Original Article

Socioeconomic status and catastrophic health expenditure evaluation in IR Iran: A comparative study in 2004 and 2011

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Abstact

Background: Health equity is a main principle of all healthcare systems in the world. Family Physician (FP) program, as a health sector reform (HSR) in Iran, was executed to reduce households' health care cost and to achieve health equity in 2004. Meanwhile, catastrophic health expenditure is known as an accepted indicator in HSR evaluation. In this context, after determining and comparing socioeconomic status (SES) among different periods, we made an attempt to evaluate households' health financial protection in different quintiles after implementation of FP program.

Methods: The current cross-sectional study was based on the data obtained from Household Income and Expenditure Survey in 2004 and 2011. The health expenditures, catastrophic health expenditure (CHE), and SES were determined by this data during these years. Descriptive analyses and comparisons using Chi-squared test were carried out via SPSS, version 20.

Results: A total of 1716 households were included in the survey during 2004 and 2011. The highest proportion of households was related to quintiles very poor and poor with respect to each year. Moreover, it was observed that SES in 2011 had the worse situation compared to that in 2004; this situation was worse in urban areas. In the present study, CHE is related to poorer quintiles, and in rural areas no household was faced with CHE in 2011.

Conclusions: Implementation of FP program in rural areas with more primary care has prevented hospitalization. This was considerable for poorer quintiles and has led to financial protection for rural households.

Keywords: Health Care costs; Health Equity; Primary Health Care; Social Class

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Introduction

Nowadays the world has been encountered to dramatic increase in health care expenditures (1, 2). Out-of-pocket (OOP) payment by households are the main source of

health care financing in low income countries (3, 4). Therefore, 70 percent of health financing in low-income countries and 14.9 percent of those in high-income countries is related to OOP payments (5, 6).

access to health services can cause catastrophic expenditures for households so, in health sector reform the protecting of people from catastrophic payments is a main objective (7, 8).

Making CHE change according to households socioeconomic status (SES) and it is not always match with expensive health cares (7, 9). SES definition includes different access to appropriate resources (10). According to literature review determinants of SES are education, income, occupation, family size and home status (11-14). Each factor represents a particular aspect of social stratification, which may be linked to the inequity health outcome (10, 12). Obviously, most of the SES determinants correlate to each other (10, 13).

One of the main goal of family physician (FP) program as a health sector reform (HSR) in Iran in 2004 was reduction on direct costs of households for health care and getting more appropriate services (15). Also, in fourth 5-year development program of Iran was emphasized to decrease CHE from 3% to 1% and health insurance coverage was implemented in the referral system (16-18). Our previous article in this study indicated that CHE was declined in rural areas of Charmahal and Bakhtyari (C&B) province after execution of FP program (19).

However, health equity is a main principle of all healthcare systems in the world (20, 21). If resources allocation is according to patients needs and health services payment is regarding to capacity to pay then occur health equity (22). Ensuring financial protection of poorer household is a paramount goal for health systems across the world (23).

Therefore, in this context after determining and comparing SES in different years we intend to evaluate household's health financial protection in different quintiles after implementation of FP program.

Methods

Study Design

We implemented this retrospective cross sectional study in a deprived province in the center of Iran named Charmahal and Bakhtiary (C&B) that has population of 943764. This study data obtained from House-hold Income and Expenditure Survey (HIES) in 2004 and 2011, before and after execution of FP program available in the statistical center of Iran (SCI). These data are based on national health account in whole of the country, so we expect each scientific analysis based on these data could be shown the reality of society. The unit sample of HIES is a household and gathering information of HIES is according to a personal interview with the household heads and filling the detailed questionnaire throughout the year. In general the questionnaire includes four parts: The social properties of family members, home status and living facilities and major appliances, food and non-food costs, and household incomes. In non-food cost section all expenditures of outpatient and inpatient services and premium of families are recorded. Outpatient expenditures consist out of pocket expenditures families paid for physicians' visit, para-clinic services, and drugs. The sampling method was based on multistage random sampling with geographical stratification (rural and urban) and clustering .The sample size for measuring SES and calculating CHE included 715 households of rural and urban areas in 2004 and 1001 households of rural and urban areas in 2011.

Measuring of catastrophic expenditure

In order to calculate CHE we applied to questionnaires data in parts of food and non-food expenditures of the household and household incomes.

Based on WHO definition, households with CHE were defined as those with health

expenditures more than 40% of household's capacity to pay (CTP) (8, 14). By using Xu k model CHE was calculated based on subsistence expenditures and CTP. Household CTP means effective income minus subsistence expenditures of the household.

