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Targeted subsidy plan and Kakwani index in Iran health system

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Abstract:

INTRODUCTION: Health care is considered as a human right, and fair financial contribution to health care plays an important role in providing effective services for all members of society. This study aimed at investigating the effects of targeted subsidy plan (since 2010) on equality in health-care financing in Iran from 2004 to 2014.

MATERIALS AND METHODS: This was a descriptive-analysis, cross-sectional study that was conducted using data obtained from households' expenditure-income survey that is performed every year by the Statistical Center of Iran. The Lorenz curve, Gini coefficient, and Theil index were applied to measure inequality in healthcare expenditures (HEs). Furthermore, the Kakwani index was used to examine inequality in health-care finance during the study period. The analysis was performed using Stata version 13.

RESULTS: Kakwani index was negative for all the studied years, except 2007. The value of this index was equal to −0.032, −0.045, and −0.046 in 2004, 2008, and 2014 for rural areas and was equal to −0.041, −0.029, and −0.0001 for urban areas, respectively. Despite the Kakwani index has been negative for most of the years, which reflects regressive financing in health care, there is no significant change in the trend of this indicator after the implementation of the subsidies. In addition, this indicator is moving toward being positive (progressive) in urban areas in 2014, which represents increased share of the poor in health payments.

CONCLUSIONS: According to the results, the targeted subsidy plan could not reach to its purpose in health-care system for supporting the poor from HEs. It is recommended for policy-makers to design a specific plan for health-care financing and to allocate some defined resources such as taxes or subsidies to health-care sector.

Keywords:

Equality, health-care costs, net household expenditures, targeted subsidies law

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Introduction

Health care is a fundamental human right, and reducing inequalities in healthcare services and fair financial contribution in health care has an important role in providing effective services for all individuals.[1] Health-care reforms focus on finance and justice. Furthermore, policy-makers and researchers consider justice as one of the main issues in health-care system.

Taxation, private insurance, and social security insurance are conventional sources of health-care financing.[2] Financial support of the poor is the responsibility of governments.[3] Meanwhile, most governments decrease per capita public health-care expenditures (HEs) due to weak financial performance. As most of health-care services are essential and are not avoidable, households have to pay out-of-pocket payments (OOPPs) for receiving these services. Therefore, the poor households sale their properties or reduce or ignore other essential expenditures such as food, clothes, and education to receive health-care services.[4]

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OOPP is a suitable index for measuring inequality among different groups in societies.[4] OOPP is households' expenditures for health-care service that insurers do not reimburse for them.

The experimental results showed that OOPP significantly is associated to CHEs. CHEs occur when households pay a large proportion of their income for purchasing health-care services. Therefore, households are in the bargain for these payments.[5]

OOPP is considered as a barrier to –health-care utilization and has negative effects on society's health, especially for people with low-income and poor families.[6] Moreover, it will increase the probability of being stuck in poverty trap for households.[7]

Thus, there is a two-way correlation between health care and the poverty for poor households, and many of these households, which cannot afford HEs, may become poor due to paying for HEs. On the other hand, health-care financing can make these people poorer or lead to their death.

According to the World Health Organization reports, about 40% of total budget of health care in the world is in the form of OOPP. These payments are about 60%–70% of total expenditures (TEs) in some countries.[4] OOPP was equal to 55% in 2004 in Iran and had a decreasing trend and was equal to 50% of total HEs in 2012. Finally, according to the latest report, OOPP was decreased by 47.8% in 2014.

The implementation of a targeted subsidy plan in 2010 was one of the major changes in Iran's economy that brought a dramatic change in the consumption behaviors of Iranian households. The targeted subsidy plan is a policy whereby the government, instead of providing subsidized commodities such as energy and wheat, monthly pays fixed cash payment for all people in Iranian households. Of course, the government was forced to eliminate this payment for some of the high-income households in the coming years. The fact that the government pays a fixed amount for each person per month in cash can have serious effects on the households' payment status. At the microlevel, the consequences of this policy depend on household choices. It seems that the choices of people have been extended due to subsidies. However, the increased prices and high inflation rate restricted the households' choices and decreased the purchasing power of them. Therefore, at the macrolevel, the sharp increase in inflation was the most important consequence of this policy which was due to the growth in liquidity.

