	*0.095
Cosmetic products	*0.408	*0.395	*0.280	*0.168
All harmful products	*0.177	*0.196	** -0.034	*0.070

*P < 0.1, **P < 0.05, ***P ≤ 0.001

emphasizing the need for comprehensive approaches to health promotion that address both economic and social determinants.

When comparing our findings with those of other studies, it is essential to acknowledge that differences in results may stem from variations in the definition of harmful products across different regions, including Iran. The criteria set by Iran's Ministry of Health may differ from those used in other countries, leading to discrepancies in reported expenditures. Additionally, variations in the indices employed to measure inequality, such as the Gini coefficient or concentration index, can influence outcomes and interpretations. Furthermore, socio-cultural factors unique to each region can shape consumption behaviors and attitudes towards harmful products, which may not be fully captured in quantitative analyses. Therefore, understanding these contextual differences is crucial for accurately interpreting comparative results and drawing meaningful conclusions about health-related expenditures across diverse populations.

All Gini coefficients whether for total household expenditure on harmful products or for household expenditures on subcategories of these products revealed significant inequalities in households' spending on harmful products. This aligns with existing evidence that supports the presence of disparities in the consumption patterns of both unhealthy and healthy food among citizens. For example, the study of Geada A et al. revealed inequalities in alcohol, tobacco and hashish consumption among adolescents from a multicultural population in Spain [24]. Also, Anderson et al. found disparities in fast food consumption among adults in Michigan [25]. Herran et al. estimated inequalities in the consumption of whole fruits, fruit juice and raw and cooked vegetables in Colombia using the Gini coefficient and showed inequality in the consumption of vegetables was high in the surveyed population [26]. Otero et al. further found that there were inequalities in the access to higher quality foods among people from the United States, 1961–2007 [27].

In the current study, we did not find any significantly substantial degree of inequalities in the expenditure on products harmful to health among households in different income, education, and occupational classes. Consequently, it appears that consumption expenditures of harmful products were not distributed highly unequal among rich versus poor households, high-educated versus low-educated households, and those in merit occupation versus non-merit occupation. The unexpected findings suggest that households across different income, education, and occupation all face a partly similar risk of engaging in unhealthy consumption behaviors. Thus, the formulation of effective policies to reduce the consumption of health-harmful products in Iranian society should focus on all income, education, and occupation classes.

In contrast to the findings of the present study, existing evidence has consistently established correlations between education and occupation classes and the consumption of harmful products. For instance, Saldiva et al. (2019) conducted a study on infant nutrition in Brazil, revealing an inverse relationship between a mother's education level and the consumption of unhealthy foods by infants. Higher maternal education was associated with lower consumption of unhealthy foods, with children of mothers without formal education consuming fruit juice, soft drinks, and coffee at twice the rate of children whose mothers had an academic degree [28]. Similarly, Venn et al. found that more educated families in Australia spend a smaller proportion of their food expenditure to processed foods [29]. Homaeirad et al. found that low education level of Iranian household members was positively correlated with frequency and expenditure of cigarettes smoking [30]. Cornelsen et al. investigated inequality in household expenditures on out-of-home

foods, discovering that households with lower education levels and occupation classes spent less on such foods but allocated a higher proportion of their total budget to out-of-home foods [31]. Further, Hassoy et al. found the unemployed group exhibiting the highest smoking rates in a sample of Turkish citizens. Also, inequalities in smoking have increased among unemployed men over the years [7].

