

# Catastrophic Health Expenditure Among Iranian Rural and Urban Households, 2013 - 2014

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**Background:** During the last two decades, the trend of out-of-pocket payments (OOP) for health services by Iranian households has been a matter of concern and it has exposed a significant proportion of them to catastrophic and impoverishing health expenditures.

**Objectives:** The current study aimed to investigate three objectives: First, the mean of out-of-pocket payments among Iranian households for health services; second, the headcount and overshoot measures of catastrophic health expenditure; and finally the level of inequality in its distribution.

**Materials and Methods:** This descriptive study on Iranian rural and urban households was conducted from April to June 2015. The sample sizes were 19437 rural and 18888 urban households that Iranian Statistical Centre (ISC) selected them through a three-step randomized clustered sampling. The headcount and overshoot measures for catastrophic health expenditure were calculated. Also, the concentration index was calculated in order to investigate the inequality in distribution of the mentioned measures.

**Results:** The catastrophic health expenditure headcount ratio varied from 0.5% to 14.3% and from 0.48% to 13.27% for rural and urban households, respectively. Also, the overshoot of catastrophic health expenditure varied from 9.62% to 18.72% and from 8.8% to 17.74% for rural and urban households, respectively.

**Conclusions:** Considering Iran's economic condition during the last five years, the catastrophic health expenditure headcount ratio was more than 2% in Iran.

**Keywords:** Financial Risk Protection; Out-of-Pocket Expenditure; Catastrophic Health Expenditures; Concentration Index

## 1. Background

The accessibility and utilization of health services requires resources and facilities which first, are produced in sufficient levels and second, are distributed among sections of the society in an equitable way (1, 2). Today, the idea that health is a merit good that everyone should have access to it, is approved by all scholars and policy makers; therefore, the only difference exists just about the method of sufficient and equitable provision (3).

During the past three decades, equity in health, in general, and in health financing, in particular, have been discussed by experts and also in this regard solutions were introduced (4).

In a general sense, equity in health refers to benefiting from services based on needs and paying based on the ability to pay (5). Evidence indicates that the ability to pay is a variable with desired characteristics to determine the level of inequality in population's contribution to finance healthcare services. However, besides this variable, other variables such as income, total consumption,

nonfood expenditure and household asset index are frequently used (6-10). Regardless of what socio-economic status represented the ability to pay, the headcount and overshoot measures of catastrophic health expenditure (CHE) are very important.

The financial hardship is recognized as one of the significant barriers to health services utilization, therefore, the universal health coverage will not be achieved. There were no explicit and determined plans and actions tackling the healthcare financing equity in Iran during the three recent decades. But in policy levels achieving the universal health coverage through protecting Iranian households against financial hardship was emphasized (11, 12).

Health and its subordinates are always emphasized in plans and policies in the country. For instance, in two consecutive social, economic and cultural development plans of the country titled "Fourth and Fifth Plans Act", the government was required to decrease the level of

out-of-pocket payments by 30% and also decrease the headcount ratio of catastrophic health expenditure (13). Current year is the last year of the fifth development plan; however, not only the mentioned objectives are not achieved, but also, it seems that the rates have increased.

Despite emphasizing on the mentioned policies and national plans, the out-of-pocket payments were a major share of the Iranian healthcare expenditures. The out-of-pocket payments refer to all expenditures paid by households to utilize the healthcare services in place of receiving the services, directly. The out-of-pocket payments may lead to catastrophic health expenditure.

If the household payments on health services exceed the determined threshold, it is exposed to catastrophic health expenditure. The thresholds in catastrophic health expenditure are different regarding the considered socio-economic variables. The World Health Organization (WHO) researchers defined the households' payments on health equal or greater than 0.4 as the catastrophic health expenditure, while other researchers use the 10%, 20% and 30% of total consumption or nonfood expenditures as catastrophic health expenditure (1, 6-8).

Two previous studies showed the catastrophic health expenditure rates as 2.8% and 2.1% for Iranian households in 2008 and 2010 (14, 15), respectively. At the regional level two studies conducted in Kermanshah and Shiraz indicated that about 22.2% and 14.2% of households experienced catastrophic health expenditure in 2008 and 2014, respectively (16, 17).

According to the recent statistics, the out-of-pocket payment on health as a percentage of total health expenditure was about 52.5% in 2008 (18).