Because some households had announced their food expenditures less than their subsistence expenditures, we calculated ability to pay of the household considering the effective income minus food expenditures. The effective income was calculated based on the total consumption expenditures of a household in a certain period of time. To calculate the subsistence expenditures of household, food poverty line (FPL) were used, i.e. part of the total expenditures of the household spent for food. Per capita average of equivalent food expenditures of those households, which are placed on the 45 to 55 percentile comparing to total expenditures of the household, was considered as the poverty line.

Subsistence expenditures are calculated as follows:

The portion of food expenses of all house-hold's expenses Modified dimension of household for each household by equivalent size (Eqsize) of the families. The Eqsize of the households is equal to household size power 0.56.

Then Eqfood expenses of each household on its modified dimension are computed by ratio of food expenses to household Eqsize. In the final step the ratios of households' health expenditures to their CTP was calculated. Whenever this ratio is greater than 0.4, the household is faced with CHE (7, 24).

Determination of socioeconomic status (SES)

In this study we measured education, income, occupation, family size and home status as SES determinants (11-14). These indicators were weighted by a simple method in multi-objective decision making known as Stepwise Adoption of Weights (SAW) (24). Implementation of this method consists of weighting and scoring of each indicator, calculation of detailed individual scores and final score.

The results of these indicators weighting have been shown in table1. In this study we applied to another study in ranking and scoring of indicators. Determining social stratification was done by considering the experts' opinions and economic context of Iran.

Table **1- The average weight and the percentage of impact on SES**

No.	indicator	Weight	Impact on SES (%)
1	Income	4.5	30
2	Occupation	4	27
3	Education	3	20
4	Home status	2	13
5	Family size	1,5	10

Income

In our study income gained the highest weight for measuring SES from the other factors (table 1). In order to classify family's income we needed to have poverty line according to specific year and urban or rural. According to Raghfar study the mean of poverty line in the years of 2004 and 2011 in rural and urban area of C&B province are as table 2.

Each family income was compared with related poverty line and family income was ranked according to table 3. After that we multiplied this rank in impact of income on SES (30%).

Table 2-Amount of poverty line in rural and urban areas of C&B province according to year

		2004	2011
Poverty line	Rural area	158232 IRR (178 USD)	6272422 IRR (594 USD)
	Urban area	1956664 IRR (217 USD)	8979559 IRR (846 USD)

Table 3- Income classification based on city poverty line (C.P.L)

Groups	Monthly household income	Score
Extremely poor	Income ≤ 1/2 C.P.L.*	1
	1/2C.P.L.< Income ≥ C.P.L.	2
Poor	C.P.L.< Income ≤ 2C.P.L.	3
	2C.P.L.< Income ≤ 3C.P.L.	4
Moderate	3C.P.L.< Income ≤ 4 C.P.L.	5
	4C.P.L.< Income ≤ 5 C.P.L.	6
Wealthy	5 C.P.L.< Income	7

*City Poverty Line

Occupation

In occupation ranking, according to an occupational code of the household head name and group of occupation of each family according to table 4 was defined. After that we multiplied this rank in percentage of occupational impact on SES (27%).

Table 4- Ranking of family occupation

Occupation categories	Ranks	Scores
Large and moderate landowners, Top-level managers, Professionals	high	6
Lower managers, Semiprofessional, Vendors, artisans	Average	3
Low-wage industrial workers , officers, and retail sellers Services workers, Unemployed, pensioners	Low	1

Education

In this stratification we considered household head education. According to code of education, we defined category and score of education similar to table 5. Then we multiplied each score in impact of education on SES (20%).

Table 5- education classification

Level of education	Score
Under High School Diploma	1
High School Diploma- Bachelor of Science	4
Master of Sciences and above	7

1: Homeowner group= Home surface (HS) score* rent estimated score

Home status

This stratification consists 4 stages:

In the first stage households were separated into two groups; homeowners and tenants. In the second stage the homeowners were ranked based on the size and price of their homes. This stage was conducted in three steps. First, we classified the home surface into five groups; equal or less than 100 m^2 to larger than 400 m^2 and scored them from 1 to 5. Next, we classified the second score according to the estimation of location rent from 1 (lowest value) to 9 (highest value). For this estimation we had some missing in household's questionnaire. So we did missing analysis and regression according to some predictors such as income, place of residence, study year and job. Then we estimated the rent of their location. Finally, estimated rent according to table 6 was divided. For this dividing maximum, minimum and range of location rent were calculated for each year separately. Then the range was divided into 5 and according to table 6 was arranged for each year. In the third step the score of homeowners was determined by multiplying their scores in two previous steps. The homeowners were scored from 1 to 45 and

were ranked into quintile groups from 1 to 5. The results of stage 2 are presented in table 6.

