

Original Article:



A New Scale for Measuring the Socio-economic Status in Health Studies Conducted in Tehran

Nezhat Shakeri^{1*} , Mostafa Faridizadeh¹ , Roya Sehat²

1. Department of Biostatistics, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
2. Mofid Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.



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* Corresponding author:

Nezhat Shakeri, PhD.

Address: Department of Biostatistics, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

E-mail: n.shakeri@sbmu.ac.ir

Abstract

Introduction: One of the most important determinants in health studies is health-related socio-economic status. The precise determination of health-related socio-economic classes is contingent upon updating the data and taking new cultural, social, and health factors. The objective of this study is to provide a practical method for determining the index and health-related socio-economic classes of the subjects under study.

Materials and Methods: A questionnaire containing 68 items was developed as a tool to assess the socio-economic status index related to health. Data were collected from six hundred and four married individuals who were randomly recruited from the city of Tehran. To identify the prognostic variables of the model, linear regression method was used. Predicted values of the index were obtained using the model. Then, boundary lines were proposed to determine the five socio-economic classes using the K-means cluster method.

Results: Education, employment, internet access at home, use of supplementary health insurance, and time spent in virtual reality (cyberspace) were among the significant variables.

Conclusion: The socio-economic class determination table at the end of the manuscript presents a step-by-step method for calculating the index and determining the desired class with respect to gender.

Keywords: Health studies, H-SES, Leisure activity, Modeling, Socioeconomic.

1. Introduction

One of the most important determinants in health studies is socio-economic status (SES) [1].

Although social hierarchy is a topic without a clear definition, it is understood by individuals in any society [2]. The SES criterion, like other criteria such as the quality of life, is a hidden variable, because it is not directly measurable.³ According to Oakes and colleagues' definition, the SES of each individual comprises the individual's access to desired resources such as commodities, money, a network of friends, health, employment opportunities, etc., in such a way that access to these resources would bring success and

prosperity in the society [3]. Likewise, an article from India notes that income, employment and education are the three main factors which can play a significant role in SES classifications [4]. According to Adler and Newman (2002), SES is comprised of three major determinants of health, i.e., health care, environmental exposure, and health behavior [5]. An examination of the literature shows that the SES possesses various dimensions and based on the aims of the research, its various aspects can be the subject of study [6]. In various articles, reference has been made to the significant role of this indicator in medicine and health sciences [7-10]. According to Australian Institute of Health and Welfare (AIHW), people who are socioeconomically disadvantaged have greater rates of cardiovascular disease (CVD), diabetes, and chronic

kidney disease (CKD) [11].

The study done by Ranjbaran et al. indicated that Principal Component Analysis (PCA) is an appropriate method for giving weight to the variables in research related to SES and health [12]. Nevertheless, the author of a piece of enquiry in India suggests that PCA for the reduction of variables should not be used under any circumstances in health-related studies, because it is merely statistical with no biological meaning causing difficulty in the interpretation of results [13].

In health-related studies, factors such as owning a car, a television set, a washing machine and such things were usually considered for determining the level of SES. For example, in Moradi *et al.*'s, which was conducted for examining inequality in SES as a factor in the risk of contracting contagious diseases, the variables taken into consideration were the number of people living in each room, owning a microwave oven, mobile phone, an LCD television set, a washing machine, a dishwasher, and other related elements for determining the level of income and eventually SES [14]. In other studies, e.g., Rashidkhani *et al.*'s, which focused on a group of women whose ages ranged from 20-50, the level of education, the whole family's income per month, and their home's infrastructure were considered as constituents of the SES [15]. In still another study, Pejoooyan *et al.* attempted to classify families with the help of SES [16].

Researchers believe that a method for determining an indicator for SES is not only necessary because of tribal and ethnic differences in various regions [2], but also important in different time periods; thus, the study must be updated and an appropriate method needs to be determined [17]. The aim of the current study is to present a practical method for calculating SES from the point of view of health in large cities with using a sample from Tehran, capital of Iran – i.e., a criterion which would easily and, at the same time, completely categorize the society in terms of H-SES.

2. Materials and Methods

In preparing an appropriate tool for determining a socio-economic criterion with an application in health studies, the results of previous studies were used; besides, some analysts and specialists in the fields of medicine and sociology were consulted. For evaluating the face validity of the questionnaire, five specialists in health and sociology were asked to examine the items based on and give suggestions as to simplicity, comprehensibility, and appropriateness. The content validity of the questionnaire was

examined by the Lausche method and ultimately a questionnaire containing 68 items was developed.

