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Decomposing inequality in Financial Protection Situation in Iran after implementing the health reform plan; what does the evidence show based on National Survey of Households' Budget?

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Abstract

Background: Assuring accessibility to health care services without facing with financial hardship is an accepted objective for health system. Utilizing the health services in an equitable way is a part of human's right in health. Lack of well-designed health care financing mechanisms and high level of out-of-pocket payments in Iran over the last decades led to implementing Health Transformation Plan, in 2014. The initial goal of the plan was: reducing the likelihood of households suffering from catastrophic health care expenditure. There is little evidence on the impact of the plan on exposure to catastrophic health expenditures (CHE), inequality in its distribution and its determinants.

Aims: This study aims to decompose inequality in financial protection of Iranian households after the implementation of the Health Transformation Plan.

Methods and materials: This study was conducted using Iranian Statistics Center Survey on Rural and Urban Households Income- Expenditure in 2015-2016. First, the headcount ratio of catastrophic health expenditures was calculated using World Health Organization methodology. Then, the corrected concentration index based on approaches of Erreygers and Wagstaff was estimated. Finally, the role of different explanatory variables on inequality in the exposure to catastrophic health expenditures among poor and non-poor households was calculated using Farelie's model estimated by logistic regression.

Results: The headcount ratio of the exposure to catastrophic health expenditures in urban and rural households were 4.58%, 5.65% respectively and the values of corrected concentration index based on Wagstaff's approach were -0.01, 0.0067, respectively. Values of corrected concentration index indicates that in urban households, the main burden of catastrophic health expenditures is on households with lower economic status, while among rural households, the burden is on households with higher economic status. The natural logarithm of difference in households' income levels had the highest contribution in explaining the inequality in facing catastrophic health expenditures between poor and non-poor households.

Conclusion: The first goal of the plan seems has not been materialized and the headcount ratios of catastrophic health expenditure is still considerable. the results show that income is still the greatest determinant of facing catastrophic health expenditure and in urban households those in lower

socioeconomic groups are more likely to face catastrophic health expenditures. However, in rural areas there has been some reductions in inequalities. Overall, there is still further work that needs to be done to reduce exposure to catastrophic health expenditure.

Key words: catastrophic health expenditures, corrected concentration index, inequality decomposition, Iran.

Introduction:

Achieving universal health coverage (UHC) is not imaginable without protecting households and individuals against catastrophic health expenditures. The governments through the health systems should try to promote the population health by focusing on development of UHC dimensions and then contextual factors in the country. Determining an equitable financial contribution for health services users and then assuring the sustainability of it, is a desired action for financial protection and equity in it. Investigating inequality in financial protection and determining the factors which are contributing in this inequality between lower and upper economic groups, might lead to insightful understanding in situation analysis of a country. The health policy makers and planners need to acquire reliable evidence for decreasing the inequality in facing with catastrophic health expenditures (1-3). Identifying which segments of the population are more likely to face catastrophic health care expenditure (CHE), inequalities in the distribution of these costs and factors influencing the likelihood of experiencing these costs is of great importance (4). Decomposition of health inequalities can provide useful information for identifying sources of inequalities and the impact of each of them to policy makers (5, 6). This is particularly important when considering the affordability to pay for health care services without facing financial constraints(6).

In Iran, equity in health care financing and utilization based on horizontal and vertical equity approaches have been emphasized in national plans and are a component of societal preferences. However, results of studies during the last years showed that the previous and current states governments have not been able to achieve these goals(7). To make some inroads in achieving these goals in 2014 the Iranian government enacted the “*Health Transformation Plan*” (HTP) with financial protection against catastrophic health care expenditure as one of its objectives. The HTP has been implemented only in public hospitals affiliated to the Ministry of Health. There are approximately 900 hospitals and medical centers in Iran which are affiliated to the Ministry of

Health (MoH), Social Security Organization, Armed Forces Bodies, Ministry of Petroleum and other governmental organizations or bodies, and the private sector. Approximately 557 hospitals would be considered public and are affiliated to MoH and this encompasses about 74,000 inpatients beds. In this plan, all patients admitted to these hospitals pay 6% of the total medical expenses if they are from urban households and pay 3% if they are from rural households (8). Before HTP, patients were sent to outpatient facilities which could be costly for some aspects of care. The HTP forced hospitals to provide all aspects of care.(7, 9, 10).

Furthermore, an additional component of HTP extended the coverage of basic health insurance for uninsured marginalized groups. It is expected that through implementing these two components, the effects of inequality in financing and access to healthcare services will be ameliorated(11).

