

The Effect of Socio-Economic Status on Food Quality in West of Iran

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Research

Keywords: HEI, Socioeconomic status, food quality

Posted Date: January 18th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-141402/v1>

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Abstract

Background

Socio-economic status affects many health-related outcomes and one of the most important factors is the pattern and quality of nutrition. Thus, this study is carried out to investigate the effect of socio-economic status on the quality of nutrition based on healthy Eating Index (HEI).

Methods

This is a population-based study using the baseline data from Ravansar Non-Communicable Disease cohort study. HEI calculated from Food Frequency Questionnaire. The quality of nutrition was assessed based on HEI-2015 which evaluates 13 food groups.

Results

The mean of age of the participants was 48.02 ($SD = \pm 8.27$) years. The median and mean of HEI in the studied population were 53 and 53.69 ($SD = \pm 7.34$), respectively. Women, the educated, city dwellers, people of higher socioeconomic classes, and non-smokers had greater odds of having higher quality of nutrition. The worst score among all components of HEI were for the refined grains and then the whole grain, and the highest score was obtained for the total protein foods.

Conclusions

Due to low nutritional quality and its adverse effects, especially in people with low socioeconomic status and villagers, the quality of nutrition, especially in the poor, should be promoted with proper interventions so as to reduce disparity in the society.

1. Background

Daily consumption of food is one of the most essential human needs. To remain healthy, it should contain vitamins, proteins, minerals, fiber and other essential elements that can be achieved through the use of various nutrients (1).

Promoting nutritional quality reduces the risk of all causes of death, especially cardiovascular disease(CVD), diabetes and cancers(2, 3). According to the global burden of disease reported in 2017, inappropriate diet alone increases the risk for ischemic heart disease (74%), stroke (56%), diabetes type II (35%), and gastric cancer (38.5%) (4).

In most societies, high quality food is offered at a higher price than low quality foods which leads to a difference in access to and consumption of higher quality food (5). The quality of nutrition is associated with a variety of cultural factors, food prices, availability, and nutritional preferences and knowledge. As regards, there are different nutritional patterns in the world. In developed countries, lower socio-economic status(SES) meet their nutritional needs through the use of fats, salt and sugar, while in developing countries, higher socioeconomic classes may use higher fats, salt, and sugar (6-8).

Although the effect of SES on the quality of nutrition can be seen in developing and developed countries, this pattern of varies in different societies (9-11). In some societies, education has a greater impact on disparity in the quality of nutrition; in some others, other factors such as high income, more availability of food, or place of residence has played the biggest role (12-15). Therefore, according to different results from previous studies, the purpose of this research was to determine the most important factors associated with SES in the quality of nutrition of west of Iran based on Ravansar Non-Communicable Diseases (RaNCD) cohort study, the first cohort study in a Kurdish settlement.

2. Methodology

2-1- The Study Population

This is a population-based study using the baseline data from Ravansar Non-Communicable Disease (RaNCD) cohort study data. RaNCD cohort study is one of the 18 centers for Prospective Epidemiological Research Studies in IrAN (PERSIAN) that has been conducted to examine the incidence of non-communicable diseases. Further details on design and methodology of the cohort study are given in another paper (16, 17).

2-2 Definitions and Measurements

Smoking status evaluated base on National Health Interview Survey (NHIS), which screens current smoker if they smoke ≥ 100 cigarettes during their lifetime, ex-smoker refers to an individual who has given up cigarette and/or tobacco smoking , and those who continue smoking were regarded as current smokers (18). Participants' weight was measured using Bio Impedance Analyzer BIA (InBody 770 BIOSPACE, KOREA) and their height was measured with 0.1centimeter accuracy.

Diabetes was detected with fasting blood sugar (FBS) ≥ 126 mg/dL [7 mmol/L] and/or positive history of taking hypoglycemic drugs such as insulin. In this study, participants with high blood pressure were detected with a systolic pressure of 140 mm Hg or more and/or diastolic pressure of 90 mm Hg or more and/or positive history of taking antihypertensive drugs(19). Cardiovascular diseases were also detected by asking the subjects and based on the history of doctor's diagnosis and/or taking heart medications.