Similar to Garmarudi *et al.*'s, 1,000 people were taken as a sample from the city of Tehran, including 398 married women, 208 married men; the remainder were single, divorced, or widowed individuals [17]. Sampling took place in two stages. First, the city of Tehran was divided into five regions –north, south, east, west, and center –and then people between 20-60 years of age, who were accessible, were collected in groups of 200 from each region.

For determining the SES pertaining to health, the work method was in such a way that among all the questions, the choices were prioritized, and a number between 0 and 100 was assigned to each choice. For example, in a two-choice question, the numbers 0 and 100 were considered for low and high priority, respectively; and in a three-choice question, the numbers 0, 50, and 100 for lowest priority, mid-priority, and highest priority, respectively. Questions that went unanswered were deleted, while an average number for the answered questions for each individual was considered to be that individual's SES as a dependent variable. This indicator is on a scale of 0-100. Thus, an appropriate model was presented by using the linear regression method, and by examining the significant role of different predictors. Therefore, instead of using a questionnaire containing 68 items, H-SES could be determined by using fewer items. After estimating the index, the borderlines were identified for classifying individuals into five classes by using the K-means clustering method.

Two main groups including married women and married men were chosen. Due to the complexity of defining H-SES in single, widowed and divorced population, research on these groups remained for future studies.

A written letter of consent was obtained from the participants; for the sake of confidentiality, the questionnaires were anonymous. The analysis of the data was done by the SPSS software, version 25.

Considering the social and cultural differences between men and women, a method of calculation was devised by separating the sexes.

In addition to the state insurance system, people in Iran can be insured by private companies through paying a premium. Private insurance can also be used for cases where governmental insurers do not cover the losses. In this research, the word "complementary insurance" has been used for this issue.

3. Results

Married Females

Three hundred and ninety-six married women, 20-60 years of age, from the entire city of Tehran, were studied. The average age of the individuals was 40.4, with a standard deviation of 10.1. The average number of their children was 1.2, with a standard deviation of 0.1. Ninety-three percent had at least a high school diploma, while 51 percent possessed a bachelor's degree at the minimum. Only about 2 percent had primary school education or less. Ninety-two percent of the spouses in this group had at least a high school diploma, and 53 percent possessed at least a bachelor's degree. The criterion for the SES of this group had a normal distribution, and the mean $\pm$ SD of the obtained quantities was 43.8 ± 10.1 . The lowest quantity

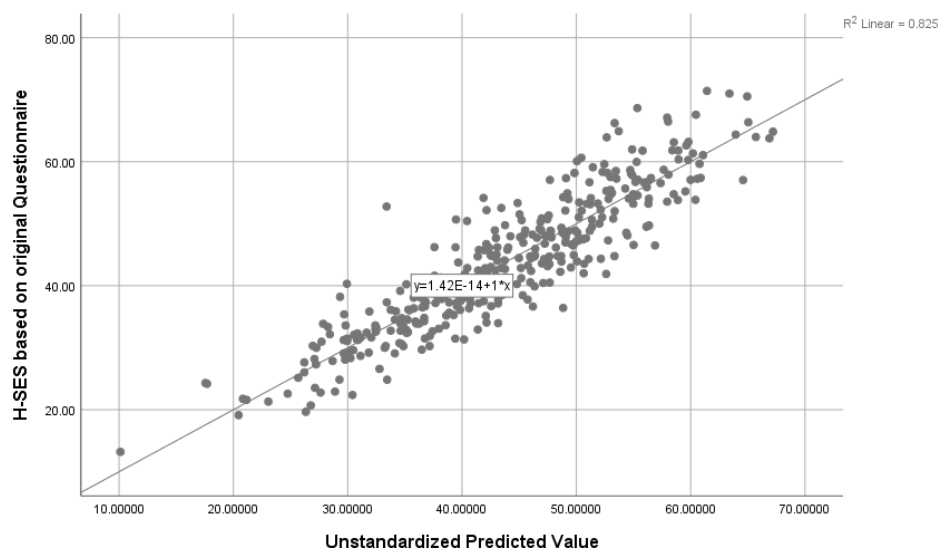
obtained was 10.1, and the highest was 67.2.

Since the distribution of the criterion for the H-SES obtained through the questionnaire for married women was normal, using the regression method would be appropriate. Therefore, the model for linear regression for the data was fitted and significance of the variables was tested. Table 1 shows the results of this model.