Previous literature has identified various factors influencing the likelihood of facing catastrophic health care costs. Gender of household head, household size, education level, age of household head, the presence of sick members, the presence of members over the age of 65 years or less than 5 years old, the utilization of outpatient and inpatient services, being rural or urban households and socio-economic status were significantly associated to the exposure to catastrophic health expenditures (12-14). There is evidence suggesting inequalities in the distribution of the exposure to catastrophic health expenditures by socioeconomic status (7, 8). Therefore, in addition to above factors, there are structural and contextual factors which are likely to be influenced by the governments' socio-economic and welfare policies.

In the three years since the implementation of HTP, this study aims to investigate the status of exposure to catastrophic health expenditures, inequality in its distribution and factors influencing inequality in terms of rural and urban using data from the household income-expenditure survey.

Methods and Materials:

Data and Setting:

Data were extracted from the national survey of household budget which is conducted annually by the National Statistical Center of Iran. The National Statistical Center uses three-stage cluster random sampling. Firstly, census areas are stratified and selected, secondly rural and urban blocks and, thirdly households are identified.

The survey includes 13 expenditure modules, so that the first 12 modules ask the head of household or an adult and informed member questions about household consumption expenditures during the last month and module 13 asks questions about durable goods and services during the last year.

Sampling and Sample Size:

The National Statistical Center uses three-stage cluster random sampling. Firstly, census areas are stratified and selected, secondly rural and urban blocks and, thirdly households are identified. Sample size in terms of urban or rural households varies from year to year. The sample, for the year 2015-2016, consisted of a total of 39886 households including 20125 rural and 19761 urban households.

Data Analysis:

Data analysis was conducted in three steps:

- Calculating the headcount ratio of catastrophic health expenditures in the urban and rural households;
- Calculating inequality rate in distribution of headcount ratio of catastrophic health expenditures; and
- Identifying the determinants of inequality between poor and non-poor groups using the decomposition method proposed by Farelle (16).

The headcount ratio of the exposure to catastrophic health expenditures was calculated using the WHO methodology (17). In this method, if a household's total health payments equal or exceed 40% of household's capacity to pay, then the household faces catastrophic health expenditures.

Inequality in distribution of headcount ratio of catastrophic health expenditures was estimated using the corrected concentration index developed by Erreygers and Wagstaff (18). Here, the rank of households constructed based on total households consumption expenditures.

The Farelle's method based on logistic regression was used to determine the contribution of each of explanatory variables, in explaining the inequality rate in facing catastrophic health expenditures. Decomposition of inequality is based on the categorization of households into poor and non-poor. Values for poverty line were calculated using the weighted average of food

expenditures in the 45th to 55th percentile range. All analyses were conducted using Stata software version 14.

Results: In this section, the descriptive statistics of sample has been presented through table (1), and then the table (2) shows the head count ratios of catastrophic health expenditures by rural and urban households. The result of measurement of inequality in distribution of catastrophic health expenditures has been showed through table (3) for rural and urban households. The explaining factors of difference of catastrophic health expenditures between lower and higher economic groups have been presented in table (4) and (5) for rural and urban households respectively.

Table (1): Some Demographic and Socio- economic Characteristics of Iranian Rural and Urban (2015-2016)

Variable	Urban	Rural	Total
No. of Observations	19761 (49.6%)	20125 (50.4%)	39886
Household Head Sex:			
Female	2589 (13%)	2960 (14.7%)	5594 (13.9%)

Male	17172 (87%)	17162 (85.3%)	34,292 (86.1%)
Household's Head Literacy Status:			
Illiterate	4484(22.7%)	12266(61%)	27543(70%)
literate	15277(77.3%)	7859(39%)	12343(30%)
Mean of Household Head Age (SD)	47.37 (15)	49.78(16.31)	48.6(15.73)
Mean of Household Size (SD)	3.4(1.43)	3.5(1.64)	3.45(1.54)
Having under five years member	5776(29.2%)	6723(33.4%)	8548(21.4%)
Having over 65 years member	4635(23.4%)	6548(32.5%)	6457(16.2%)
Ownership of House:			
Owner	17002(84.5%)	13142(66.5%)	30146(75.6%)
Tenant	1751(8.7%)	5083(25.7%)	6829(17.1%)
Other	1372(6.8%)	1536(7.77%)	2911(7.3%)
Mean number of house	3.54(0.99)	3.31(1.03)	

Values calculated for poverty line in 2014-2015 in terms of rural and urban households were approximately 61 US\$, and 80 US\$ monthly. The headcount ratios of the exposure to catastrophic health expenditures by rural and urban households are provided in table (2) as below:

Table (2): the headcount ratio of the exposure to catastrophic health expenditures in terms of types of households (2015-2016)

Households	CHE Headcount Ratio	Confidence Interval	
Rural	0.0565	0.0533	0.0597
Urban	0.0458	0.0424	0.0482

The rates of occurrence of catastrophic health expenditures were about 5.65%, 4.58% for Iranian rural and urban households respectively in 2015- 2016. The confidence interval is relative narrow and this may add to the robustness of estimations.