As aforementioned, in this study, the observed inequalities in expenditure for products harmful to health were not high when considering income classes. However, it appears that income inequalities in expenditure for unhealthy products were slightly higher compared to education and occupation classes. In addition, the proportion of these products in the household budget was slightly higher among poor households. Therefore, it can be suggested that rich households in Iran spend a little more than the poor ones on unhealthy products, but they allocate somehow a smaller share of their total budget to unhealthy products. Consistent with this result, Cornelsen et al. revealed that poor households in the United Kingdom spend less on out-of-home food compared to wealthy households, but that the proportion of these expenditures in their total budget was higher [31]. In contrast, a study conducted by Ugura et al. (2015) in Nigeria showed that poor people paid more for cigarettes [6]. Anderson et al. conducted a study in eight European countries and found that the poorest people spend more on products harmful to health compared to the richest one, which is however not in line with our study as we found that people in higher income groups spend more on health-threatening goods. Segovia et al. (2020) further demonstrated different patterns among income groups in Ecuador. More specifically, high-income households significantly spend more on milk and water than low-income households, although low-income households spend almost an equal share on soft drinks and milk. As such, spending more on products harmful to health among higher income groups does not necessarily mean they consume healthy products less than poor households. Because of the limited budget of the poor, the more these households spend on unhealthy products, the less they can spend on healthy products [32]. Baroosh explained that households in the lower income quintiles have to spend up to 48% of their weekly income to afford healthy and food baskets, while households in the highest income quintile need to spend significantly less of their weekly income (9%) to afford the same food basket [33]. Ansem et al. (2014) also found that poor households in the Netherlands are less likely to buy foods with relatively high fiber and low fat, salt and sugar [34]. Drewnowski (2017) found that the highest obesity rate in the United States caused by bad nutrition behaviors occurs among population groups with the highest

poverty rate and lowest education level. The influence of socioeconomic variables on obesity may be partly due to the low cost of energy-dense foods. The observed inverse relationship between the energy density of foods, defined as available energy per unit weight (kcal per gram or mega joules per kilogram), and energy cost (dollars per kcal or dollars per mega joule) indicates that diets based on refined grains, added sugars and fats are more cost-effective than recommended diets based on lean meat, fish, fresh vegetables and fruits [35].

Conclusion

In recent years, with the increased prevalence of poverty in the country, a majority of education, occupation, and income classes are grappling with budget constraints that hinder access to a healthy diet. The lack of access to nutritious food not only elevates the incidence of various diseases but also contributes to increased healthcare costs, diminished productivity, and adverse effects on public health [36]. Health policymakers should prioritize attention to all income classes to mitigate household expenditure on unhealthy products, with special consideration given to households with lower income. It is crucial to recognize that impoverished households face more stringent budget restrictions, necessitating more efficient allocation of resources, particularly towards essential items such as healthy foods.

Policymakers should recognize that providing financial and educational support to lower-income households can significantly improve their consumption behaviors. By enhancing access to resources and information, these initiatives can empower households to make healthier choices and mitigate the impact of budget constraints on their dietary patterns. In addition to direct financial assistance, educational campaigns that focus on nutrition, cooking skills, and the risks associated with harmful products can foster a more informed consumer base. Collaborating with community organizations to deliver these programs can further enhance their effectiveness, ensuring that information reaches those who need it most. Moreover, it is crucial to consider the regulatory environment surrounding the marketing and availability of harmful products. Implementing stricter regulations on advertising and sales, particularly in low-income areas, could help reduce the accessibility and appeal of these products, ultimately promoting healthier consumption choices. Despite these recommendations, we emphasize the importance of conducting further studies to explore the origins of inequalities in unhealthy consumption behaviors within Iranian society. Understanding the cultural, social, and economic factors driving these disparities will be vital in developing targeted interventions. Future research should also examine the role of community dynamics and local resources in

shaping consumption patterns, as well as the effectiveness of existing public health initiatives. In summary, a multi-faceted approach that includes financial support, educational outreach, regulatory measures, and ongoing research will be essential in addressing the inequalities in unhealthy consumption behaviors and promoting a healthier future for all Iranian households.

Study limitations

The present study was conducted on a large sample of households living in rural and urban areas across all provinces of Iran. Therefore, our findings can be generalized to all Iranian households. Still, the study has some limitations. First, data for certain products harmful to health as released by Ministry of Health, especially prescription drugs with the potential for misuse, were not included in the HIES. For this reason, it was not possible to examine inequality in the consumption of this category of products harmful to health. Second, we examined inequality in consumption habits of products harmful to health based on three types of household stratification: income, education level and occupation quintiles. The selection of these three classifications was influenced by the availability of their data in the national survey. Due to the utilization of secondary data, it was not possible to examine inequality in the consumption habits of products harmful to health based on other potentially influential stratifications such as health literacy, nutrition knowledge, or health status of household members.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s41043-025-01200-x>.