According to Iran statistical center's reports, the inflation rate in all sectors and in health-care sector touched 41.7% and 36.2%, respectively. In addition, the health-care sectors' inflation rate was higher in rural areas (41.7%). The higher inflation rate in health-care sector than other sectors can result in more OOPPs and CHEs.[8] Figures 1 and 2 show healthcare sectors' inflation rates for urban and rural areas in Iran between 2004 and 2014.

Growth in inflation has been much higher in some sectors, such as –health care. The question is how was the state of payments for households' health care during the implementation of this policy?

One of the important issues in health-care payments is that how these payments should be distribute among societies groups? Should everybody pay according to ability to pay or demand for services or the rich should pay more? This type of justice can be investigated using vertical justice relating to individual payments.[9]

The Kakwani index is a suitable index for measuring distribution of health-care payment among different income groups. Indeed, the investigation of justice in health-care financing starts with this theorem that individuals should use –health-care services according to their needs and pay based on their ability to pay. The Kakwani index is easy to understand and also is the easiest way to report health-care financing inequalities to policy-makers.

This index provides a justice implication about inequality. The unequal distribution of payments so that the rich pay more than the poor is considered as justice in health-care payments.[10] Many studies, such as Pourasghari *et al*.(2016), Naghdi (2013), Zare *et al*., and Raghfar (2014), have used this index to assess the state of equity in health sector financing.

This study applied the Gini index and Theil index to investigate inequality in health-care payment.

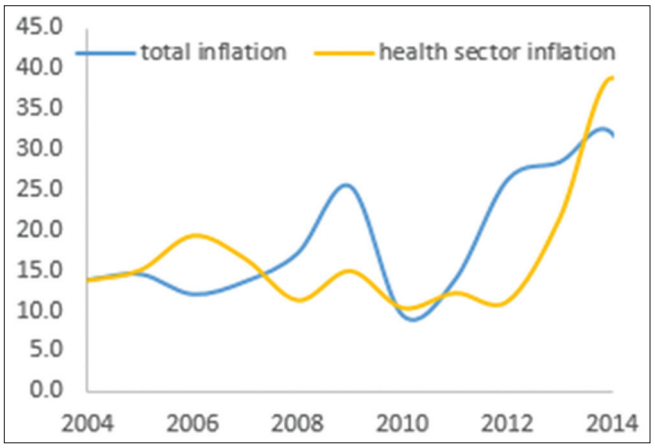

Figure 1: Health sector and total inflation rates for urban areas in Iran between 2004 and 2014

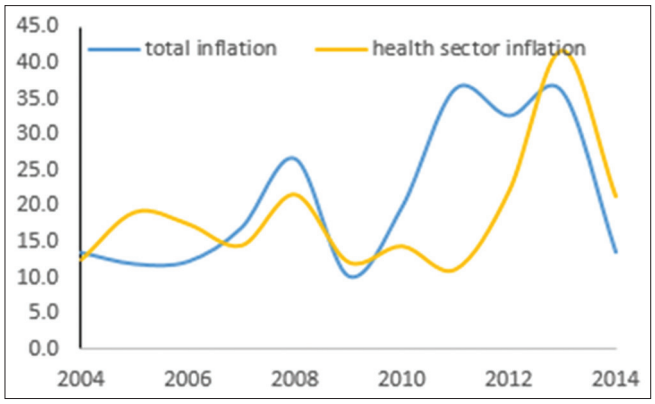

Figure 2: Health sector and total inflation rates for rural areas in Iran between 2004 and 2014

Furthermore, regressive (unequal) or progressive (equal) trends of –health-care payments were investigated using the Kakwani index among income quintiles.

