

# Determinants of Catastrophic Health Expenditures: A Study in Hamedan, Iran

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## Abstract

**Background:** Catastrophic health expenditure (CHE) has been explained as a growth in spending for health care services that exceeds 40% of total household income. Therefore, devoting a large portion of household resources to health care services can greatly threaten to standards of living in the short and long term. The present study was an attempt to evaluate the financial contribution of Iranian households in health care services system in Hamadan Province in 2017.

**Methods:** This cross-sectional study reflected on spending for health care services. For this purpose, the data were extracted from the household expenditure statistics published in the database of the Statistical Center of Iran. Accordingly, among the common econometric models associated with the subject matter, the logit model was employed, and the data were then analyzed using the Stata 14 software.

**Results:** The study findings revealed that 8.9% of the total household costs had been allocated to health care services. The results also showed that 3.5% of the households faced catastrophic cost among all the studied households. Upon examining the factors, significant relationship was further observed between the probability of exposure to CHE and living in rural areas, income decile group, number of employees, and marital status in the households concerned.

**Conclusion:** It was concluded that poor distribution of health care services, unequal distribution of income and wealth among jobs, as well as socioeconomic conditions could influence CHE. Therefore, there is a need to plan and develop policies for better access to health care services.

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## Introduction

Health has been considered as one of the main preconditions for social welfare. In addition to healthy lifestyle, all people are required to promote and restore their health through sickness by employing health care services; in other words, they have to pay to use them.<sup>1</sup>

<sup>2</sup> In this respect, showing willingness to utilize such services and raising demands for them are assumed as two interconnected concepts.<sup>3</sup>

In accordance with the definitions released by the World Health Organization (WHO), spending for health care services is considered as catastrophic health expenditure (CHE) if it exceeds 40% of total household income. Catastrophic health expenditures (CHE) are of concern to policy makers and can prevent individuals accessing effective health care services.<sup>4</sup> The reliance on out-of-pocket expenditure to finance health services is a common feature in many low- and middle-income countries.<sup>5,6</sup> One of the roles of

health systems is to achieve equity in health care expenditures.<sup>7</sup> Devoting a large portion of household resources to health care services can thus make true threats to the standards of living in the short and long term, so that in the short run, households have to neglect current consumption of goods and services, and in the long run, there are consequences such as sales of property, saving depletion, and debt accumulation in households. In fact, spending for health care services is a significantly evident factor affecting the collapse of lower income decile groups below the national poverty line.<sup>8</sup> With regard to health problems in these groups, the probability of rising above the national poverty line in these households is usually rare. On the other hand, these expenses make the households living in higher income decile groups draw towards lower groups by one or more. Falling below the national poverty line due to such costs, and ultimately CHE, is thus among the permanent challenges all governments are grappling with.<sup>9</sup> Accordingly, out-of-pocket (OOP) spending for health care services and consequently the incidence of CHE are two important factors that should be continuously incorporated in the calculations related to planning and policy-making in health care services systems.<sup>10</sup> Therefore, the WHO has determined the provision of support against spending for health care services as one of the three goals of health care systems.<sup>11</sup>

From the economic perspective, the intention to use health care services in individuals heavily depends on health benefit costs arising from such services. In addition to people’s desire, paying for health care services is the outcome of interactions between demand and supply of health care services.<sup>12, 13</sup> Demand for such services also varies based on numerous factors that are sometimes linked. In general, individuals’ socioeconomic behaviors and characteristics include a whole range of factors shaping demands for health care services such as health status, level of income, and level of education among the most significant ones.<sup>14, 15</sup>

To eliminate extreme poverty and reform spending for health care services, examining socioeconomic factors shaping CHE can provide useful information

regarding insurance system performance, allocation of funds, and need for capital investment in different service sectors such as services for specific groups (such as the elderly, etc.) to do internal planning and develop policies. Therefore, this study aimed to evaluate the factors affecting CHE in Iranian households living in Hamadan Province in 2017.

**Methods**

The microdata recruited in this study were collected using the multistage random sampling technique based on geographic classifications in urban and rural areas. The unit employed for statistics in this study was households. The total number of the sample households in Hamadan Province, Iran, in 2017, was 997, of which 500 cases were residing in urban areas and 497 households were living in rural ones.

To analyze fairness in financial contribution, we employed the CHE index. To explain this issue, we utilized the OOPCTP<sub>h</sub> index, defined as the ratio of spending for health care services paid out-of-pocket (OOP) to the capacity to pay (CTP) for each household. Accordingly, CTP represented the total excess income divided by the minimum living costs.<sup>8</sup> An increase in this index could thus denote that the household was forced to spend too much higher than CTP to maintain an adequate level of health and treatment in its members. For this purpose, a critical level is often defined for this index, and exceeding this limit is called CHE. According to prior research and experience, international authorities have thus far established this borderline by 40% based on econometric analyses.<sup>16</sup> Table 1 show the variables used in the model. Dependent variable was scored 1 (for households with catastrophic expenditures) or 0 (for other households). This dependent variable is categorized as . This study did not have human participants. Ethical approval was obtained from the Hamadan University of Medical Sciences, health research ethics committee (IR.UMSHA.1396.892.REC).