Nutritional assessment was performed using Food Frequency Questionnaire(FFQ) which evaluates a selection of common foods consumed by the subjects over the past year. It contained 131 general items which, after confirmation of validity and reliability, was adjusted according to Iran's society (20).The quality of nutrition was assessed based on Healthy Eating Index 2015 (HEI-2015) which evaluates 13 food groups; 9 for adequate consumption and 4 for moderated consumption(21). The procedure taken for HEI classification and scoring is presented in Table 1. HEI score is between 0 and 100; the higher the score, the better the quality of nutrition (22)

According to previous studies and opinion of nutritionists, the quality of nutrition was divided into three groups; poor quality (HEI< 51), needs improvement (51<HEI<57), and good quality (HEI>57).

Inclusion and Exclusion Criteria: A total of 10065 individuals participated in RaNCD, among whom 813 were excluded because of pregnancy and lactation, thyroid disorder, and cancer. The studied subjects had no acute conditions such as trauma, sign of burning, and special diet, and they were not professional athletes.

2-3- Statistical Analysis

According to Principal Component Analysis (PCA), the subjects were classified into five groups according to their SES: the poorest, the poor, the middle class, the rich, and the richest. SES of the subjects was determined using an inventory for measuring the items: employment status, household type, type of housing, internet access, having a personal computer, cell phone, home appliances such as dishwasher, washing machine, LCD/ LED/ Plasma TV, refrigerator, bathroom, number of rooms for family members, type of kitchen, drinking water supply, types of vehicles, and number of travels abroad(23).

To show the relationship between independent variables with HEI, its components, and different HEI tertiles and Chi-square test were used. The odds ratio(OR) was used to show the relationship between each of the variables with HEI. All analyses were carried out using Stata software (version 14.2) (Stata Corp, College Station, TX, USA) and Microsoft Excel 2016. For all the analyses, P-value<0.05 was considered as the level of significance.

3. Results

3-1- Descriptive Results

From 9252 subjects included in this study, 4635 (50.1%) were male. The average age of men and women were 47.8 (SD=8.06) and 48.3 (SD=8.5) years. From total, 5441 (58.8%) were city dwellers, 2273 (24.6%) were illiterate, and 1139

(12.3%) were current smokers. Mean and Standard Deviation(SD) HEI and median value were 53.69 ± 7.34 and 53, respectively. The mean(SD) HEI in women and men were 54.13 ± 7.7 and 53.25 ± 6.9 respectively .The prevalence rates of cardiovascular disease, diabetes, and high blood pressure were 10.8%, 8.1%, 15.4%, respectively (table2).

3-2- Nutritional Status

In comparison made between the three groups HEI, there was a significant relationship between HEI and all the studied factors ($p < 0.001$). HEI score of women was better than that of men. With increasing education level, the quality of nutrition increased so that 45.7% of illiterate people had poor quality of nutrition and 23.6% had good quality of nutrition. As the level of education increased, the HEI score improved; as a result, the odds of a group with some level of academic education was 1.83(CI=1.40,2.39 (times of those who were illiterate for high HEI.

39.8% of city dwellers and 15.6% of villagers had good quality of nutrition while 50% of villagers and 24% of the city dwellers had poor quality of nutrition. Odds ratio for place of residence was 0.37 (CI=0.34,0.41), meaning that villagers had a lower odds for better quality of nutrition. People with cardiovascular diseases, high blood pressure, and diabetes showed no significant difference in HEI; with small differences, they had good, need improvement, and poor quality of nutrition. In addition, with improving SES, HEI increased.

The radar charts show HEI components, scores for three nutrition quality groups(Figure 1), two groups of the richest and the poorest(Figure2) and for place of residence(Figure3). According to this comparison based on SES, the greatest difference in HEI scores of these two quantiles can be seen in the whole fruits and total fruits. The richest have three components with total score of near to 90, but the poorest have only one component with such a score. In both groups, the highest score belongs to protein foods and added sugars. Similarly, among HEI groups and the place of residence; Total Fruits, Whole Fruits, Total Vegetables and Greens & Beans were the most different among HEI components.

4. Discussion

This study aimed to investigate the most important factors affecting socio-economic status in quality of nutrition of west of Iran. In this study, mean HEI was close to 50 which reflect undesirable nutritional status. Among the three groups HEI, the most significant differences in the quality of nutrition was associated with socioeconomic status. Different studies presented different results. In general, in more reports, the significant effect of SES on the quality of nutrition on individuals is evident(24, 25). The results of a systematic review by Ana-Lucia Mayén on the impact of interventions on reducing social inequalities in quality of nutrition in low-and middle-income countries, including Iran, suggested that intervention improves the nutritional quality but for reducing disparities, interventions need to be carried out with more focus in deprived communities. Although interventions in the entire population results in better quality of nutrition in the whole population, the difference between socio-economic groups is likely to remain unchanged(26). Considering the nutritional status of the participants in this study, intervention in all groups with more focus on people with lower SES and villagers was preferred. To change traditional eating habits, it is also necessary to improve nutritional quality through a team including experts from public health and nutrition educators.