Health-care system in Iran and economic reforms over 2004–2014

Iran has rich natural resources and its economic is depended strongly to oil incomes. Iran economic is considered as an "one-dimensional" economy so that >70% of annual financial resources of government and >80% of annual foreign exchange earnings are obtained from crude oil exports.[11]

The Ministry of Health Care and Medical Education is responsible for people's health care in Iran. primary care centers and more than 70% of other facilities (tertiary and rehabilitation) are public, and other remaining centers are belong to private or nongovernmental organization s. Iran has a mixed health-care financing – public funds, social health-care insurance, private insurance premiums, and OOPPs.[12] Insurers collect premiums from their members, and the government supports them by public revenues (these are obtained from general taxation and natural resources' exports).

Some evidence showed that >90% of people are covered by public insurance, social security, or private insurance.

According to the high inflation in health-care sector and high level of OOPP in Iran, health-care system cannot have a good financial support. In this case, even medium HE can result in CHEs for low-income households.[13]

Many micro and macro reforms have done for improving justice in –health-care financing in Iran. "Targeted subsidy plan" was one of the most important economic reforms in recent years. This plan was a part of "economic development plan" that was started since 2008 and have had a huge effect on health-care sector. Targeted subsidy plan was started since 2010 and aimed at reforming the energy prices, the development of social insurance, health-care services, promotion of society's health, expanding drug's insurance coverage and treatment for specific diseases, implementation and empowerment of social support programs, and finally, supporting the national production.[14] The process of this plan included removing subsidies from some services and goods and paying cash money to all people instead. Amount of this cash subsidy was equal to USD 44 in 2008. "Health-care sector evolution plan" was another plan that aimed at decreasing problems of health-care sector and was started since 2014. One of the main goals of the plan was the financial support.[15] This study has intended to investigate the effects of targeted subsidy plan on inequality in –health-care financing in Iran between 2004 and 2014.

Materials and Methods

The effects of targeted subsidy policies on households' payment on health care were investigated in this study. Therefore, the data were extracted from households' cost-income survey that is performed every year by the Statistical Center of Iran (SCI). As questions about consumer expenditures are less sensitive than questions about income, they are better indicator for households' welfare. Therefore, per capita gross costs can be considered as a good representative indicator for household income and welfare.

SCI uses two different approaches for making quintiles, according to per capita gross costs and per capita net costs. According to the definition of SCI, when some of the costs such as added value of second-hand goods, direct taxes, pensions, nonmedical social security premiums, and other similar premiums are subtracted from gross costs, households' net cost will be achieved.[16]

The SCI applies a three-stage randomized clustering sampling and collects data using a valid and reliable questionnaire. Household's headman is interviewed for collecting data.[17] Data include demographic and socioeconomic information about households. Data show the amount of expenditures and income of rural and urban households by different quintiles too. Table 1 shows sample size between 2004 and 2014 in term of the place of resident. Totally, sample size was 381,181 households during the studied period. The latest data are available for 2014, so we did not consider years coming after this time.

Lorenz curve

This curve compares the distribution of a particular variable (e.g. human resources such as physicians and nurses) with the uniform distribution that denotes equality.[18] The diagonal line in this curve represents

Table 1: Sample size during the studied period (2004–2014)

Number samples	Years										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Rural	12,916	13,971	16,736	16,266	19,708	18,204	19,585	19,787	19,658	19,437	19,391
Urban	11,620	12,926	14,176	15,019	19,382	18,666	18,702	18,728	18,536	18,881	18,886
Total	24,536	26,897	30,912	31,285	39,090	36,870	38,287	38,515	38,194	38,318	38,277

the equality and is called the equality line. The greater deviation from the equality line implies the greater inequality.[19] The Gini coefficient (GC) that is one of the most famous inequality indexes is derived from the Lorenz curve.