The significant variables of this model were the individual's level of education, the state of employment, access to amenities at home such as the Internet, having more than one television set at home, more than one refrigerator and freezer, a dishwasher, a microwave oven, a vacuum cleaner, complementary health insurance, dental health care, annual check-ups, gynecological care in the course of one year, and length and quality of their leisure time. Answers to the following questions were

Table 1. Results of the fitted linear regression model in the married women group

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
(Constant)		6.28	2.961		2.120	.035
X ₁	level of education	.063	.022	.097	2.921	.004
X ₂	Education of husband	.041	.018	.070	2.301	.022
X ₃	state of employment	.017	.006	.073	2.680	.008
access to amenities at home	X ₄ having access to the Internet	.044	.008	.141	5.641	.000
	X ₅ having more than one television set at home	.037	.007	.142	5.547	.000
	X ₆ more than one refrigerator and freezer	.024	.008	.072	2.895	.004
	X ₇ having access to dishwasher	.049	.006	.221	8.205	.000
	X ₈ having access to microwave oven	.024	.007	.092	3.682	.000
	X ₉ Having access to vacuum cleaner	.069	.029	.056	2.408	.017
	X ₁₀ complementary health insurance	.031	.005	.138	5.607	.000
	X ₁₁ dental health care and annual check-ups	.051	.006	.228	8.625	.000
Health Care	X ₁₂ gynecological care in the course of one year	.032	.006	.137	5.438	.000
	X ₁₃ Participation in arts and sports classes	.031	.006	.123	4.957	.000
	X ₁₄ spending time at home watching television	.019	.006	.082	3.387	.001
Leisure Time	X ₁₅ visiting friends and relatives	.025	.006	.105	4.299	.000
	X ₁₆ traveling outside the city	.034	.007	.121	4.578	.000
	X ₁₇ spending time at home reading a book	.031	.006	.119	4.942	.000
	X ₁₈ walking in the park	.032	.005	.139	5.933	.000
	X ₁₉ spending time in virtual reality (cyberspace)	.029	.006	.129	5.050	.000



Graph 1. Graph of observed quantities versus non-standard predicted quantities among the married women group

found to be significant as well; they included participation in arts and sports classes, spending time at home watching television, visiting friends and relatives, traveling outside the city, spending time at home reading a book, walking in the park, and spending time in virtual reality (cyberspace). (Table 1)

As a result of the model, the amount of the adjusted r squared coefficient of determination was (82%) and the table of the observed quantities versus the expected quantities showed the appropriateness of this model. (Graph 1).

Upon becoming certain of the appropriateness of the selected model, for determining the various socio-economic classes (five classes), the cluster method of K-means was used in such a way that the criterion obtained via the model was divided into five classes.

In brief, the method of calculating the criterion resulting from the model is as follows: By using the number value of each of the choices (which is presented in the appendix), the index can be calculated. For example, for a Master degree female with Ph.D. degree husband value 5.7 will be added to 4.1. In this manner, up to the end, quantities relating to each choice and the constant value of 6.28 would be added and, ultimately, the H-SES indicator resulting from the model would be calculated.

Married Males

Two hundred and eight married men participated in the study. They ranged in age from 20 to 60 years, with a *mean* $\pm$ *SD* age of 42.4 ± 9.8 . The *mean* $\pm$ *SD*

number of their children was 1.2 ± 0.4 , and about 2 percent had primary school education or less. Ninety-four percent of the men possessed a high school diploma, while 51 percent had at least a bachelor's degree. Ninety-eight percent of the spouses of this group possessed at least a high school diploma, while 45 percent had at least a bachelor's degree. The H-SES index of this group had a normal distribution, with an average of 41.9 ± 11.3 , with the minimum quantity of 15, and maximum of 74.

Considering the normal distribution of the H-SES indicator in this group, the use of the linear regression method is appropriate. Therefore, linear regression method was fitted to the data and significant predictors were specified. Table 2 shows the results of this model.

The chosen variables are: The level of education, the employment situation, the employment situation of the spouse, having access to the Internet at home, having complementary health insurance, having more than one television set, more than one refrigerator or freezer, a washing machine, a dishwasher, and a microwave oven at home, dental care and annual check-ups, and with respect to the way in which leisure time is spent during the week:

Participation in arts and sports classes, visiting friends and relatives, traveling outside the city, spending time at home reading a book, and spending time in virtual reality (cyberspace) were among the determining variables of the H-SES class of married men.