According to the authors best knowledge, the present study is the first to calculate the catastrophic overshoot in addition to headcount ratio and it also calculates the status of the inequality rate in the distribution of mentioned ratios based on concentration index in Iranian households. Also, various approaches with different threshold levels are used to calculate the headcount ratio and the catastrophic overshoot.

### 1.1. Providing and Financing Health Services in Iran

Currently, health services are provided within three main sectors: the state sector, public sector-Social Security Organization (SSO), the Armed Forces, the Ministry of Petroleum, etc. - as well as the private sector. According to the available statistics, currently more than 900 hospitals and medical centers are active in the country. There are about 120000 inpatient beds in the country, i.e. one bed per 625 persons. Furthermore, a significant part of inpatient services are provided by state hospitals which are mainly managed by universities of Medical Sciences in the country; the private sector provides less than 20% of inpatient services (19, 20). While, a significant part of outpatient services including dentistry services, general practitioner and specialists visits, medical diagnostic services, medicines and

medical equipment are provided by the private sector, the state sector provides less than 30% of services in this area (21). For instance, in 2013, there were 5140 active laboratories in Iran, which 3100 of them belonged to the private sector. Also, according to the SSO statistics, in 2011; 1625 medical imaging centers contracted with the organization (SSO) and about 1560 centers belonged to the private sector. The number of active dentistry units in the state sector was less than 5% of the total active units in the country and its financial performance was less than 10% of the total expenditure paid for dentistry services in the country (22, 23). The average annual number of visits to the general practitioners and specialists were 2.6 and 2.4, respectively.

In healthcare financing side the statistics show that the health share of Gross domestic product (GDP) in 2012 was 6.7%, health expenditure per capita was about 1562 USD and also the share of out-of-pocket payments in health expenditures was about 52% (18). The current financing system in Iran consists of state and private sectors, based on taxation, social health insurance and out-of-pocket payment. The government annually allocates part of the budget from oil revenues, non-oil exports and general taxes to develop health infrastructures such as primary healthcare, curative affairs management and hospitals. There are four insurance organizations, including SSO, Medical Services Insurance Organization (MSIO), Imam Khomeini Relief Committee (IKRC) and the Armed Forces Insurance (24, 25). They are the main purchasers of inpatient services in the state and public sectors and also in a limited way purchase services from the private sector, especially outside the capital. Meanwhile, the private insurances contract with private medical centers for outpatients and inpatients services. However, two basic health insurance organizations including the Armed Forces Insurance and MSIO have their own private insurance funds and the latter is one of the major purchasers of the private sector. Due to the lack of required information infrastructures, unfortunately there are no accurate statistics of the number of insured persons in the country; and sometimes contradictory statistics are reported, and there is still a significant part of marginalized population who are not covered by health insurance (25, 26).

## 2. Objectives

The current study aimed to investigate three objectives: First, the mean of out-of-pocket payments by the Iranian households for health services, second, the headcount and overshoot measures of catastrophic health expenditure, and finally the level of inequality in the distribution of it.

## 3. Materials and Methods

### 3.1. Type of Study

The current descriptive study was conducted in retrospective frame and its results could be applied by health policy makers.

### 3.2. Data and Settings

The data was obtained from the Iranian households income and expenditure survey (HIES) conducted by the ISC. The ISC gathers detailed households' expenditure in 13 modules for urban and rural households using a standard questionnaire and through going to the subjects homes and interviewing head or an adult in the household. Expenditure modules include food, beverages, clothing, housing, health, education, recreation and entertainment, fuel and waste, furniture and fixtures, transport and communication, cultural affairs, fast food, hotel and durable goods and services. The health module includes 93 codes for inpatient and outpatient services.

The HIES encompassed some missing values for each of the 13 modules of households' expenditures and this led to exclusion of some households in the analysis where the considered variable was critical. The households' member size, food, health and total expenditures were critical variables in this study. Therefore, the rural or urban households were excluded if the values of these variables were not available. Other households' expenditure modules, such as housing, entertainment, clothing, etc. were replaced by default STATA missing-value code.