Values for corrected concentration index by rural and urban households based on the two approaches of Erreygers and Wagstaff are provided in table (3) below:

Table (3): values for corrected concentration index in terms of types of households (2015-2016)

Households	Erreygers Corrected CI	Wagstaff Corrected CI
Rural	0.002(0.001)	0.007(0.005)
Urban	-0.002(0.001)	-0.01(0.007)

The corrected amounts of concentration index for rural households are positive and this implies a pro-rich direction of inequality in distribution of CHE. However, the story is different in urban households and direction of inequality is pro-poor.

For the final part of our analysis, the results of the inequality decomposition for rural households are provided in table (4):

Table (4): Results of the inequality decomposition in facing catastrophic health expenditures in rural households (2015-2016)

Variables	Coefficient	Std. Error	Z	P> Z	[95% Confidence Interval]	
Household Head's Female Gender	0.0161	0.008	2.01	0.044	0.0004	0.0319
Household Size	0.0415	0.011	3.71	0.000	0.01959	0.0634
Household's Head Age	0.0372	0.0117	3.16	0.002	0.0141	0.0604
Number of rooms	0.0161	0.0072	2.22	0.026	0.0019	0.0303
Household's per capital area	-0.0086	0.0043	-1.96	0.050	-0.0172	0.3572
Owning of House	0.0117	0.0038	3.08	0.002	0.0042	0.0192
Having under five years old member	-0.0020	0.0040	-0.50	0.616	-0.0099	0.0058
Having older than 65 years old member	0.0158	0.0083	1.89	0.059	-.0005	0.0323
LN total Income	0.106	0.0215	4.92	0.000	0.0637	0.1482
Household's Head Education Level:	0.0062	0.0069	0.90	0.368	-.0073	0.0198
Number of obs =20099 Pr(Y!=0 G=0) = .0945 Pr(Y!=0 G=1) = 0.0853 Difference = 0.091 Total explained = 0 .24						

Table (4) shows the considered explanatory variables explained about 24% of difference between poor and non- poor groups. The natural logarithm of income is the largest contributing factor of difference in occurrence of CHE between poor and non-poor groups. Households size and households head age are second and third largest contributing factors of difference in exposure to CHE between poor and non-poor households.

Results of the inequality decomposition in urban households are also provided in table (5):

Table (5): Results of the inequality decomposition in facing catastrophic health expenditures in urban households (2015-2016)

Variables	Coefficient	Std. Error	Z	P> Z	[95% Confidence Interval]	
Household Head's Female Gender	0.0031	0.0075	0.41	0.681	-0.0117	.0179
Household Size	-0.0121	0.0118	-1.03	0.305	-0.0354	0.0111
Household's Head Age	0.0139	0.0103	1.35	0.177	-0.0063	0.0343
Number of rooms	0.0148	0.0094	1.56	0.118	-0.00376	0.0334
Household's per capital area	-0.0089	0.0033	-2.68	0.007	-0.0155	-0.0024
Owning of House:	0.0092	0.0051	1.79	0.074	-0.0008	0.0193
Having under five years old member	-0.0022	0.0028	-0.80	0.422	-0.0078	0.0032
Having older than 65 years old member	0.0106	0.0064	1.64	0.10	-0.002	0.0232
LN total Income	0.2746	.0281	9.75	0.000	0.219	0.3298
Household's Head Education Level	0.0273	0.0076	3.59	0.000	0.0124	0.0423
Number of obs =18470 Pr(Y!=0 G=0) = 0.184 Pr(Y!=0 G=1) = 0.0455 Difference = 0.1386 Total explained = 0 .330						

The results from Table 5 show that the considered explanatory variables explain about 33% of differences of occurrence of CHE between poor and non-poor households. The main contributor of difference of CHE is logarithm of households' total income and then households head educational level and the number of rooms of households' residential building.

Discussion: We have discussed the results in three sections; firstly the head count ratio, secondly the inequality in distribution of catastrophic health expenditures, and finally the decomposing the inequality of catastrophic health expenditures between lower and higher economic groups.