Gini coefficient

The GC is one of the most commonly used income inequality indicators and has been accepted more than other inequality indexes. The value of this index is calculated as the ratio of the area between Lorenz curve and the equality line (the 45° line) to the whole area below the equality line. Among different methods for calculating the Gini index, the following formula was used in this study:[20]

$$G = \frac{1}{n}\left[n + 1 - 2\left(\frac{\sum_{i=1}^{n} (n+1-i) y_i}{\sum_{i=1}^{n} y_i} \right) \right]$$

where

$y_1, y_2, \cdots, y_n$ = represents the income of n people from society or sample that is sorted from the smallest to the largest. In the case of this study, y_i denotes per capita expenditures of households and n is the number of households. The GC value ranges from 0 (perfect equality) to 1 (perfect inequality), and it is independent of mean and it is symmetric. Furthermore, it is not dependent on a unit of measurement.

Theil developed a method for measuring inequality in income distribution (1967) using generalized entropy (GE). This index uses share of income for measuring inequality.[21] The general form of GE is as following:

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha}\left[\frac{1}{n} \sum_{i=1}^{n} \left(\frac{y_i}{\bar{y}} \right)^{\alpha} - 1 \right]$$

where

n is the number of people within the society, yi is income of i^{th} people, and $\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$ is the arithmetic mean of incomes. The value of GE ranges from 0 to ∞. The zero value indicates perfect equality and the larger GE implies the higher inequality. α can be any real number. For smaller values of α, GE formula is sensitive to income changes in lower parts of income distribution and vice versa. When α =1, GE is indicated as Theil index:[22]

$$GE(1) = \frac{1}{n} \sum_{i=1}^{n} \frac{y_i}{\bar{y}} ln\left(\frac{y_i}{\bar{y}} \right)$$

Theil index, along with the Gini index, is the most popular index from GE measures and is used in many studies on income distribution around the world.[23]

Kakwani index

As other similar studies on healthcare financing, this study has used Kakwani index to evaluate vertical equity in the Iranian health-care system. The Kakwani index of progressivity estimates the progressivity and repressiveness of OOPP. This index shows which source of health-care finance departs from proportionality.[24] The Kakwani index value ranges between 2 and 1. The value 2 indicates that the richest person pays all costs and 1 implies that the poorest person pays all costs. The negative Kakwani index indicates that financing system is regressive; if the Kakwani index is positive, it is progressive; and zero value shows that the system is proportional.

The Kakwani index on gross income is twice more than the area between two curves of Lorenz for gross income (L_{inc}) and concentration curve for –health-care payments (L_{pay}). The following formula is used for calculating the Kakwani index:

$$\pi_k = 2\int_0^1 \left[l_{inc} - l_{pay} \right] dp$$

$$\pi_k = 2\int_0^1 \left[l_{cum} - l_{pay} \right] dp - 2\int_0^1 \left[l_{cum} - l_{inc} \right] dp$$

$$\pi_k = C - G$$

where C is the concentration index of health-care payments and G denotes the GC of gross income.

Results

Summarizing the results, only the Lorenz curve has been reported for years 2004 (beginning of the study period),

2008 (start of the economic development plan in Iran), and 2014 (the end of the study period) for rural and urban areas. The results showed that, in all years, Lorenz curve of TEs of households had more deviation from equality line than HEs that imply the higher inequality in TE. This finding is almost the same for rural and urban areas. In 2014, the difference in inequality between TE and HE in urban areas was less than in other years [Figure 3].

The results of the GC showed that the value of this indicator for HE was equal to 0.27 in 2004 in rural areas. The GC has had an increasing trend until 2007 (GC = 0.3), and the smallest value of GC was observed in 2013 (GC = 0.208). The GC has had the same trend during the period of 2004–2014 in urban areas. The value of GC was equal to 0.25 for the distribution of HE in urban areas at the beginning of the period and it was increased by 0.3 in 2007, and finally, it was decreased by 0.26 in 2013.