### 3.3. Population and Sampling

All private and collective settled households in urban and rural regions constitute the population target of HIES. The ISC selects the samples through a three-staged cluster sampling method and strata were used in the survey. First, the census areas are classified and selected. Second, the urban and rural blocks are selected and the selection of sample 'households is done at the third stage. The number of samples is optimized to estimate average annual income and expenditure of the sample household based on the aim of the survey. ISC tries to obtain estimations that represent the whole year, therefore, distributes the samples between the months evenly. ISC estimates the sample size based on the following equation (20):

$$(1) \quad n_{ct} = \left( \frac{Z_{0.975} S_{ct}}{r_{ct} X_{ct}} \right)^2 \times \text{Deff}_t \times \alpha_t$$

Where,  $c$  is the considered variable (income, total expenditures, and nonfood expenditure),  $t$  is the province,  $Z_{0.975}$  is the 0.975th quintile in normal distribution (here is equal to 1.96),  $S_{ct}$  is Standard Deviation of  $c$  in each province,  $\alpha_t$  is the rate to compensate the sample loss in each province,  $r_{ct}$  is the desired level of precision and  $\text{Deff}_t$  is minimum expected difference or also known as the effect size of each province. Therefore the sample size in 2013 was equal to 18881 urban and 19437 rural households.

### 3.4. Ethical Considerations

The secondary data obtained from Iranian households

income expenditures survey (HIES) were used. The HIES data are released by ISC in Access and Excel format. The ISC database provides the data to the users freely and with no restrictions. The current study was approved by the Ethics Committee of Iran University of Medical Sciences (approved ethical code: 1394/105/464).

### 3.5. Data Analysis

The data were analyzed through four steps as follows:

1. The mean of out-of-pocket payments by urban and rural regions were calculated through the following equation (27):

$$(2) \quad \text{MOOP} = \sum_{i=1}^n \frac{W_i(OP_i \times 12) + (IN_i)}{W_i}$$

(MOOP: mean of out-of-pocket,  $OP_i$ : out-of-pocket payment by each household for outpatient services,  $IN_i$ : out-of-pocket payment by each household for inpatient services and  $W_i$ : weight of each household in the sample).

2. The headcount ratio and the catastrophic overshoot measure were calculated through two common approaches, the WHO researchers' (1) and other approaches (6, 7, 9, 28-30). According to WHO if out-of-pocket payment for health is equal or more than 40% of the capacity to pay, then the household faces catastrophic expenditure. This approach is calculated through the following steps:

Equivalent household food expenditure:

$$(3) \quad (\text{Equi.Food.Exp.})_i = \frac{(\text{Food Expenditure})_i}{\text{Equi.HSize}_i}$$

Where,  $\text{Equi.Food.Exp.}$  is the food expenditure based on equivalent household size,  $(\text{Food Expenditure})_i$  is the food expenditure for each household and  $\text{Equi.HSize}_i$  is the Equivalent household size calculated by exponentiation of household size to 0.56.

- Calculation of poverty line: households are sorted based on total consumption from the lowest to the highest. Then the mean of equivalent food expenditures in 45th to 55th percentile are calculated.

$$(4) \quad (\text{MEqui.Food.Exp.})_{45\text{th}-55\text{th}} = \sum_{45\text{th}}^{55\text{th}} \frac{(\text{Equi.Food.Exp.})_{45\text{th}-55\text{th}}}{W_{45\text{th}-55\text{th}}}$$

Where,  $(\text{MEqui.Food.Exp.})_{45\text{th}-55\text{th}}$  is the mean of food expenditure based on equivalent household size for households in 45th to 55th percentile which, hereafter, is called poverty line or the subsistence expenditure; and  $W_{45\text{th}-55\text{th}}$  is the weight related to each household in the mentioned percentile.

- Poverty line (the subsistence expenditure) for each household is calculated by multiplying poverty line of 45th and 55th percentile by equivalent household size:

$$(5) \quad \text{PL}_i (\text{S.E.}_i) = \text{PL}_{45\text{th}-55\text{th}} (\text{SE}_{45\text{th}-55\text{th}}) \times \text{Equi.HSize}_i$$

Where,  $PL_i$  (S.E.<sub>i</sub>) is poverty line or the subsistence expenditure,  $PL_{45th-55th}$  (SE<sub>45th-55th</sub>) is the poverty line calculated in the previous step and Equi.HSize<sub>i</sub> is equivalent size for each household.