The status of the tenants in the third stage was defined. The National Minimum Wage (NMW) was considered as references for classifying the tenants' status. According to circular of the ministry of labor and social affair NMW in 2004 and 2011 were 1066000 and 3303000 Iranian Rials (118 and 311US$ in respect). Then final ranking was made according to table 7. On the base of market price and the experts' opinions the tenants were classified into 5 groups. In the fourth stage, the situation of homeowners and tenants was ranked, scored and compared in a single model. Table 8 showed the final result of stage 4 in home status measurement. Then, this score is multiplied in the impact of home status in SES (13%).

Family size

Family size (FS) is defined from a summary of questions asking participants to give the number of spouses, parents, siblings, children or children-in-law, grandchildren, or other relatives living in their household. Then considering to the family size, we put them in 4 sub-groups (table 8). Finally, the score of each family multiplied in the impact of family size in SES (10%).

Finally with considering impact percentage of each item on SES and minimum and maximum score, we determined the highest and the lowest SES then by getting range and dividing into 5, the SES was devoted to five groups.

Table 6- The rank of homeowners based on price and surface size

Home Surface (HS)	Score	Rent estimated	Score	Homeowner group[1]	Score
HS $\geq$ 100 m^2	1	Lowest price	1	Homeowner 1	1-5
100 m^2< HS $\geq$ 200m^2	2	Low price	3	Homeowner 2	6-15
200 m^2< HS $\geq$ 300m^2	3	Medium price	5	Homeowner 3	16-29
300 m^2< HS $\geq$ 400m^2	4	High price	7	Homeowner 4	30-39
HS > 400 m^2	5	Highest price	9	Homeowner 5	40-45

Table 7-The rank of home status based on national minimum wage (NMW)

Home status	Ranking	Home status	Ranking
Rent < 1/3 NMW*	1	2 NMW $\leq$ Rent $\leq$5 NMW	6
1/3 NMW $\leq$ Rent < NMW	2	Homeowner 3	7
NMW $\leq$ Rent <2NMW	3	Rent >5 NMW	8
Homeowner1	4	Homeowner 4	9
Homeowner 2	5	Homeowner 5	10

*national minimum wage

Table 8- the scores of family size

Family size	Scores
FS ≤ 2	8
FS = 3	5
FS = 4	3
FS ≥ 5	1

Data analysis

After data entry, catastrophic health expenditure and socioeconomic stratification of households were calculated according to data of social characteristics of household members and household income exist in the questionnaire. Then, descriptive analysis, Univariate analysis, chi-square, independent t-test for comparisons among different quintiles in 2004 and 2011 was carried out with SPSS ver.20 and Excel. In the univariate analysis, the association between CHE, other financial health expenditures and different quintiles was assessed.

Result

In this study according to House-hold Income and Expenditure questionnaire we included 715 households in 2004 and 1001 households in 2011. Five were excluded because of insufficient data .The mean age of the household's head was 47.5 (SD=15. 6) and 51.1 (SD=15. 3) in 2004 and 2011 respectively. 8.9% and 12.8% of the household's head were female and 55.6% and 50.7% lived in rural areas in 2004 and 2011 respectively. Unemployed households head rate was 24% and 33.7% (p value =0.002) in urban areas and this rate was 21% and 29% in rural areas (p value=0.003) in 2004 and 2011 respectively. The family size with more than 5 was 49.8% and 27.8% (p value <0.001) in urban areas. This proportion for rural areas was 53.7% and 40.9% (p value <0.001) in 2004 and 2011 in respect.

According to figure 1 the most percentage of SES was related to quintile 2, 51.2% and 48.7% households in 2004 and 2011 respectively. The next level was related to quintile 1 with 33.9% and 42.4% in these years. Quintile 4 and 5 had very little proportion.

Figure 2 indicates that poorer SES position especially quintile 1 are in rural areas that means 24% of total SES in 2004 was related to poorest quintile in rural areas and this percent for urban households was 10%. Though, quintile 3,4 and 5 in urban areas was more than rural areas. Moreover, in urban areas in 2011 proportion of the poorest SES was increased significantly than 2004 from 10% to 18% (p value < 0.001), but proportion of quintile 3, 4 and 5 were declined. However, for rural households the proportion of quintile 2 and 3 was declined and this proportion for quintile 1 was nearly without change.