The Theil index values for TE and HE were equal to 0.12 and 0.10, respectively, for rural areas in 2004. In this year, the Theil index was equal to 0.14 and 0.10 for the distribution of TE and HE in urban areas, respectively. The values of the Theil index for HE of households were equal to 0.09 and 0.09, respectively, in rural and urban areas, 2008. The value of this index for HE was equal to 0.067 and 0.118, respectively, in 2014. Totally, this index had higher values for TE distribution. Furthermore, the values of this index were higher for distribution of both TE and HE in urban areas. Therefore, the trend of inequality in the distribution of HE and TH in terms of the Theil index was similar to the Gini index. The values of the GC and Theil index are shown in Table 2.

Figure 4 shows the time trend of the GC for HE and TE with the place of residence (urban/rural). The results declared that inequality in the distribution of HE is larger in urban areas than in rural areas. In addition, the trend of GC was almost the same in both rural and urban areas during the studied period. Furthermore, the results showed that a short period after implementation of targeted subsidy plan, inequality has been decreased in the distribution of both TE and HE in both rural and urban areas.

The result of Kakwani index showed that this index was negative for all the studied years, except 2007. The value

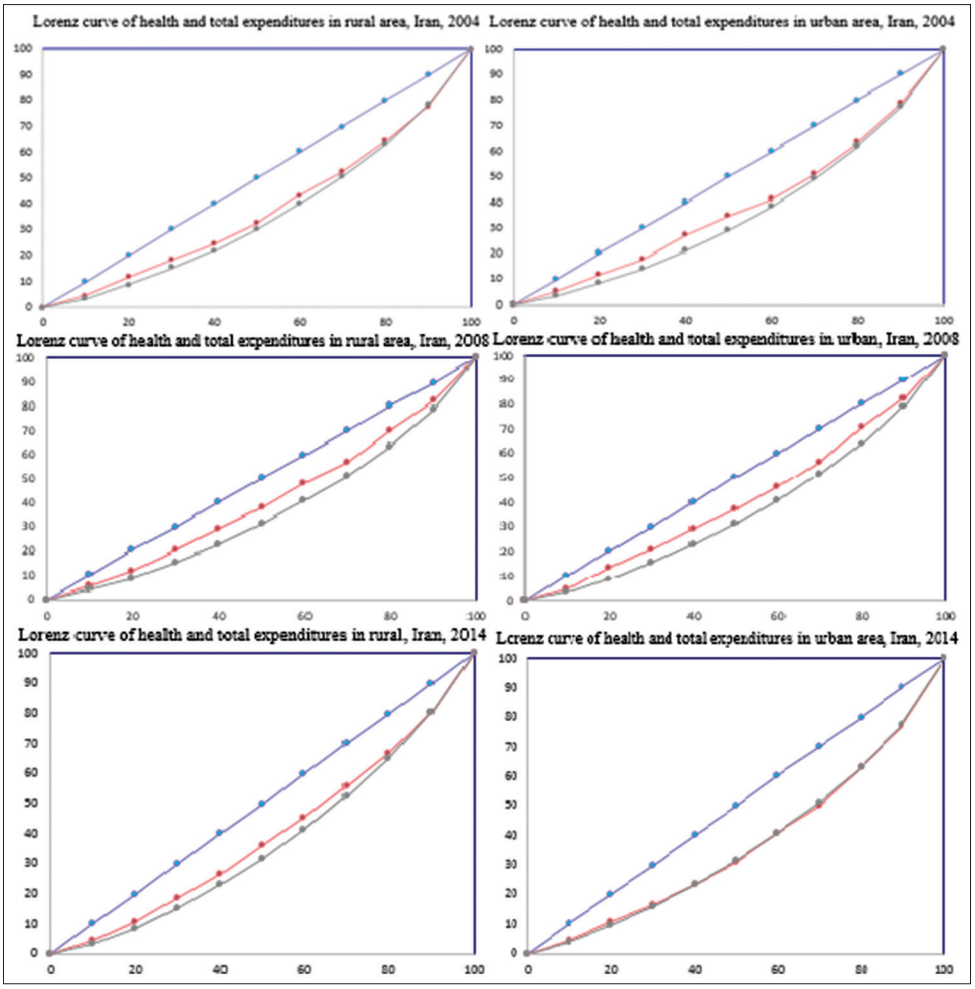

Figure 3: Lorenz curve of health and total expenditures in rural/urban areas, Iran, 2004, 2008, 2014

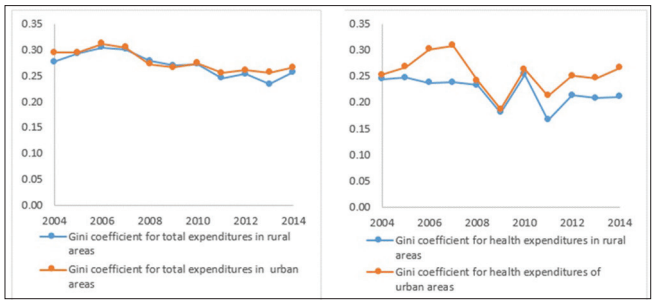

Figure 4: The time trend of the Gini coefficient for total expenditures and household health expenditures in rural and urban areas, Iran, 2004–2014