- Capacity to pay for each household is calculated using poverty line (the subsistence expenditure) for each household minus total consumption expenditure of that household. Then, total expenditures paid by each household for health services is divided by the capacity to pay; if the quotient is equal or more than 0.4, then the household has faced catastrophic expenditures, otherwise not.

$$(6) \quad (CTP)_i = (Total \ Expenditure)_i - (PL_i \ (S.E._i))$$

$(CTP)_i$  is the capacity to pay for each household,  $(Total \ Expenditure)_i$  is the total consumption expenditure for each household and  $(PL_i \ (S.E._i))$  is the poverty line (the subsistence expenditure).

$$(7) \quad (OOPCTP)_i = \frac{OOP_i}{CTP_i}$$

If the  $(OOPCTP)_i \geq 0.4$ , called catastrophic health payments.

The second approach is based on total consumption and nonfood expenditure of household through which if out-of-pocket payment for health services paid by a household is 10%, 20%, or 30% of its total consumption or 10%, 20%, or 25% of nonfood expenditure, then the household has faced catastrophic healthcare expenditures.

$$(8) \quad (CHE)_i = \left( \frac{OOP}{TE} \right)_i \geq 0.1, 0.2, \text{ or } 0.3$$

$$(9) \quad (CHE)_i = \left( \frac{OOP}{Nonfood} \right)_i \geq 0.1, 0.2, \text{ or } 0.3$$

Catastrophic headcount ratio is calculated by the number of households facing catastrophic expenditures divided by the total number of households in terms of urban and rural household. Also, catastrophic overshoot measure is calculated by the following equation:

$$(10) \quad \text{Catastrophic \ Overshoot} = \sum_{i=1}^N O_i$$

$$(11) \quad O_i = E_i \left( \left( \frac{T_i}{X_i} \right) - Z \right)$$

Where, catastrophic overshoot is the severity measure of catastrophic expenditure,  $\left( \frac{T_i}{X_i} \right)$  is the ratio of out-of-pocket payment for each household to total consumption (capacity to pay, nonfood expenditure) and Z is threshold levels considered for catastrophic expenditure (10%, 20% and 30%).

In the third step, the analysis of data on inequality in headcount ratio and catastrophic overshoot is con-

ducted using the calculation of concentration index, as below (29):

$$(12) \quad \text{Concentration \ Index} = \frac{2}{\mu} \text{Cov}(h, r)$$

Where,  $\mu$  is the headcount ratio or mean positive catastrophic overshoot studied and  $\text{Cov}(h, r)$  is the covariance of variable headcount ratio or catastrophic overshoot (h) with the relative rank of household based on total consumption expenditure (capacity to pay, nonfood expenditure).

Also, the rank-weighted Headcount and Overshoot are calculated based on the following two equation:

$$(13) \quad H^w = H. (1 - C_E)$$

H is the headcount ratio of households that experienced catastrophic health expenditure and  $C_E$  is the concentration index for headcount ratio.

$$(14) \quad O^w = O. (1 - O_E)$$

O is the previously calculated overshoot indicator, and  $O_E$  is the concentration index of the overshoot. At the fourth step, the distribution of catastrophic headcount ratio is provided in terms of provinces of the country.

The Excel 2010 was used to prepare the data for analyses, calculating the mean of out-of-pocket and catastrophic health expenditure headcount and overshoot measures. The STATA 10 was used to calculate the inequality measures, and the ArchGIS Desktop 10.2 to present the catastrophic health expenditure headcount ratio in rural and urban households on Iran map.

#### 4. Results

In 2012 - 2013, the number of rural and urban Samples were 19437 and 18888 respectively, that 284 rural and 241 urban households were excluded because of missing values of the mentioned critical variables. Also, at least one of the 93 health codes was utilized by 64% of the rural and 67% of the urban households.

Table 1 summarized the Iranian rural and urban households' main characteristics in 2013 - 2014. The distribution of samples were similar between urban and rural regions of Iran, while the urbanization rate was 70% in 2012-2013, and about 90% of households were headed by male, and 73% of the heads were literate. Also, about 77% of the Iranian households owned houses and 41% of them had cars. The health insurance coverage was about 79% that the coverage rate was 88% and 67% among rural and urban households, respectively.

The mean of out-of-pocket payments in terms of rural and urban households was provided in Table 2. The main source of it was outpatient services that constituted over 80% of it. The urban households had greater out-of-pocket payments than rural households both in terms of total and outpatients and inpatients separately.