Supplementary Materials 1

Acknowledgements

The authors would like to acknowledge Tabriz University of Medical sciences for their support and contribution to this study.

Author contributions

Maryam Moeeni: Concept and design, Acquisition of data, Analysis and interpretation of data, Drafting of the manuscript. Faezeh Arjvand: Acquisition of data, Analysis and interpretation of data, Drafting of the manuscript. Koen Ponnet: Critical revision of paper for important intellectual content. Shirin Nosratnejad: Concept and design, Acquisition of data, Analysis and interpretation of data, Drafting of the manuscript.

Funding

The authors report that no funding was received for this study.

Data availability

The datasets generated and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was ethically approved by Ethical Committee of Tabriz University of Medical Sciences on 4 October 2021 under number of IR.TBZMED.REC.1400.601.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 10 June 2025 / Accepted: 10 December 2025

Published online: 28 December 2025

References

1. UN.ESCAP Integrating economic and environmental policies : the case of Pacific Island countries. [Internet]. 2004. [quote: 2023 AAahhnn.
2. Salem AA, Gholami E. Estimating the optimal taxation rate on consumer goods harmful to health by microstimulating in Iran. *Q J Econ Res Policies*. 2022;30(101):85–119.
3. Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics*. 2005;115(1):22–7.
4. Plourde B, Sarrazin JF, Nault I, Poirier P. Sudden cardiac death and obesity. *Expert Review of Cardiovascular Therapy*. 2014;12(9):1099–1110. <https://doi.org/10.1586/14779072.2014.952283>
5. Nicklas TA, Goh ET, Goodell LS, Acuff DS, Reiher R, Buday R, et al. Impact of commercials on food preferences of low-income, minority preschoolers. *J Nutr Educ Behav*. 2011;43(1):35–41.
6. Uguru NP, Mbachu C, Ibe OP, Uguru CC, Odukoja O, Okwuosa C, et al. Investigating male tobacco use and expenditure patterns across socio-economic groups in Nigeria. *PLoS One*. 2015;10(4):e0122021.
7. Hassoy H, Ergin I, Yazarbas G. Trends in socioeconomic inequalities in smoking in Turkey from 2008 to 2016. *BMC Public Health*. 2021;21(1):2128.
8. Gupta V, Mohapatra S, Mishra H, Farooq U, Kumar K, Ansari MJ, et al. Nano-technology in cosmetics and cosmeceuticals-a review of latest advancements. *Gels*. 2022. <https://doi.org/10.3390/gels8030173>.
9. Moussakhani N, Safari M, Safari GH. Investigating the health effects of cosmetics on human health. *J Environ Sci Stud*. 2023;9(2):8649–726.
10. Arjvand F, Moeeni M, Najafi B, Nosratnejad S. Factors affecting inequality in the quality diets: a scoping review. *Value Health Reg Issues*. 2023;37:105–12.
11. Yazdi-Feyzabadi V, Rashidian A, Amini RM. Socio-economic inequality in unhealthy snacks consumption among adolescent students in Iran: a concentration index decomposition analysis. *Public Health Nutr*. 2019;22(12):2179–88.
12. De Irala-EsteAvez1 J MG, Johansson3 L, Oltersdorf 4 U, PraËttaËlaËS R, MartõAñez-GonzaAlez1 MA *. A systematic review of socio-economic differences in food habits in Europe: consumption of fruit and vegetables. *Eur J Clin Nutr*. 2000. <https://doi.org/10.1038/sj.ejcn.1601080>
13. Hjartåker A, Lund E. Relationship between dietary habits, age, lifestyle, and socio-economic status among adult Norwegian women. The Norwegian women and cancer study. *Eur J Clin Nutr*. 1998;52(8):565–72.
14. Turrell G, Vandevijvere S. Socio-economic inequalities in diet and body weight: evidence, causes and intervention options. *Public Health Nutr*. 2015;18(5):759–63.
15. <https://www.amar.org.ir/english>.
16. <https://behdasht.gov.ir>. Ministry of Health and Medical Education 2022
17. Livingstone KM, Olstad DL, Leech RM, Ball K, Meertens B, Potter J, et al. Socioeconomic inequities in diet quality and nutrient intakes among Australian adults: findings from a nationally representative cross-sectional study. *Nutrients*. 2017. <https://doi.org/10.3390/nu9101092>.
18. Mello AV, Sarti FM, Pereira JL, Goldbaum M, Cesar CLG, Alves M, et al. Determinants of inequalities in the quality of Brazilian diet: trends in 12-year population-based study (2003-2015). *Int J Equity Health*. 2018;17(1):72.
19. De Clercq B, Abel T, Moor I, Elgar FJ, Lievens J, Sioen I, et al. Social inequality in adolescents' healthy food intake: the interplay between economic, social and cultural capital. *Eur J Public Health*. 2017;27(2):279–86.