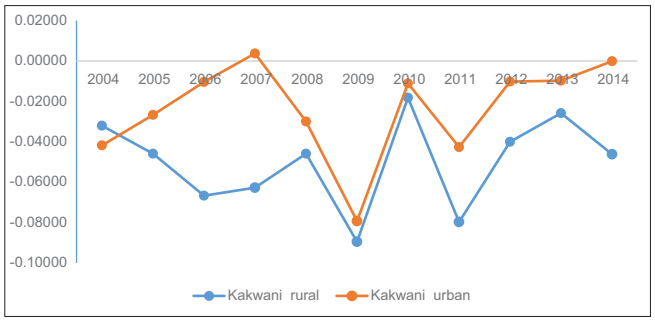

Figure 5: The Kakwani index for health finance in rural and urban areas, Iran, 2004–2014

Table 2: The Gini coefficient and Theil index for total expenditures and health-care expenditures of urban and rural households between 2004 and 2014

Years	Variables	Gini coefficient		Theil index	
		Rural	Urban	Rural	Urban
2004	TE	0.27	0.29	0.12	0.14
	HE	0.24	0.25	0.10	0.1
2005	TE	0.29	0.29	0.14	0.14
	HE	0.24	0.26	0.11	0.11
2006	TE	0.30	0.31	0.14	0.15
	HE	0.23	0.30	0.09	0.16
2007	TE	0.30	0.30	0.14	0.15
	HE	0.23	0.30	0.09	0.17
2008	TE	0.27	0.27	0.12	0.11
	HE	0.23	0.24	0.09	0.09
2009	TE	0.27	0.26	0.11	0.11
	HE	0.18	0.18	0.05	0.05
2010	TE	0.27	0.27	0.12	0.12
	HE	0.25	0.26	0.11	0.11
2011	TE	0.24	0.25	0.09	0.1
	HE	0.16	0.21	0.05	0.07
2012	TE	0.25	0.26	0.10	0.11
	HE	0.21	0.25	0.07	0.11
2013	TE	0.23	0.25	0.08	0.10
	HE	0.20	0.24	0.07	0.09
2014	TE	0.25	0.26	0.10	0.11
	HE	0.21	0.26	0.07	0.11

TE=Total expenditure, HE=Health expenditures

of this index was equal to −0.032, −0.045, and −0.046 in the years 2004, 2008, and 2014, respectively, for rural areas. The values of the Kakwani index for health-care financing were equal to −0.041, −0.029, and −0.0001, respectively, in the above-mentioned years in urban areas. The value of this index was equal to 0.0036 in 2007. In total, the inequality in health-care finance was higher in urban areas than rural areas. Furthermore, the highest inequality was observed in 2009 in both rural and urban areas. Figure 5 shows the time trend of the Kakwani index for health-care finance in rural and urban areas between 2004 and 2014 in Iran.