**Table 1.** Selected Characteristics of Iranian Households (2013 - 2014)<sup>a,b,c</sup>

Variable	Urban	Rural	Total
<b>Observations</b>	18881 (0.493)	19437 (0.507)	38318 (100)
<b>Marital status (HH)</b>			
Married	16497 (0.87)	16716 (0.86)	33336 (0.87)
Widow	1133 (0.06)	1361 (0.07)	2299 (0.06)
Divorced	944 (0.05)	972 (0.05)	1916 (0.05)
Single	307 (0.02)	389 (0.02)	383 (0.01)
<b>Literacy status (HH)</b>			
Literate	15484 (0.82)	12319 (0.63)	27810 (0.73)
Illiterate	3397 (0.18)	7180 (0.27)	10507 (0.27)
<b>Gender (HH)</b>			
Male	16771 (0.89)	16886 (0.87)	33669 (0.88)
Female	2110 (0.21)	2551 (0.13)	4648 (0.12)
<b>Mean of households' size</b>	3.6	3.72	3.66
<b>Households with under five-year member(s)</b>	5532 (0.29)	6167 (0.32)	11699 (0.3)
<b>Households with over 65-year member(s)</b>	3202 (0.17)	4527 (0.23)	7738 (0.2)
<b>Residence status</b>			
Owner	12688 (0.67)	16704 (0.86)	29406 (0.77)
Tenant	4285 (0.22)	907 (0.05)	5192 (0.14)
Other	1908 (0.11)	1826 (0.09)	3715 (0.09)
<b>Owning cars</b>	7719 (0.41)	4609 (0.24)	12333 (0.32)
<b>Health insurance coverage</b>	12553 (0.67)	17034 (0.88)	30271 (0.79)

<sup>a</sup> Abbreviation: HH, Household's Head.

<sup>b</sup> There was a significant difference between rural and urban households in categorical variables (HH's Literacy Status, HH's marital status, HH's Gender, Owning cars and houses) (P = 0.05).

<sup>c</sup> Values are presented as proportion no (%).

**Table 2.** The Mean of Iranian Households Out-of-Pocket Payments on Healthcare Services 2013 - 2014<sup>a</sup>

Households Residency	Service Type		Total [CI]
	Outpatients Services [CI]	Inpatients Services [CI]	
<b>Rural households, (USD)</b>	6914514 [6845931 - 6983098] (216.22)	149674 [147996 - 151352] (4.8)	7064189 [6749214 - 7424184] (221)
<b>Urban households, (USD)</b>	10986250 [10827629 - 11144873] (343.6)	259064 [253075 - 265054] (8.1)	11245315 [9085827 - 13404802] (351.7)

<sup>a</sup> [CI] is Confidence Interval (95%); total is summation of outpatients with inpatients services; 1 USD = 31979 I.R. Rial in average from March, 21, 2012 to March, 20, 2013, Adopted: Central Bank of I.R. Iran.

The catastrophic health expenditure headcount ratio and overshoot measures are two main aspects of any financial protection performance healthcare systems. The catastrophic health expenditure headcount and overshoot measures are shown in Table 3 based on various approaches and thresholds. The WHO approach -40% of

capacity to pay-indicated the lowest catastrophic health expenditure headcount ratio while the 10% of nonfood expenditure approach indicated the highest amounts. The overshoot is lowest based on 10% of total consumption approach and highest based on 30% of nonfood expenditure approach.

Also the rural households' catastrophic health expenditure headcount ratio and overshoot are greater than those of the urban households. The results of the inequality burden in catastrophic health expenditure headcount ratio and overshoot distribution in rural and urban households are provided in Tables 4 and 5. In urban households, the highest amount of inequality of headcount ratio related to the 40% of capacity to pay-WHO-approach (concentration index was 0.078), and the lowest related to 30% of nonfood expenditure approach (0.017). The highest amount of inequality of overshoot measures related to 40% of capacity to pay approach (concentration index was 0.024) and the

lowest to 30% of total consumption (concentration index was 0.006). The rank-weighted headcount ratios ( $H^W$ ) and overshoot measures ( $O^W$ ) were positive, the highest level of  $H^W$  related to 30% of nonfood expenditure (0.18) and the lowest to 30% total consumption (0.005) for urban households. The lowest and highest rank-weighted overshoot measures ( $O^W$ ) in urban households are related to 30% total consumption and 40% capacity to pay-WHO-approach equal to 0.016 and 0.114 respectively. All these positive  $H^W$  and  $O^W$  measures implied that relatively, the rich households in Iran experienced catastrophic health expenditure more than the poor ones.