As SES improved, HEI score of most components, especially dairy, fatty acids, sodium, total fruits, and whole fruits, increased. Individuals with higher SES earned lower scores only in terms of saturated fatty acids consumption. By more detailed analysis of the relationship between saturated fatty acid and the five socio-economic groups, it can be concluded that people with scores 5 to 8 were more likely to have higher SES, and those with scores 9 to 10 were more concentrated on lower SES.

Another interesting point in this study is that, HEI scores in people with cardiovascular diseases, high blood pressure, and diabetes was favorable compared with healthy people. Given that this was a cross-sectional study, the results might be influenced by the knowledge of patients in selection and proper use of food followed by medical consultation after the

diagnosis of their disease. Further studies can be helpful in assessing the health status and nutritional quality among incident cases of such conditions and measure the impact of health education on health eating.

Villagers, with poor SES, had lower quality diet than city dwellers ($OR=0.37$) even after adjustment for all other important factors, especially in terms of fruits and vegetables. With the expansion of agricultural land and horticulture and livestock in Iran, especially in rural areas, villagers expected to have enough consumption of fruits and vegetables, especially dairy and meat; yet, according to conducted studies in Iran, consumption of these valuable foods has been low in most Iranian adults. Such differences between people living in rural areas and those in urban areas might be related to the culture and nutritional habits. Although according to other published reports, the most important causes of low consumption of high quality food are weak economic situation, higher price of such foods, and low education levels; nutritional habits are also important(27-30).

The results suggested that, as the level of education improves, the odds for better HEI increases. The positive effect of education on improving the quality of nutrition has been reported in different studies. Although there is a direct relationship between education and knowledge in different fields including nutrition, it is worthwhile to consider the type of individual's knowledge so as to be able to explain inconsistent studies such as studies in Turkey(31, 32).

In this study, although BMI has no relationship with the quality of nutrition, it can be assumed that increased food intake has led to an increase in weight, which in turn increased the HEI score (in 9 components of Adequacy consumption). Considering that 70% of the study population had $BMI>25$ and this is a significant risk factor for most chronic diseases, greater efforts are needed to promote and educate the quality of proper nutrition in this society so as to benefit from its outcomes as well as balanced weights.

The main reason for low scores of refined grains and whole grains in the studied population was related to high consumption (more than scoring standards) of white rice and white bread, the staple food of the region which constitutes the first and most important component of their daily food so that even SES had no significant effect on the refined grains. By eliminating this component in the HEI calculations, the subjects' score increase significantly. Following a high-carbohydrate dietary pattern, that is common to the most less developed societies, may be due to lower prices of sources of carbohydrates than protein in these societies (33). A diet containing larger amount of refined grains, fast food, industrial drinks, and less whole grains is consistent with that pattern found in other reports from Iran(34, 35). Also according to research conducted in Poland, people who care more about their health tend to use whole wheat bread and replace it with white bread(36). Although there are some discrepancies among reports, there are often consistent reports on the use of refined grains, especially in less developed societies(24, 37-39). Due to significant weight gain in a large number of the studied subjects, interventions for improving dietary habits such as mandatory use of wheat bran in bakeries, promoting the use of brown rice; and providing a package of whole-grain food instead of refined grains, is very important.

Considering the importance of legumes and its role in preventing a range of chronic diseases, HEI (2015) included it among the four HEI components (total vegetables, greens and beans, total protein foods, seafood and plant proteins)(40). In the present study, all four components were mostly consumed by the rich. Farvid et al. (in 2017) examined 42403 Iranian adults over 11 years and observed that consumption of legumes was in favorable condition and daily intake of 1 unit of beans was an important factor in reducing the risk of death to all causes(17).

In our study, women had better mean HEI than men and the quality of their nutrition was 1.27 times better than men. According to previous studies, women are more concerned about their health than men. Because of employment, men often spend little time for choosing and serving snacks, especially at work, but women are often housewives and use more healthy snacks (41, 42). However, the results of another study in Iran were indicative of the better status of men than women in terms of quality of nutrition(31).