Catastrophic health Expenditures Head count ratio:

In this study, the exposure rate to catastrophic health expenditures in terms of rural, urban households in 2015-2016 were 5.65% and 4.58% respectively. These levels of CHE rates are considerable and imply a warning alarm to Iranian health policy makers. This means even after implementing the HTP in 2014, the rate of CHE has remained in high level and at least in short term the reform plan could not meet the policy makers' expectation.

Several studies have investigated the exposure to catastrophic health expenditures before the implementation of the HTP (before 2014) and estimated various values in different years. One study by Ghiasvand et al. showed about 2.87% of urban households and 2.45% of rural households have experienced catastrophic health expenditure in 2013-2014 (15). Rates of the exposure to catastrophic health expenditures in 2014-2015 were about 4.38% for rural and 2.69% for urban households(16). Another study estimated the rate of catastrophic health expenditure to be approximately 2.8% for all Iranian households in 2010 (17).

Sometimes the difference of households socio- economic proxy variables in these studies are not same, so the results may be not comparable. Of course over the past years –especially before implementing the HTP in Iran- the health care services were not affordable and then reducing access to care. Therefore, an increase in CHE rate after HTP may be related to improving the situation of financial accessibility of health services to Iranian households.

It seems that after the implementation of the health transformation plan, in short term - one year after the implementation of the mentioned plan which is of interest to this study - there was no significant change in the rate of exposure to catastrophic health expenditures among Iranian households. Some reasons for this issue can be due to targeting of the mentioned plan, so that the plan has covered only services provided in hospitals affiliated to the Ministry of Health while the role of private sector, as a key player in providing services in outpatient setting, has not been significantly considered. Since outpatient services such as diagnostic services, dentistry, rehabilitation, outpatient consultations, medicines and equipment, are mainly provided by the private sector and they were mentioned as main components of health expenditures in Iranian households in previous studies (9, 17, 18).

Inequality in Distribution of Exposure to Catastrophic Health Expenditures:

The values of corrected concentration index based on the approaches of Erreygers and Wagstaff, respectively, were 0.002 and 0.007 for rural households, -0.002 and -0.01 for urban households and -0.003 and -0.002 for the whole country households.

Values of corrected concentration index indicates that in urban households, the main burden of catastrophic health expenditures is on households with lower economic status, while among rural households, the burden is on households with higher economic status. However, it should be noted that the mentioned values, especially those based on Erreygers' approach, are not that considerable for urban and rural households. Results of some studies showed that lower income households are more likely to face catastrophic health expenditures. Some reasons for these findings are if health services are expensive than consequently households have to spend considerable amount of their income, wealth and savings or to borrow or sell their productive assets(8, 9, 18).

By contrast, there is evidence indicating more exposure to catastrophic health expenditures among higher income - expenditure quintiles in rural locations. It can be argued that one explanation for this may be lack of utilization by those in low income levels, so actually they are excluded from the cycle of receiving services; and higher income households can utilize healthcare services and consequently they are more likely to face catastrophic health expenditures. This issue was also mentioned in a study conducted by Rashad et al. in Egypt, Jordan and Palestine(19). Results of a study in Malaysia showed that although urban households in Kuala Lumpur are richer than those in rural areas, they are at a higher rate of exposure to catastrophic expenditures resulted from hospitalization due to rotavirus gastroenteritis; this is because of the development of the desirable primary health care network in rural areas and the possibility for the utilization of healthcare services with lower direct and indirect costs for rural households, compared to urban households. In this study, values for concentration index in Kuala Lumpur and Kuala Terengganu were calculated to be 0.03 and 0.24, respectively(20).

A study conducted in Vietnam showed that poor households, particularly in marginalized areas and slums were at a higher risk of facing catastrophic health expenditures and values of concentration index were about -0.35 for slums and about -0.29 for non-marginalized areas(21, 22).

The development of the primary healthcare network in Iran for rural households began approximately 30 years ago with these households benefiting from the coverage of rural health insurance and more focus on rural areas than urban areas by supportive entities such as Imam

Khomeini Relief Committee were effective in reducing the burden of catastrophic health expenditures on the poor in these areas rather than those in cities. Studies conducted by Etemad et al. and also by Hasanzadeh et al. indicate that fact that there is no significant difference between rural and urban areas in Iran in terms of benefiting from healthcare services and meeting health needs. However, a study conducted by Hosseinpour et al. indicated a significant difference in unmet needs between satellite villages and other rural areas and also urban areas (23-25).

Decomposing Inequality of Catastrophic Health Expenditures between Lower and Higher Economic Groups

The inequality decomposition in facing catastrophic health expenditures indicates that in urban and rural households, the natural logarithm of income is the largest contributing factor in explaining the current gap between poor and non-poor groups in facing catastrophic health expenditures. The role of income and the difference in income levels as determinants of the exposure of individuals and households to catastrophic health expenditures have been already discussed and compared with previous studies.