20. Shavers VL. Measurement of socioeconomic status in health disparities research. *J Natl Med Assoc.* 2007;99(9):1013–23.
21. Rodriguez E. Keeping the unemployed healthy: the effect of means-tested and entitlement benefits in Britain, Germany, and the United States. *Am J Public Health.* 2001;91(9):1403–11.
22. Yen IH, Moss N. Unbundling education: a critical discussion of what education confers and how it lowers risk for disease and death. *Ann NY Acad Sci.* 1999;896:350–1.
23. Braveman PA, Cubbin C, Egerter S, Chideya S, Marchi KS, Metzler M, et al. Socioeconomic status in health research: one size does not fit all. *JAMA.* 2005;294(22):2879–88.
24. Díaz Geada A, Busto Miramontes A, Caamaño Isorna F. Alcohol, tobacco and cannabis consumption in adolescents from a multicultural population (Burela, Lugo). *Adicciones.* 2018;30(4):264–70.
25. Anderson B, Rafferty AP, Lyon-Callo S, Fussman C, Imes G. Fast-food consumption and obesity among Michigan adults. *Prev Chronic Dis.* 2011;8(4):A71.
26. Herran OF, Patiño GA, Gamboa EM. Socioeconomic inequalities in the consumption of fruits and vegetables: Colombian National Nutrition Survey, 2010. *Cad Saude Publica.* 2019;35(2):e00031418.
27. Otero G, Pechlaner G, Liberman G, Gürçan E. The neoliberal diet and inequality in the United States. *Soc Sci Med.* 2015;142:47–55.
28. Saldiva SR, Venancio SI, de Santana AC, da Silva Castro AL, Escuder MM, Giugliani ER. The consumption of unhealthy foods by Brazilian children is influenced by their mother's educational level. *Nutr J.* 2014;13:33.
29. Venn D, Dixon J, Banwell C, Strazdins L. Social determinants of household food expenditure in Australia: the role of education, income, geography and time. *Public Health Nutr.* 2018;21(5):902–11.
30. Homaie Rad E, Hajizadeh M, Rezaei S, Reihanian A. Cigarette smoking and its financial burden among Iranian households: evidence from household income and expenditures survey. *J Res Health Sci.* 2020;20(4):e00494.
31. Cornelsen L, Berger N, Cummins S, Smith RD. Socio-economic patterning of expenditures on "out-of-home" food and non-alcoholic beverages by product and place of purchase in Britain. *Soc Sci Med.* 2019;235:112361.
32. Segovia J, Orellana M, Sarmiento JP, Carchi D. The effects of taxing sugar-sweetened beverages in Ecuador: an analysis across different income and consumption groups. *PLoS One.* 2020;15(10):e0240546.
33. Barosh L, Friel S, Engelhardt K, Chan L. The cost of a healthy and sustainable diet—who can afford it? *Aust N Z J Public Health.* 2014;38(1):7–12.
34. van Ansem WJ, van Lenthe FJ, Schrijvers CT, Rodenburg G, van de Mheen D. Socio-economic inequalities in children's snack consumption and sugar-sweetened beverage consumption: the contribution of home environmental factors. *Br J Nutr.* 2014;112(3):467–76.
35. Drewnowski A. Obesity, diets, and social inequalities. *Nutr Rev.* 2009;67(Suppl 1):S36–9.
36. Najafi E, Amini-Rarani M, Moeeni M. Inequality in dental care expenditure in Iranian households: analysis of income quintiles and educational levels. *BMC Oral Health.* 2021;21(1):550.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.