In chi-square analysis, in 2004, 20%, 70% and 10% households facing to catastrophic health expenditure was related quintile 1, 2 and 3 respectively. Also, in 2011 this percent for household with CHE was 25% and 75% in quintile 1 and 2. However, there was no significant relationship between different quintile in each year. The main result revealed significant difference between households facing CHE in 2004 and 2011.

Table 9 indicates the percentage of catastrophic expenditure, insurance coverage, inpatient service and outpatient service in each one of quintiles in 2004 and 2011. Insurance coverage had significant difference between different SES (p value < 0.001) in 2004 and 2011 in urban areas. Moreover, outpatient service had significant difference only in 2004 in rural areas (p value =0.03).

Moreover, in our analysis we indicated the mean of health expenditures in sections of total

health, inpatient and outpatient in each quintile according to rural and urban areas in 2004 and 2011(table 10). The mean of outpatient cost related to moderate quintile of rural areas in 2004 was the most. Among different quintiles the mean of inpatient cost in poor quintile was more than others. The mean of outpatient and inpatient costs were declined in 2011 for rural areas. Good quintile of urban areas expended more than others in outpatient costs in 2004.The mean of inpatient costs in poor quintile of urban areas was more than others in 2004. The mean of inpatient costs of urban areas were increased in all quintiles in 2011 to 2004 but the mean of outpatient costs were declined in all quintile in these two years.

Table 9– Some health coverage in different SES in rural and urban areas in 2004 and 2011

	SES	1	2	3	4	5	***P*** value
Rural	Catastrophic expenditure	1.2% 0	2.1% 0	3% 0	0% 0	-	0.8
2004 2011	Insurance coverage	44% 93.8%	42% 93.3%	66.7% 100%	100% 100%	-	0.04 0.6
	Inpatient service	1.8% 8.3%	5.8% 13.8%	6.1% 8.7%	0 0	-	0.2 0.2
	Outpatient Service	64.5% 71.5%	73.2% 73.3%	88% 87%	100% 66.7%	-	0.03 0.4
Urban	Catastrophic expenditure	0 0.5%	1.7% 1.2%	0 0%	0 0%	0	0.6 0.7
2004 2011	Insurance coverage	38% 72%	61% 88%	82% 98%	100% 100%	0 0%	<0.001
	Inpatient service	1.4% 14.3%	4.1% 11%	0 3.6%	11.1% 11%	0 0%	0.24 0.18
	Outpatient Service	66.2% 78.6%	72.7% 78%	73.8% 78.2%	55.6% 66.7%	0 0%	0.3 0.8

Table 10– the mean of health expenditures in different quintile according to rural and urban areas in 2004 and 2011

	Year		Very poor	Poor	Moderate	Good	Wealthy
RURAL	2004	Number	169	190	33	1	
		OOP mean $(SD)	115.6 (150.4)	235.7 (656.6)	422.8 (844)	283.3	
		Outpatient mean$(SD)	82.4 (108.2)	96 (163.3)	288.5 (841.3)	134	
		Inpatient mean$(SD)	10.2 (90.7)	106.6 (615.2)	46.7 (188.7)	0	
	2011	Number	242	240	23	3	
		OOP mean$(SD)	499 (429.3)	532.2 (517.7)	724.1 (446)	419.5 (96)	
		Outpatient mean$(SD)	37.6 (97.8)	51.4 (78)	59 (78)	5(4.7)	
		Inpatient mean$(SD)	60.7 (279.2)	118 (458)	5.5 (20.5)	0	
URBAN	2004	Number	71	172	61	9	1
		OOP mean$(SD)	645.6 (599)	484.6 (442)	581.4 (671)	460.6 (377)	401.3
		Outpatient mean$(SD)	88.4 (154)	113 (138)	174.8 (239)	229.7 (367)	0
		Inpatient mean$(SD)	2.1 (18.2)	109.3 (790)	0	20(60)	0
	2011	Number	182	247	55	9	
		OOP mean$(SD)	437 (813)	545.5 (977)	660 (356.4)	3371.5 (7717)	
		Outpatient mean$(SD)	76.4 (147.3)	80.7 (225.6)	64.3 (101.6)	70.2 (147.7)	0
		Inpatient mean$(SD)	172.2 (770)	152.7 (866)	11.8 (77)	2418 (7854)	