The method of calculating the criterion resulting from

Table 2. The results of the linear regression model in the married men group

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	9.43	3.113		3.030	.003
X_1	level of education	.075	.022	.131	3.440	.001
X_2	state of employment	.051	.025	.071	2.064	.040
X_3	state of employment of wife	.026	.009	.102	2.910	.004
X_4	having access to the Internet	.043	.013	.130	3.414	.001
X_5	having more than one television set at home	.055	.012	.201	4.692	.000
X_6	more than one refrigerator and freezer	.044	.014	.130	3.181	.002
X_7	Having access to washing machine	.048	.017	.098	2.853	.005
X_8	having access to dishwasher	.062	.009	.277	7.148	.000
X_9	having access to microwave oven	.030	.009	.125	3.243	.001
X_{10}	complementary health insurance	.038	.008	.167	4.610	.000
X_{11}	dental health care and annual check-ups	.040	.008	.181	4.786	.000
X_{12}	Participation in arts and sports classes	.044	.014	.111	3.183	.002
X_{13}	visiting friends and relatives	.018	.008	.081	2.325	.021
X_{14}	traveling outside the city	.023	.010	.079	2.275	.024
X_{15}	spending time at home reading a book	.043	.010	.149	4.140	.000
X_{16}	spending time in virtual reality (cyberspace)	.043	.008	.194	5.424	.000

Table 3. The classification of the H-SES indicator by using the suggested boundary lines in the married men and women group

H-SES class	H-SES index	
	Female	Male
V	<25	<30
IV	25-35.8	30-37
III	35.9-44.5	37-44.5
II	44.6-54	44.5-54
I	>54	>54

the model for male group is the same as described for females except for the constant value which should be added 9.43 for men.

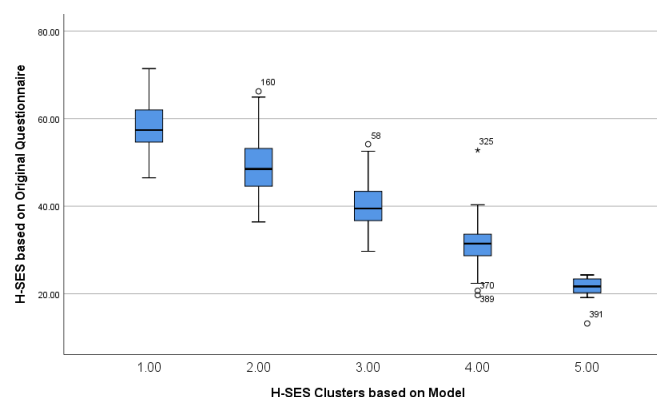
The method of calculation for obtaining the socio-economic class of married men and women will be according to Table 3.

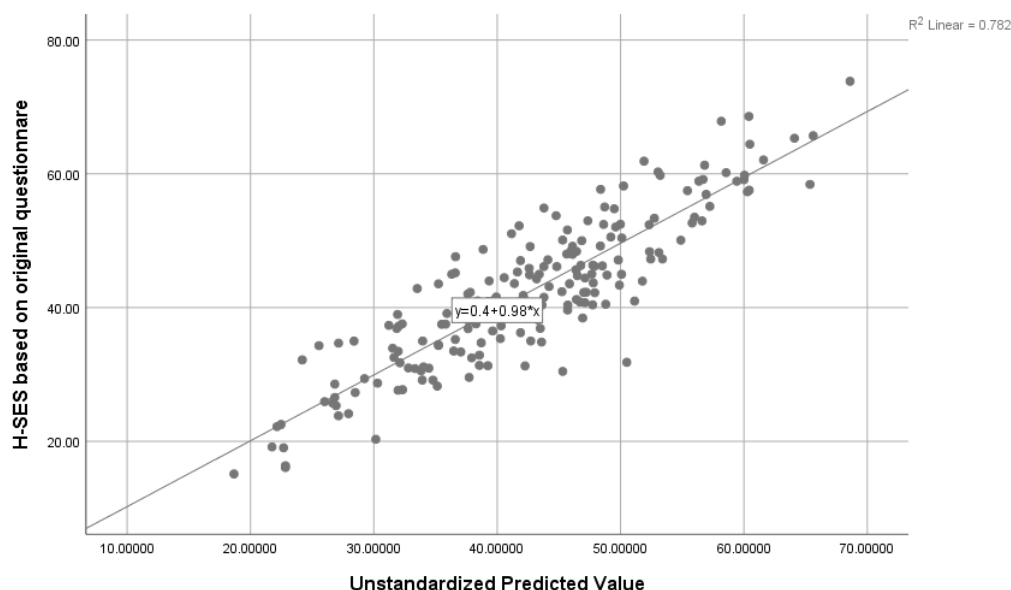
Table 4 shows the frequency obtained for each of the classes among women. As it can be seen, 17 percent of the participants belong to Class 1, and 2 percent belong to Class 5. The majority of the people (32 percent) belong to Class 2.