**Table 3.** The Headcount Ratio and Catastrophic Overshoot for Healthcare Services Among Rural and Urban Households <sup>a</sup>

CHE Threshold	CHE Measures			
	Headcount [CI] in rural households	Overshoot [CI] in rural households	Headcount [CI] in urban households	Overshoot [CI] in urban households
<b>Total cons, %</b>				
10%	9.1 [0.090 - 0.092]	8.6 [0.085 - 0.085]	9.65 [0.956 - 0.974]	8.8 [0.087 - 0.089]
20%	2.43 [0.235 - 0.252]	11.7 [0.116 - 0.118]	2.9 [0.0280 - 0.030]	10.97 [0.109 - 0.11]
30%	1.03 [0.010 - 0.011]	18.72 [0.165 - 0.190]	1.075 [0.010 - 0.012]	12.15 [0.118 - 0.125]
<b>Nonfood exp, %</b>				
10%	14.3 [0.136 - 0.148]	9.62 [0.087 - 0.097]	13.27 [0.132 - 0.134]	9.76 [0.097 - 0.098]
20%	4.65 [0.039 - 0.048]	11.65 [0.116 - 0.117]	4.45 [0.0434 - 0.046]	11.3 [0.113 - 0.114]
30%	1.8 [0.011 - 0.0195]	18.71 [0.163 - 0.190]	1.84 [0.017 - 0.020]	17.74 [0.177 - 0.178]
<b>Capacity to pay, %</b>				
20%	2.45 [0.196 - 0.286]	11 [0.075 - 0.142]	2.87 [0.026 - 0.030]	10.98 [0.104 - 0.113]
40%	0.5 [0.004 - 0.006]	11.7 [0.086 - 0.146]	0.48 [0.004 - 0.006]	11.45 [0.114 - 0.115]

<sup>a</sup> Abbreviations: [CI] is Confidence Interval (95%); CHE, Catastrophic Health Expenditure; Total Cons, household's total consumption over the recall period (one year); Nonfood exp, household's nonfood expenditure over the recall period (one year).

**Table 4.** The Catastrophic Health Expenditures Distribution-Sensitive in Iranian Urban Households <sup>a</sup>

Distributions Measures Based on Economic Status Variables	Thresholds of CHE			
	10%	20%	30%	40%
<b>Total cons</b>				
Concentration index of head count	0.035	0.027	0.050	
Rank-weighted head count, $H^W$	0.070	0.030	0.005	
Concentration index of overshoot	0.017	0.011	0.006	
Rank-weighted overshoot, $O^W$	0.090	0.083	0.016	
<b>Nonfood exp</b>				
Concentration index of head count	0.055	0.020	0.017	
Rank-weighted head count, $H^W$	0.042	0.130	0.180	
Concentration index of overshoot	0.015	0.014	0.010	
Rank-weighted overshoot, $O^W$	0.096	0.180	0.018	
<b>Capacity to pay</b>				
Concentration index of head count		0.0230		0.078
Rank-weighted head count, $H^W$		0.030		0.008
Concentration index of overshoot		0.008		0.024
Rank-weighted overshoot, $O^W$		0.11		0.114

<sup>a</sup> Abbreviations: CHE, Catastrophic Health Expenditure; Total Cons, household's total consumption over the recall period (one year); Nonfood exp, household's nonfood expenditure over the recall period (one year).

**Table 5.** The Catastrophic Health Expenditures Distribution-Sensitive in Iranian Rural Households<sup>a</sup>

Distributions Measures Based on Economic Status Variable	Thresholds of CHE			
	10%	20%	30%	40%
<b>Total cons</b>				
Concentration index of head count	-0.13	-0.176	-0.42	
Rank-weighted head count, H <sup>W</sup>	0.100	0.024	0.015	
Concentration index of overshoot	-0.25	-0.14	-0.13	
Rank-weighted overshoot, O <sup>W</sup>	0.108	0.1334	0.012	
<b>Nonfood exp</b>				
Concentration index of head count	-0.04	-0.12	-0.31	
Rank-weighted head count, H <sup>W</sup>	0.15	0.052	0.024	
Concentration index of overshoot	-0.06	-0.05	-0.0053	
Rank-weighted overshoot, O <sup>W</sup>	0.11	0.12	0.26	
<b>Capacity to pay</b>				
Concentration index of head count		-0.17		-0.086
Rank-weighted head count, H <sup>W</sup>		0.0288		0.009
Concentration index of overshoot		-0.037		-0.04
Rank-weighted overshoot, O <sup>W</sup>		0.12		0.114

<sup>a</sup> Abbreviations: CHE, Catastrophic Health Expenditure; Total Cons., household's total consumption over the recall period (one year); Nonfood exp., household's nonfood expenditure over (one year).