Reducing disparities should be addressed with regard to the structure of society and vulnerable groups and the quality of nutrition can be promoted by addressing the weaknesses for example through increasing the knowledge and awareness of

individuals. Nutrition knowledge is very effective in improving the dietary pattern. In a systematic review by Xiao Zhou et al. (in 2018) showed the effect of nutritional knowledge and awareness on improving the quality of nutrition(43).

Weaknesses and limitations

This research may also be affected by a recall bias. However, all such bias is more likely to be non-differential and therefore it tends to move the point estimate to null. To our knowledge, this is the first report of its type among Kurdish people to investigate the nutritional quality, the socio-economic status, and the other factors in nutritional quality, simultaneously. For the purpose of this study, we used a population-based study with large enough sample size and with standard tools for data collection by trained personnel with less than 1% missing information. In addition, we used HEI-2015 method for the first time in Iran.

Conclusion

The results of this study showed that the quality of nutrition of the studied subjects was not good and needed improvement. Also, the effect of SES on the quality of the subjects' nutrition was evident. With high prevalence of high blood pressure, diabetes, and overweight among the study subjects, interventions for promoting the quality of nutrition, especially for low SES of the study population, seems to be necessary.

Abbreviations

BMI= body mass index

CVD= cardiovascular disease

HEI= healthy eating index

FFQ= Food Frequency Questionnaire

PCA= principal component analysis

RaNCD= Ravansar Non-Communicable Disease

SES= socio-economic status

Declarations

Ethics approval and consent to participate: Informed written consents were obtained from all the candidates who were willing to participate, and they were ensured that they could withdraw from the study at any time they wished. The research was registered (No: 92472) at the Research and Technology Deputy and was approved by the ethics committee of Kermanshah University of Medical Sciences under the code KUMS.REC.1394.318.

Consent for publication: Not applicable

Availability of data and materials: The RaNCD cohort is not an open-access database. However, we would encourage external investigators to consider applying to use the data for secondary analyses, to maximize the scientific output from the data. All the information on how to access the RaNCD public data archive, with a list of current proposals and papers under preparation, can be found on our website: www.persiancohort.com.

Competing interests: The authors declare that they have no competing interests

funding: This study was supported by Ministry of Health and Medical Education of Iran and Kermanshah University of Medical Science (Grant No: 92472).

Authors' contributions: Conceptualization: MA,FN. Data curation: FN,MM. Formal analysis: MA,MM,AK. Methodology: MA,MM,FN,YP,AK,MS. Project administration: MA,MM. Visualization: MA,MS,MM. Writing – original draft: MA,MM. Writing – review & editing: MA,MM,FN,YP,AK,MS.

Acknowledgements: RaNCD is part of PERSIAN national cohort and we would like to thank Professor Reza Malekzadeh Deputy of Research and Technology at the Ministry of Health and Medical Education of Iran and Director of the PERSIAN cohort and also Dr.Hossein Poustchi Executive Director of PERSIAN cohort for all their supports during design and running of RaNCD.

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Tables

Table 1: HEI-2015 Components, Dietary Constituents and Scoring Standards

Standard for Minimum of Zero	Standard for Maximum Scores	Maximum Scores	Components
Adequacy			
No Fruits	≥ 0.8 cup	5	Total Fruits ²
No Whole Fruits	≥ 0.4 cup	5	Whole Fruits ³
No Vegetables	≥ 1.1 cup	5	Total Vegetables ⁴
No Greens and Beans	≥ 0.2 cup	5	Greens & Beans ⁵
No Whole Grains	≥ 1.5 oz	10	Whole Grains
No Dairy	≥ 1.3 cup	10	Dairy ⁶
No Protein Foods	≥ 2.5 oz	5	Total Protein Foods ⁷
No Seafood & Plant Proteins	≥ 0.8 cup	5	Seafood & Plant Proteins ⁸
(PUFAs + MUFAs)/SFAs ≤ 1.2	(PUFAs + MUFAs)/SFAs ≥ 2.5	10	Fatty Acids ⁹
Moderation			
≥ 4.3 oz	≤ 1.8 oz	10	Refined Grains
≥ 2.0 g	≤ 1.1 g	10	Sodium
$\geq 26\%$ of energy	$\leq 6.5\%$ of energy	10	Added Sugars
$\geq 16\%$ of energy	$\leq 8\%$ of energy	10	Saturated Fats

1:Intakes between the minimum and maximum standards are scored proportionately.