Graph 2 shows the H-SES indicator among women based on five classes versus obtained H-SES through

Table 4. Frequency of socio-economic classes in the married women group

	Frequency	Percent
I	61	17
II	115	32
III	104	29
IV	74	20
V	8	2
Total	362	100

**Graph 2.** H-SES indicator based on five classes versus obtained H-SES through the main questionnaire in women's group



Graph 3. Observed quantities as compared to the non-standard expected quantities in the married men group

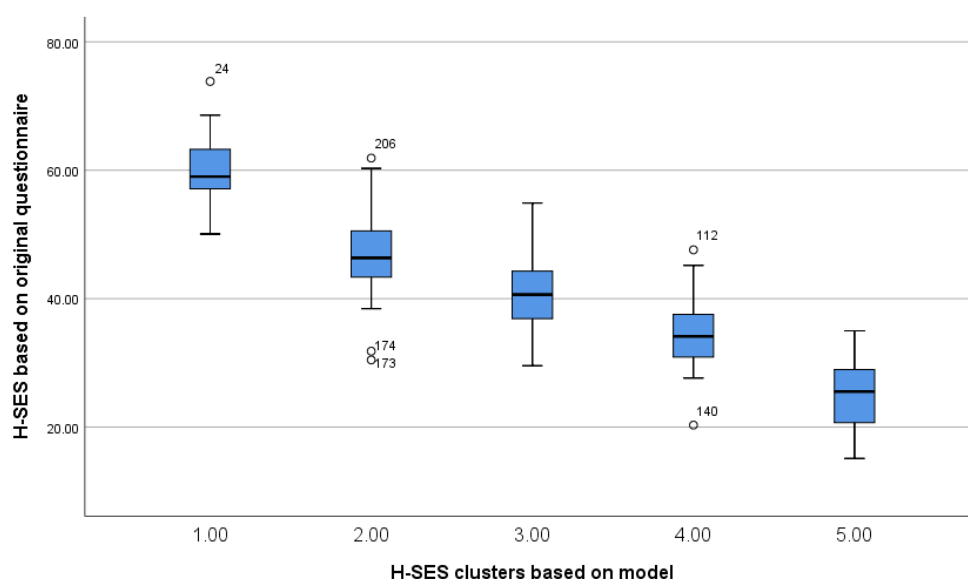
the main questionnaire. As can be observed, the individuals' classification through the model has been done with a good approximation, which shows the appropriateness of the model.

AS a result of the model in the married men group, the amount of the adjusted r squared coefficient of determination was (82%) and the table of the observed quantities versus the expected quantities showed the appropriateness of this model. (Graph 3)

Graph 4 shows the H-SES indicator based on five

classes versus obtained H-SES through the main questionnaire in men's group. As can be seen from the shape of the graph, the people's classification via the model has been done with a good approximation, which shows that the model is appropriate.

Table 5 shows the frequency obtained for each of the classes. As it can be seen, 17 percent of the participants belong to Class 1, and 2 percent belong to Class 5. The majority of the people (32 percent) belong to Class 2.



Graph 4. H-SES indicator based on five classes versus obtained H-SES through the main questionnaire in men's group

Table 5. Frequency of socio-economic classes in the married women group

		Frequency	Percent
Valid	I	61	17
	II	115	32
	III	104	29
	IV	74	20
	V	8	2
Total		362	100

Table 6 shows the number of people in each of the obtained classes in the married men group. As can be observed, 10.3% of participants belong to Class 5 and 12.4% belong to Class 1. The majority of the people (31.4%) belong to Class 2.