In rural households the results of inequality in distribution of headcount ratios and overshoot measures were different from those of the urban households. The concentration index for both headcount ratio and overshoot measures was negative but the rank-weighted measure was positive. The highest and lowest concentration indexes belonged to 30% total consumption approach (-0.42) and 10% nonfood expenditure (-0.04) in rural households with respect to absolute value. The highest and lowest inequality level of rural households' catastrophic health expenditure, and overshoot measures belonged to 10% (-0.25) and 30% total consumption with respect to absolute value. Also the rank-weighted headcount ratios (H<sup>W</sup>) and overshoot measures (O<sup>W</sup>) were positive, the highest level of H<sup>W</sup> belonged to 10% of nonfood expenditure (0.15) and the lowest to 40% capacity to pay (0.009) for urban households. The highest and lowest rank-weighted overshoot

measure (O<sup>W</sup>) in rural households belonged to 30% nonfood expenditure and 30% total consumption approaches equal to 0.26 and 0.012, respectively. All these positive H<sup>W</sup> and O<sup>W</sup> measures implied that relatively, the rich households in Iran experienced catastrophic health expenditure more than the poor ones.

In the final section the catastrophic healthcare headcount ratio among Iranian provinces by rural and urban households. As other part of situation analysis this implies to useful implications to health policy makers were presented. In rural regions the lowest and highest amounts of catastrophic health expenditure headcount ratios belonged to South Khorasan and Guilan provinces that were 0.7% and 9.4% respectively. Also, the lowest and highest levels in urban regions were 0.8% and 13.6% for South Khorasan and Qom provinces, respectively. The complete picture of headcount ratios of Iranian provinces are shown in Figure 1.





ductible and insured co-payments for health services such as dental care, drugs, and medical equipment that were not covered by basic insurers. The private health insurance in Iran is a duplicate -and in a limited form a supplementary-kind and often have an active contribution to cover the difference between approved health services tariffs with basic health insurance obligations. This implies that there is no defined and effective complementary or supplementary health insurance coverage (25, 26).

Currently, more than 85% of out-of-pocket payments by Iranian households occur in outpatient sector and the share of the private sector is 75%. Meanwhile, basic health insurance schemes consider state tariffs as a basis for their obligation to purchase services from both state and private sectors; these schemes pay 70% of the state tariffs in private outpatient sector and 90% of state tariffs in private inpatient sector. However, private sector tariffs for outpatient and inpatient services are about 2.3-fold and 4.3-fold higher than those of state sector tariffs, respectively (22, 26).

A study conducted in Kurdistan province indicated that the insured persons paid over 50% of health service expenditures through direct payments. This study concluded that the main share of people's OOP was spent on drugs and medical equipment, general and specialist practitioners' visits and consultations, and dentistry services (31).

According to the national survey conducted by ISC in 2013, about 28% of visits were done by general practitioners in the private sector and 6% in the public sector. Also, about 45% of specialists' visits were performed in the private sector and 2% in the public sector. Based on this survey, the private sector provided about 80% of dentistry services and about 14% of diagnostic services, including laboratory and medical imaging, to the studied Iranian households (20, 21). Two previous studies in the national and regional levels showed that the medicines, equipment, supplies and dentistry services alongside the medical diagnostic procedures are the main determinant of households' exposure to catastrophic health payment (17, 18).

However, at the macro level, there are also significant challenges in financing and financial protection against catastrophic health expenditures. The four basic health insurers do not have effective information mechanisms to accurately identify the health and socio-economic status of their insured. The structural and also policy fragmentation of these insurance schemes hinder creating a unified mechanism and large-scale pooling of resources and as a result, there is no possibility for cross-subsidiary transferring between insurers in a desired manner. Also, financing mechanisms of the mentioned insurer organizations are different and they face a serious challenge regarding sustainability (24-26).