2: Includes 100% fruit juice.

3: Includes all forms except juice.

4: Total Vegetables + Legumes (Beans and Peas) in cup equivalents

5. Dark Green Vegetables + Legumes (Beans and Peas) in cup equivalents

6: Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages.

7: Total Meat, Poultry, and Seafood (including organ meats and cured meats) + Eggs + Nuts and Seeds + Soy + Legumes (Beans and Peas) in oz equivalents

8: Seafood (high in n-3) + Seafood (low in n-3) + Soy Products + Nuts and Seeds + Legumes (Beans and Peas) in oz equivalents

9: Ratio of poly- and monounsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs).

Extracted from HEI-2015¹ Components & Scoring Standards(25).

Table 2: Demographic characteristics and adjusted odds ratio of the participants based on the quality of nutrition

Variables	Total	Adjusted	Poor	needs improvement	Good	p-value
	N(%)	Odds ratio (CI 95%)*	HEI(27-50) N(%)	HEI(51-57) N(%)	HEI(58-91) N(%)	
Total	N(%)	9252(100)		3226(34.9)	3267(35.3)	2759(29.8) <0.001
	HEI Mean(SD)	59.69(7.34)		46.00(3.48)	53.91(1.97)	62.41(4.09)
gender	Male	4635(50.1)	-	1646(35.5)	1728(37.3)	1261(27.2) <0.001
	female	4617(49.9)	1.27(1.13 1.43)	1580(34.2)	1539(33.3)	1498(32.5)
Age groups (years)	35-45	4121(44.5)	-	1331(32.3)	1545(37.5)	1245(30.2) <0.001
	46-55	3032(32.8)	0.99(0.88 1.11)	1060(35.0)	1046(34.5)	926(30.5)
	56-65	2099(22.7)	0.98(0.94 1.13)	835(39.8)	676(32.2)	588(28.0)
Education (year)	illiterate	2273(24.6)	-	1038(45.7)	698(30.7)	537(23.6) <0.001
	1-5 Y	3483(37.6)	1.35(1.18 1.54)	1218(35)	1282(36.8)	983(28.2)
	6-9 Y	1566(16.9)	1.49(1.26 1.78)	519(33.1)	562(35.9)	485(31.0)
	10-12 y	1190(12.9)	1.83(1.50 2.25)	311(26.1)	467(39.2)	412(34.7)
	≥13 y	740(8.0)	1.83(1.40 2.39)	140(18.9)	258(34.9)	342(46.2)
marital status	Married	8360(90.4)	-	2864(34.3)	2986(35.7)	2510(30.0) <0.001
	Single	396(4.3)	0.97(0.77 1.21)	161(40.7)	147(37.1)	88(22.2)
	Widowhood/ divorced	496(5.3)	0.89(0.73 1.10)	201(40.5)	134(27.0)	161(32.5)
place of residence	urban	5441(58.8)	-	1307(24.0)	1971(36.2)	2163(39.8) <0.001
	rural	3811(41.2)	0.37(0.34 0.41)	1919(50.3)	1296(34.1)	596(15.6)
smoking status	never	7300(79.1)	-	2384(32.7)	2584(35.4)	2332(31.9) <0.001
	current	1139(12.3)	0.63(0.54 0.73)	531(46.6)	388(34.1)	220(19.3)
	former	790(8.6)	0.85(0.71 1.00)	305(38.6)	284(35.9)	201(25.4)
BMI (kg/m ²)	18.5≥	158(1.7)	-	77(48.7)	54(34.2)	27(17.1) <0.001
	18.6 -24.9	2550(27.8)	0.94(0.67 1.33)	1073(42)	880(34.5)	597(23.5)
	25-29.9	4022(43.9)	1.15(0.82 1.62)	1328(33)	1457(36.2)	1237(30.8)
	30-34.9	1928(21.0)	1.26(0.88 1.80)	559(29.0)	676(35.0)	693(36.0)