Table 6. Frequency of people in the H-SES class in the married men group

		Frequency	Percent
Valid	I	24	12.4
	II	61	31.4
	III	53	27.3
	IV	36	18.6
	V	20	10.3
Total		194	100.0

4. Discussion

Considering the speed at which conditions change in gaining access to amenities, the use of traditional methods in determining the indicator would certainly not have been effective. A precise determination of the H-SES class is contingent upon updating the data and taking into consideration new cultural, social, and health factors in determining the indicator. In this research, an attempt was made to examine the role of factors such as having access to the Internet at home, the use of complementary health insurance, or spending time in virtual reality (cyberspace) as the determining factor of the indicator. In the study of Garmarudi and Moradi (2010), a tool was designed for measuring the H-SES classes of families residing in Tehran [18]. On that basis, education of the head of the family and his spouse, their home's infrastructure, and owning a car and computer were found as significant predictors of SES index. Unlike our study, it was not health-oriented, i.e., there were no questions about health care and health behavior. Moreover, border line was introduced for classifying the families not individuals.

Suggestions for determining the socio-economic classes, by using data of the city of Tehran, for married women and married men have been offered, and considering the existence of similarities, it can probably be generalized to residents of large cities.

However, this research is not appropriate for determining the indicator in small towns and rural areas.

By considering various other factors in determining the socio-economic classes of single, widowed and divorced individuals, research in this field will have to be postponed to future studies.

5. Conclusion

In obtaining the H-SES classes of the married women and men groups, it was demonstrated that the variables relating to education, employment, health care, and the way individuals spent their leisure time play the greatest roles in measuring their H-SES. An adjusted r squared coefficient of determination above 82% showed that the models were appropriate. Based on the cluster method, borderlines for determining the five H-SES classes, separated by sex, were presented.

Ethical Considerations

Compliance with ethical guidelines

This study was undertaken by ethics number 35-96/2/31 from Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran.

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Author's contributions

Nezhat Shakeri suggested the topic of the article. Data analysis and article writing and submission were done by her. Roya Sehat prepared the questionnaire. Mustafa Faridzadeh performed the data analysis.

Conflict of interest

The authors have declared no conflict of interest.

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Appendix- Computation of H-SES Classes Step-by-Step

In order to calculate socio-economic index, value of choices should be extracted from tables below divided in female and male groups and after calculating the sum of the result, socio-economic classes would be calculated using Table 3. Value of choices:

1- Level of Education*

	Female		Male
	Self education	Husband's education	
Illiterate	0	0	0
Only reading and writing	0.6	0.4	0.7
Primary School	1.2	0.75	1.4
Junior high school	1.7	1.1	2
High School	2.3	1.5	2.7
Diploma	2.9	1.9	3.4
2 years Upper diploma	3.4	2.2	4.1
BA or BSc.	4	2.6	4.8
MA or MSc student	4.6	3	5.4
Ph.D. student	5.2	3.4	6.1
MA or MSc	5.7	3.7	6.8
Ph.D. or above	6.3	4.1	7.5

*For calculating H-SES index for women's group, it is necessary to consider the choice of value of woman's education along with her husband's education. For calculating H-SES index for men's groups, only the value of choice of male's education is calculated.

2- State of employment**

	female	Male's employment	male Wife's employment
Unemployed	0	0	0
Student	0.6	1.7	0.9
Retired or having income without employing	1.1	3.4	1.7
Employee	1.7	5.1	2.6

**The value of choices for state of employment in men's group includes employment status of the person and his wife's employment status. For women's group, only the value of choice of individual's employment status is calculated.

Questions***	Female	male
		NO=0
3- having access to the Internet	4.4	4.3
4- having more than one television set at home	3.7	5.5
5- more than one refrigerator and freezer	2.4	4.4
6- Having access to washing machine	0	4.8
7- having access to dishwasher	4.9	6.2
8- having access to microwave oven	2.4	3
9- Having access to vacuum cleaner	6.9	0
10- complementary health insurance	3.1	3.8
11- dental health care and annual check-ups	5.1	4
12- gynecological care in the course of one year	3.2	0
13- Participation in arts and sports classes	3.1	4.4
14- spending time at home watching television	1.9	0
15- visiting friends and relatives	2.5	1.8
16- traveling outside the city	3.4	2.3
17- spending time at home reading a book	3.1	4.3
18- walking in the park	3.2	0
19- spending time in virtual reality (cyberspace)	2.9	4.3
Constant	6.28	9.43
Total		

***For questions 3 to 19, if the answer is negative, the value of the question is considered to be zero.

After calculating the sum of the value of all the choices as H-SES, H-SES classes will be obtained by using Table 3.