**Results**

Table 2 shows the demographic characteristics of the

**Table 1:** The variables used in the study

Variable	Explain
Independent variables:	
Number of Employee in household	The number of employed persons in household
Place of residence	Score 1 for rural households and score 0 for urban households
Sex of household’s head	
Education attainment of household’s head	Score 0 for male and score 1 for Female
Health insurance coverage	Score 1 for illiterate or low literacy householder and score 0 for others
Household Married	
Rank	1 for insured household and score 0 for uninsured household
Household size	1 score for married and score 0 for single ones
Age of household’s head	
Depended variable:	
Catastrophic	Number of household expenditure deciles catastrophic health expenditures=1& the other=0

**Table 2:** Demographic characteristics of households in Hamedan Province in terms of the study variables in 2017

Variable	Number	%
	Undergraduate	
Place of residence		
Rural	497	49.9
Urban	500	50.1
Sex of household's head		
Female	99	10
Male	898	90
Age of household's head		
20-40 years	240	24
40-60 years	461	46
61 years and above	296	30
Education attainment of household's head		
Literate	716	72
Illiterate	281	28
Marital status		
Married	890	89
Single	107	11
Employee status		
Employee	639	64
Non-employee	358	36
Number of Employee in household		
2 and Under 2	661	66
Over 2	64	6
None	272	27
Rank		
(1-7)	693	70
(8-10)	104	30
Household with a member over 60 years		
1	185	21
2 and Over	68	2
None	744	77
Household with a member under 5 years		
1 child	209	18
2 child and Over	24	7
none	734	75
Catastrophic		
Upper 40% of total household expenditures	35	3.5
Under 40% of total household expenditures	962	96.5

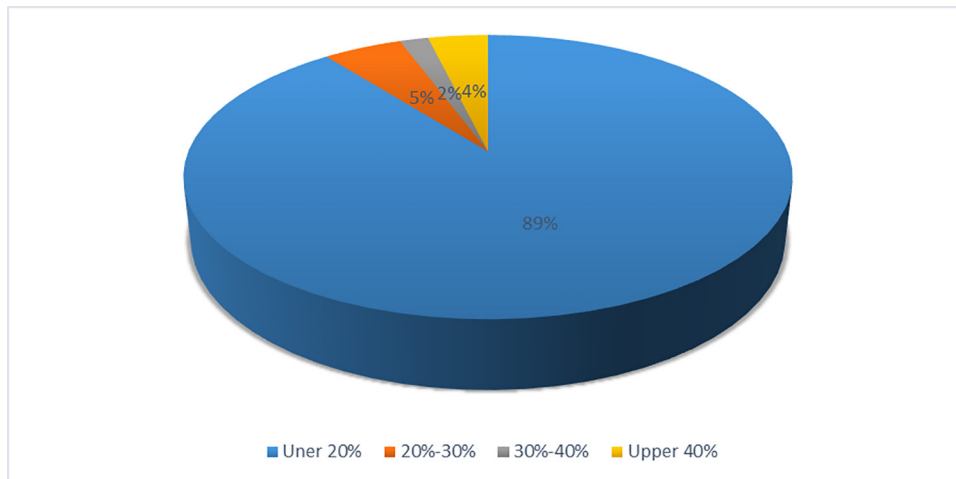
households in Hamedan Province in terms of the study variables.

According to Table 1, in terms of age, most of these households were placed in the age group of 40-60 years old. As to marital status, 89% of the households were married, and 11% of the cases were single (namely, due to deceased spouse, divorced spouse, or never married). Moreover, about 64% of the heads of the households were employed, and 36% of the cases were unemployed (i.e., looking for a job, earning money but unemployed, students, homemakers, and others). As to the level of education, most of the households were literate; 55% of the heads of the households were holding high school diplomas, 8% of them had bachelor's degrees, and 2% of these individuals were holding postgraduate degrees. About 66% of the households also had one or two employed members; mostly two people were working. The majority of the households (77%) had no children under the age of five, and the rest had a maximum of two children in this age range. On the other hand, 75% of the households had no adult members over 60 years of age, and about 25% of the cases had a maximum of two members aged over 60.

In addition, according to the collected data, the place of living in 51% of the households was less than 100 square meters, and 100-200 and more than 200 square meters in 46% and 3% of them, respectively. They were further divided into 10 decile groups based on total household income.