	≤ 35	514(5.6)	1.10 0.74 1.61(	163(31.7)	171(33.3)	180(35)	
CVD	No	8253(89.2)	-	2929(35.5)	2927(35.5)	2397(29.0)	<0.001
	Yes	999(10.8)	1.34 1.11 1.62(	297(29.7)	340(34)	362(36.3)	
Blood Pressure	No	7812(84.6)	-	2757(35.3)	2789(35.7)	2266(29.0)	<0.001
	yes	1419(15.4)	1.11 0.95 1.31(	461(32.5)	473(33.3)	485(34.2)	
diabetes	No	8451(91.9)	-	2998(35.5)	2987(35.3)	2466(29.2)	<0.001
	yes	742(8.1)	1.25 1.05 1.50(	209(28.2)	262(35.3)	271(36.5)	
socioeconomic status	1st quintile(poorest)	1872(20.2)	-	918(49)	577(30.8)	377(20.2)	<0.001
	2nd quintile	1855(20.1)	1.30 1.13 1.50(	746(40.2)	655(35.3)	454(24.5)	
	3rd quintile	1850(20.0)	1.54 1.33 1.77(	650(35.1)	660(35.7)	540(29.2)	
	4th quintile	1845(19.9)	1.84 1.58 2.13(	520(28.2)	723(39.2)	602(32.6)	
	5th quintile (highest)	1830(19.8)	2.00 1.67 2.39(	392(21.4)	652(35.6)	786(43.0)	