The weakness of insurance system in the country has caused the lack of power to supervise and control moral hazards especially about physicians; given the lack of guidelines to provide services, strategic purchasing and effective payment mechanisms, there is a possibility of imposing unnecessary and increased costs on insurers

and the insured persons (18).

Previous studies (14-18), conducted in Iran, on catastrophic headcount ratio and also general as well as specific economic status of providing and financing health services, the values of higher than 2% and lower than 10% among both rural and urban population seem reasonable and also in rural regions this value is higher than that of the urban areas.

In a study conducted in Brazil, various threshold levels were used to measure health catastrophic headcount ratio in terms of three views including capacity to pay, total consumption and nonfood expenditure. In the mentioned study, similar to the present study, the least headcount ratio belonged to the 40% of capacity to pay approach and the highest headcount ratio belonged to the total consumption expenditure approach; however, in the present study, the highest ratio was associated with the nonfood expenditure approach (28). Also, in a study conducted in Kenya, the highest headcount ratio was where the criterion was 10% of nonfood expenditure and the least ratio was where the 40% of total consumption expenditure criterion was used (30).

The results showed a low level of inequality in headcount ratio distribution and catastrophic overshoot. It was more obvious in urban households; it indicates a very weak relationship between economic levels and the status of facing catastrophic health expenditures. This issue, in turn, is one of the weaknesses of the current system of financing health services in Iran which indicates the lack of urban households' contribution based on their ability to pay to finance health expenditures. However, about rural households, the concentration index was negative and almost significant which indicates the burden of financing health expenditures on poor households. Meanwhile, the low values for rank-weighted and headcount and rank-weighted catastrophic overshoot indicate the ability of the rich to contribute more in financing health services. The socio-economic status of Iranian households, because of the weakness of health insurers, play significant role in utilizing health services and then protecting them against catastrophic health expenditures. This means that the rich households have more accessibility and affordability to benefit from health services. These results were consistent with those of the study by Wagstaff et al. in Vietnam (6). On the contrary, the results of the study conducted in Kenya showed the negative value for the mentioned indicator and also indicated less willingness to contribute more in financing health services among the rich (30). In Poland, the results of a study showed the rank-weighted concentration index for headcount ratio and overshoot measures were positive, thus the catastrophic headcount ratio and overshoot measures were concentrated on richer households (32).

Finally, the distribution of catastrophic health expenditure between Iranian provinces was analyzed. While the lowest catastrophic headcount ratio was in rural areas of South Khorasan, Sistan and Baluchistan and Alborz prov-

inces, the highest ratio was in Guilan, Qom and Markazi provinces. Also, while the lowest catastrophic headcount ratio was in urban areas of South Khorasan, Alborz and Ardabil provinces, the highest ratio was in urban areas of Qom, Semnan and Guilan provinces. The current study, using data of 2008 about cost-income of households, showed the lowest values of catastrophic headcount ratio in rural areas of South Khorasan, Kohgiluyeh and Boyer-Ahmad and Sistan and Baluchistan provinces; and in urban areas, Ardabil, Semnan and Bushehr provinces had the lowest values (14).

This evidence was not consistent with researchers' expectations; in the first look, a higher incidence rate of catastrophic health expenditures in less developed provinces such as South Khorasan and Sistan and Baluchistan was expected. Perhaps one of the reasons for this issue may be less access to and less benefit of health services in urban areas and especially rural areas of the mentioned provinces.

### 5.1. Study Limitations

It seems that the data regarding the expenditures of inpatient services were not very accurate, because in general given the health subsidy is paid by the government and also considering the obligations of insurance organizations, a patient may have no accurate idea about total amount of expenditures and also what each of the mentioned parties pay. Furthermore, database of the ISC was not linked to other entities and systems such as the Ministry of Health (MoH) and insurance organizations, as a result, expenditure values reported by household may have bias against reality.

**Study Strengths and Weakness:** Investigating the out-of-pocket payments in addition to catastrophic health expenditures, and the conducted studies based on different and valid approaches- not only the WHO approach that was almost used in other studies- with various considered thresholds for catastrophic health expenditures would let the audiences to have a better judgment about the current situation in Iran. But the current study did not run a regression based analysis to identify the main determinants of the catastrophic health expenditure in Iran.

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### Authors' Contributions

Mohammad Hadian designed the first blue print of study, Hesam Ghiasvand collected and analyzed the data, Hassan Abolghasem Gorji drafted the manuscript and Mohamadreza Maleki finalized the last version of manuscript.

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