One of the most common methods for calculating CHE, as recommended by the WHO, is that spending for health care services is assumed catastrophic and even a burden if households have to devote at least 40% of their CTP for this purpose. In this regard, approximately 3.5% of the households who resided in Hamadan Province had suffered from CHE in 2017. The following Figure and Table show the distribution of the households exposed to CHE in different income decile groups.

The most frequent households (25.7 %) who suffered from CHE were observed in the tenth income decile group (i.e., the highest one). The following Figure illustrates the ratio of the population in Hamadan Province in terms of spending for health care services within household budget after deducting the cost of living in four groups (that is, >20%, 20-30%, 30-40%, and <40%) (Figure 1).



**Figure 1:** Ratio of population in Hamadan Province in terms of spending for health care services within household expenditures

**Table 3:** Determinants of catastrophic costs using multivariable logistic regression

Variable	Effect	P	Odds Ratio
Number of Employee in household	Negative	0.031	0.35
Place of residence	Negative	0.001	0.10
Sex of household's head	Positive	0.362	2.05
Education of household's head	Negative	0.149	2.03
Married household	Negative	0.049	0.27
Rank	Positive	0.001	1.47
Household size	Negative	0.236	0.58
Household with a member over 60 years	Positive	0.878	1.07
Household with a member under 5 years	Positive	0.759	1.31
Age of household's head	Positive	0.660	1.01

Accordingly, 3.5% of the households in this province were facing catastrophic health expenditures, and nearly 10% of them were paying more than 20% of their capacity to pay for such expenses.

*Logit Model Estimation Results*

Table 3 presents the results of the multivariable logistic regression on catastrophic expenditures. When adjusted, four variables remained statistically significant.

**Discussion**

The present study was an attempt to evaluate CHE in Iranian households who resided in Hamadan Province, in 2017. We found that the prevalence of CHE for the whole province was 3.5 percent, which is higher than the goal of the forth Iran Economic, Social, and Cultural Development Plan aiming to reduce the proportion of households facing CHE to less than 1%.<sup>17</sup> This large gap can be due to the medical costs. Another reason is out-of-pocket payments, combined with the lack of adequate health insurance coverage. The rate was less than the results (3.91 %) obtained from a systematic review and meta-analysis carried out on the pooled data of 1995 to 2015 in Iran.<sup>18</sup> The results demonstrated that, among the given variables, CHE was significantly correlated with marital status, place of living (viz. urban or rural

areas), number of employees, and income decile group like Ravangard's study.<sup>6</sup> In this way, there was a positive relationship between CHE and household income decile group but a negative association between CHE and marital status, place of living, and number of employees in a household. According to these results, households placed in higher income decile groups had single heads, were living in rural areas, had fewer employees, and were even more likely to encounter CHE. This study revealed that the prevalence of CHE among households in rural areas in Hamadan was higher than those in urban areas. One possible explanation could be the unfair distribution of healthcare resources in urban and rural areas.<sup>19</sup> Previous studies have also showed that households in rural areas reveal more prevalence of CHE.<sup>20-22</sup> To find the factors affecting CHE, we used logit model as an econometric analysis method, via calculating the proportion of spending for health care services among households in total costs. The study results revealed that 9.8% of the total costs among households who resided in Hamadan Province in 2017 had been allocated to health care services. In the households living in urban and rural areas, this proportion was by 9.8% and 1.8%, respectively. These findings are consistent with those of previous studies.<sup>23-26</sup> A major part of the high rate is related to the high annual inflation rate in Iran's economy.<sup>18</sup> According to the logistic regression results, sex, and age of household's head does not appear to be a significant

factor; this is in the same line with Diana's study.<sup>27</sup> These results are similar to Hatam et al.<sup>28</sup> and Kavosi et al.'s research<sup>9,24</sup> which did not show any statistically significant association between having children under 5 years old and facing CHEs. Upon examining the factors affecting CHE based on the specific criteria, it was reported that more than 40% of the total costs had been devoted to health care services (after deducting the costs of living). Overall, the factors affecting a growth in the probability of household exposure to such expenses were living in rural areas, income decile group, number of employees, and marital status. Based on the results, these factors could be effective in the incidence of CHE due to poor distribution of health care services, unequal distribution of income and wealth among jobs, as well as socioeconomic conditions.

### Limitations

This study was a cross-sectional one, so this method does not give actual causative conclusions.

### Conclusion

Given the main goals of the Development Plan in Iran for reducing the percentage of households exposed to CHE to 1%, there is need to plan and develop policies for better access to health care services through laying economic and cultural groundwork in order to fairly distribute such services in urban and rural areas as well as income and wealth among different groups, so that we can bridge the gap between lower income decile groups and higher ones.

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