Figures

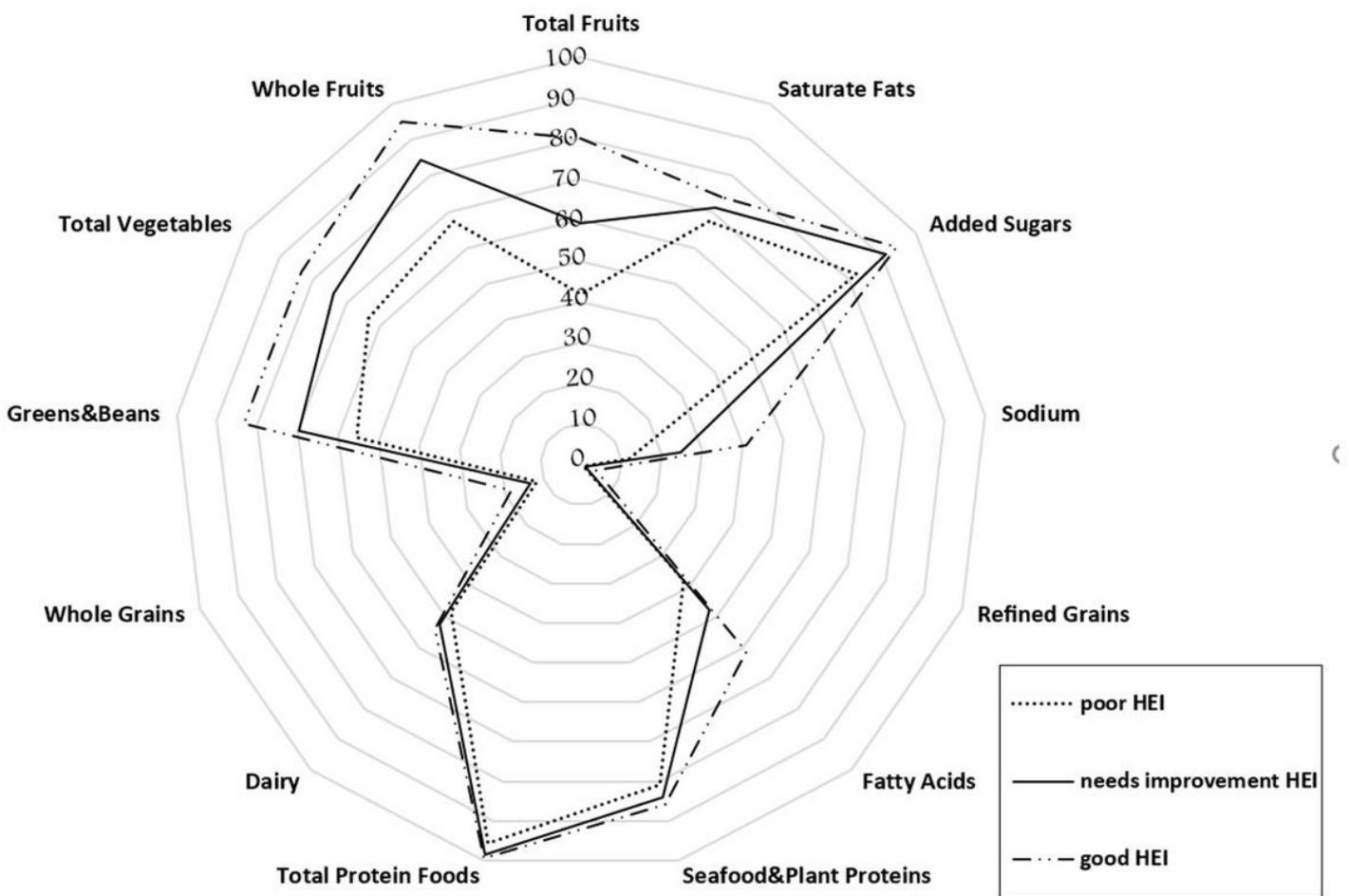


Figure 1

Radar diagram to compare HEI component scores in three nutrition quality groups.

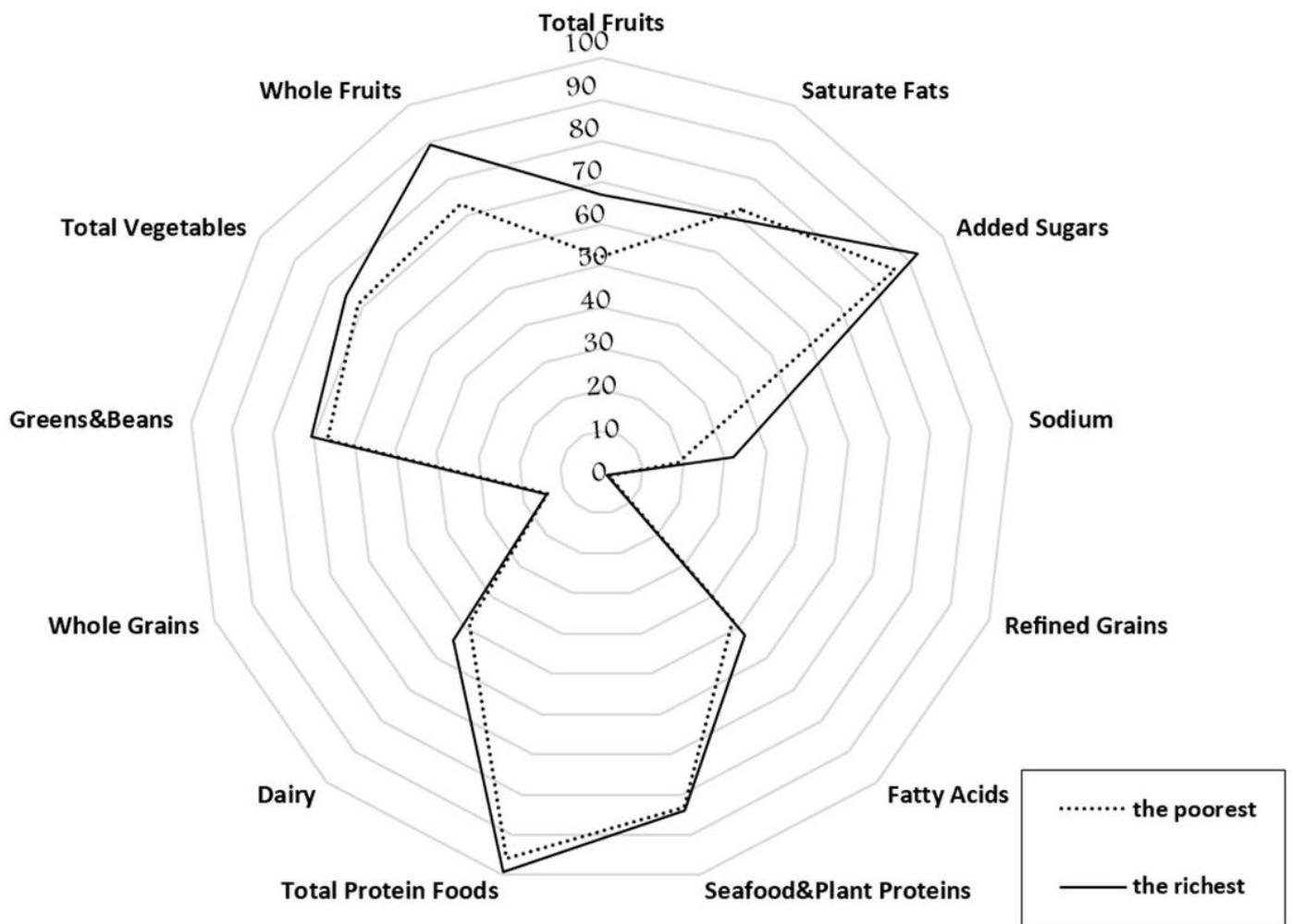


Figure 2

Radar diagram to compare the score of HEI components in the poorest and richest groups of society.