The results of the inequality decomposition indicate that the difference of CHE occurrence between poor and non-poor in rural households was about 9% and statistically significant, at the 10% significance level. The model explained about of 24% with the included explanatory variables. The natural logarithm of household income, followed by household size and age of household head, had the highest contributions in explaining the gap between poor and non-poor groups in facing catastrophic health expenditures.

Inequality between poor and non-poor groups in facing catastrophic health expenditures in urban households was explained by 33% of the difference between them. This difference is about 14% and statistically significant at the 5% significance level. The natural logarithm of urban households income, followed by education level of household head and the numbers of room available for households made the largest contributions.

In some cases such as when the poor have no financial and/or geographical access to healthcare services the demand for healthcare services is from non-poor groups and as a result the rate of

exposure to catastrophic health expenditures among them may increase. Such a situation is due to lack of utilization of healthcare services by the poor and utilization rates should be taken into account in order to contextualize these results. When the income gap between rich and poor groups in rural and urban households increased, inequality rate in the exposure to catastrophic health expenditures became higher. Mchenga et al. in a study in Malawi concluded that there was a considerable gap between households' economic levels in this country and the risk of exposure to catastrophic health expenditures (26).

Rahman et al. in a study conducted in Bangladesh concluded that the current income gap between households caused increased risk of the exposure to catastrophic health expenditures in poor households, so that the risk of the exposure to these expenditures in these households was 4 times more than rich households (1). A study to assess effects of the healthcare system reform plan in rural areas in China reached a similar conclusion; this study showed that households with lower income levels and also increased income gap between economic quintiles increased inequalities in the exposure to catastrophic health expenditures(27)..

Education level of household head in urban households was another factor explaining the inequality in the exposure to catastrophic health expenditures in urban households. The difference in education level of households' heads in urban areas caused an increased gap in the exposure to catastrophic health expenditures among these households in comparison with rural households. This is likely due to the fact that there is no considerable difference in education levels of households' heads in rural areas and this gap is more significant in urban areas.

The gap in educational level and its impact on inequality in the exposure to catastrophic health expenditures were also found in a study analyzing WHO's data on global ageing and adult health in China and India. In this study, Indian households with a head having university education level were less likely to face catastrophic health expenditures(28).

Difference in the number of rooms available for households was a variable causing inequality in facing catastrophic health expenditures in common for both urban and rural household. It is expected that more available rooms indicates more area of houses available for households and this variable, in turn, can be an indicator of the household economic status. However, this variable in conjunction with household size and house size can be a better representative for economic status and also for the impact of the gap between economic groups in inequality in the exposure to

catastrophic health expenditures. This relationship with catastrophic health expenditures has been found in the literature (6, 27).

Similar to the current study, a study conducted by Guo et al. reported results regarding the presence of members over 65 years old and its impact on inequality in the exposure to catastrophic health expenditures(27). However, in rural areas, the issue seems to be slightly different; because most of them have agriculture and livestock jobs and are more active in terms of productivity until higher ages, so the gap between ages of household heads cannot be a significant explanatory variable for inequality in the exposure to catastrophic health expenditures.

In contrast, the gender of household head in rural households or difference in it was one of factors explaining the gap in the exposure to catastrophic health expenditures. It can be due to the very low contribution rate among rural women in gaining pay equal to men for the similar jobs - agriculture and livestock - and also limitations in economic activity for them in the mentioned social context. This issue is less common in urban households. In other studies, the female gender of the household head was not only a factor increasing the risk of the exposure to catastrophic health expenditures, but also could explain the inequality in facing these expenditures. In some other studies, female gender of household head had protective effects against the exposure to catastrophic health expenditures (27-29).

Conclusion:

In general, the exposure status to catastrophic health expenditures, inequality in its distribution and the inequality decomposition based on the factors proposed in the current study indicate that the implementation of HTP did not have the intended effects of reducing likelihood of facing catastrophic health expenditures in the short term. In order to achieve desired targets in financial protection, the country health system reform plans, particularly regarding inequality, should be revised; and in this regard, according to the country's political and socio-economic situation and dimensions, as contextual variables, strategic long term plans should be designed and implemented. The development of plans for covering diseases and healthcare services with staggering costs and also covering lower socioeconomic groups focusing on marginalized and deprived areas are actions which can be taken by the government in this regard.

Limitations of the study:

Due to data limitations, we were unable to consider how costs may have impacted on access and usage of outpatient and inpatient services, medicines, equipment contributing to explaining inequality in the exposure to catastrophic health expenditures.

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