2004: 1US$=9000 Iranian Rial
2011: 1US$= 10610 Iranian Rial

Figure1- the percentage of SES in each quintile according to year

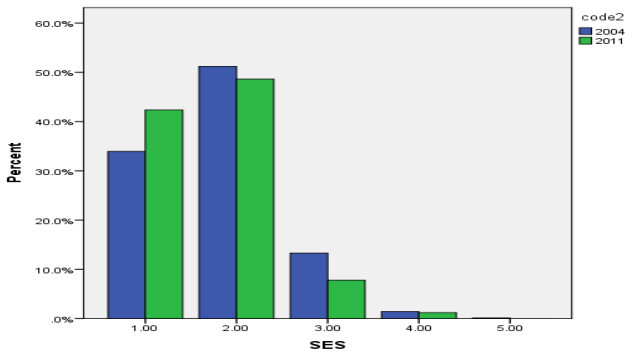
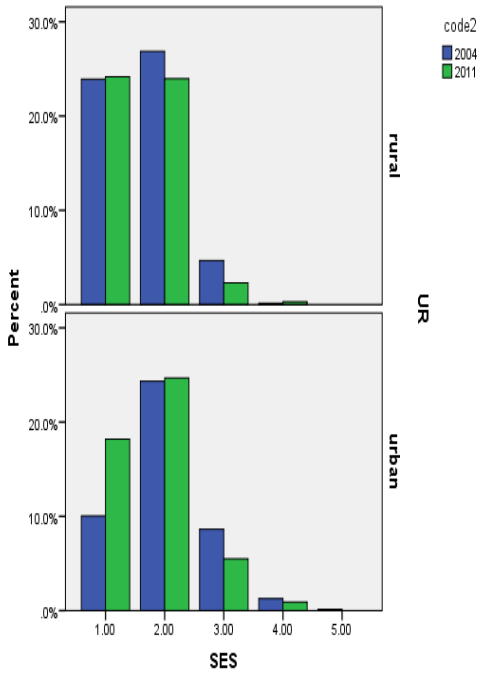


Figure2-Comparison of percentage SES in rural and urban areas according to each quintile and specific year



Discussion

In this study SES was determined according to a simple method in multi-objective decision making known as Stepwise Adoption of Weights (SAW) and determinants SES including: education, income, occupation, home status and family size in C&B in 2004 and 2011. The results indicate the most proportion of households is related to very poor and poor quintiles in respect in each year. Moreover we hospitalization is the main cause of households CHE (25-27).

In this study CHE is related to poorer quintiles, and in rural areas no household was faced to CHE in 2011. Despite this, in developing countries more rural households experience CHE (28). Probably, implementation of FP program in rural areas with more primary care has been prevented from hospitalization and observed SES in 2011 had worse position than 2004, of course this position in urban areas was more than rural areas. On the other hand, the most proportion of poorer SES was related to rural areas than urban areas.

We considered multiple dimensions of assessing SES. As without multiple measures, only a partial image would be captured (24). Since C&B is a deprived province in Iran so we could be expect that more households to be in poorer SES. Evaluation of demographic characteristic shows that unemployment rate among households heads have been raised significantly in 2011 than 2004. As occupation has direct relation to income and in our study income gained the highest weight for measuring SES compare to the other factors: therefore, the worse SES in 2011 compare to 2004 would be reasonable.

Moreover, the mean of inpatient expenditures has been raised in 2011 than 2004 in all quintiles especially in good and poorer SES of urban areas. This increase is not specific in rural areas. Also, the utilization rate of inpatient and outpatient services and insurance coverage has been raised in 2011 than 2004 in rural and urban areas. Likewise inpatient services rate has been raised in urban areas more than rural areas especially in poorer quintiles. On the other hand, some studies in Thailand, Kermanshah and Tehran, Iran represented that this result is considerable for poorer quintiles and cause of financial protection in rural households. Also the effectiveness of FP program in insurance coverage especially in poorer quintiles is prominent. Obviously some studies indicate direct and negative association between health insurance coverage and the proportion of facing CHE (28, 29).

In other article we indicated CHE decreased significantly in rural areas (19), however, this study specified that this reduction is related to poorer quantiles, and probably FP program has improved vertical equity in deprived areas.

Conclusion

Implementation of FP program in rural areas of a deprived province in Iran with majority poorer quintiles is probably the cause of financial protection. The role of more primary care and efficient insurance coverage especially in poorer quintiles is prominent.

Ethical consideration

All households' data are kept anonymously and would not be distributed. In this study we received ethical approval from Statistical Center of Iran to use the HEIS data only for research purposes.

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