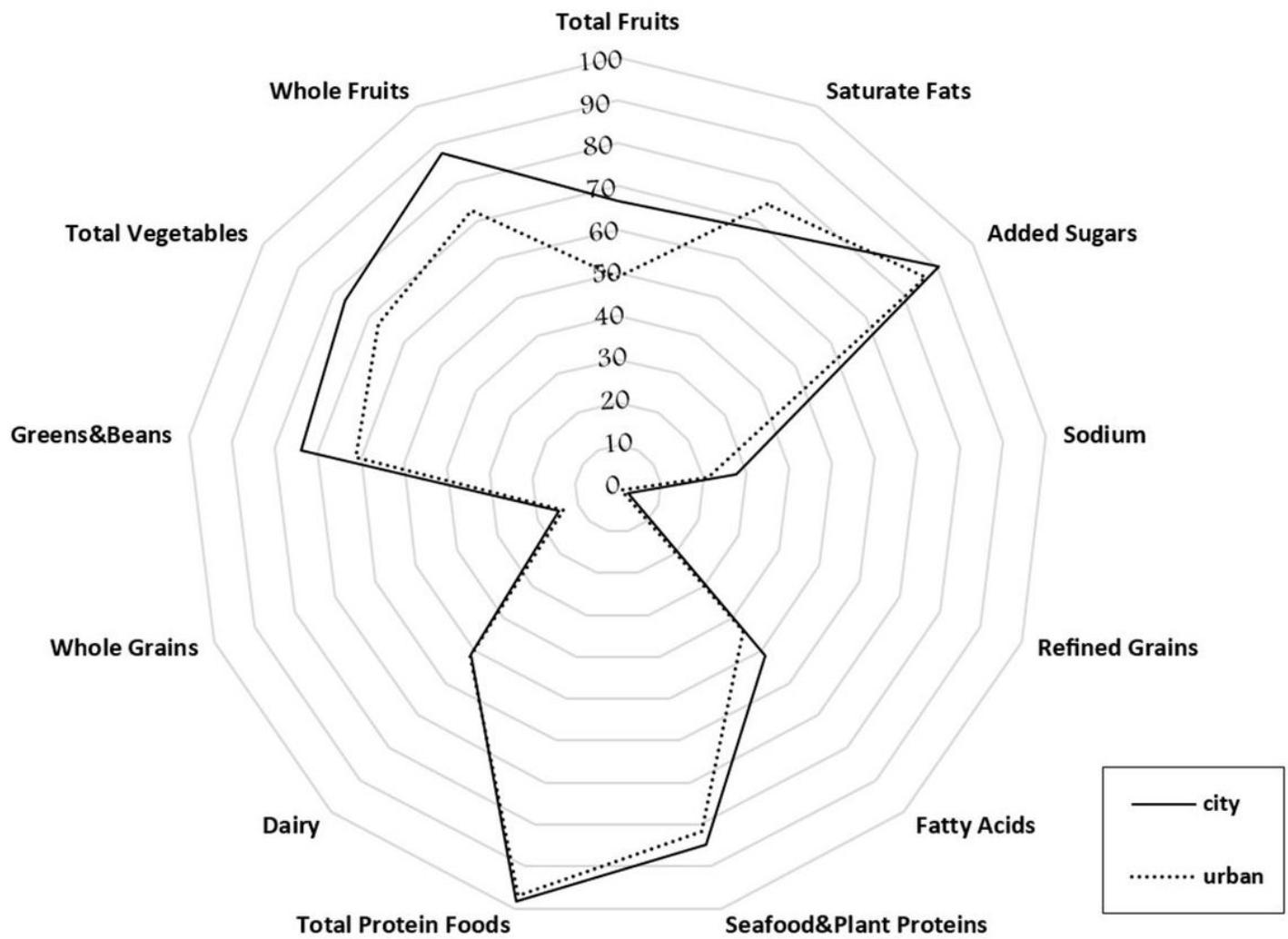


Figure 3

Radar diagram to compare the score of HEI components in urban and rural areas.