Although the Kakwani index has been negative for most of the years, which reflects the regressive financing in health care, there is no significant change in the trend of this indicator after the implementation of subsidies. In addition, this indicator is moving toward being positive (progressive) in urban areas in 2014, which represents increased share of the poor in health payments.

Discussion

This study aimed to investigate the inequality in health-care financing and consider the effect of the targeted subsidy plans on contribution of Iranian households to HEs between 2004 and 2014. It should be mentioned that the main goals of the targeted subsidy plan, which was started since December 19, 2010, were to empower society members, to implement social support programs, and finally, to support national production.

Paying equal cash subsidies to all people made a new resource for poorer households in order to spend more money for their essential needs such as health-care services. On the other hand, cash subsidies raised the amount of money in the Iran economy and finally resulted in 40% of the inflation rate.

Investigating the time trend of price index in Iran showed that it has had an increasing trend since 2004.

Moreover, this increase in the price index can be observed in all sectors that, despite more governmental supports from health-care sector, the health-care sector price index between the years 2004 and 2010 was higher than other sectors.

In addition, low price of oil since 2012 and a considerable decrease in its price in 2014 have threatened the country's budget. Therefore, the share of HEs from gross national product (GNP) has had a decreasing trend after 2012. In the meantime, the implementation of a project entitled "targeted subsidy plan" was implemented by providing cash to the household monthly. Clause 7 Article 7 of this large plan relates directly to health costs, which obliges the state to expand and provide social insurance and

health-care services to reduce pocket spending and promote community health.

The OOPP has been decreased and diminished from 57% in 2010 to 48% in 2014 after the targeted subsidy plan. Meanwhile, OOPP has been 50% on average during 2011–2014. This level of OOPP is considered as very dangerous for low- and middle-income households.

In this paper, we use the Lorenz curves and calculate the GC and Theil coefficient of these expenditures among different income segments to examine the effect of this government policy on the distribution of health costs. The calculations of the GC and Theil coefficient both confirm the lack of fair distribution of health costs between various income deciles in urban and rural areas. An important question arises is who benefits this inequality? In fact, which decile bears this inequality? Which deciles pay more health costs on health payments? Is there vertical justice in payments to health services in the study period? All these questions are answered in the interpretation of Kakwani index.

The Kakwani index is the main indicator for examining inequality in health-care finance. This index displays that which income quintiles (rich/poor) pay more for –health care. This index compares inequality in HEs with inequality in households' income (or total gross expenditures). Data regarding exact income quintiles are not available in Iran. Therefore, we used quintiles of gross households' expenditures for some reasons:

First, the deductible items in gross cost (resulting in net costs) such as direct taxes, retirement, and nonmedical insurance, which have a high dependence and direct relation to the income of individuals, lead to stopping the replacement of net costs as a substitute for household income. The second argument is that, according to the economic theory, people often choose their permanent consumption on the basis of their permanent income. Therefore, payments such as direct taxes, retirement rights, and nonmedical insurance show that the person has a steady and higher average income which sustains these costs, and these costs are a sign of their permanent income and thus have been effective in their consumption decisions; the household's gross expenditure, which includes all household expenses, is a good alternative to household income.

The last reason is that, considering the large size of the public sector in Iran, which results in a large part of the population being employed in government agencies, whether or not a portion of the household's expense including direct tax, retirement rights, and nonmedical insurance is deduced. On the other hand, many poor people do not pay for these costs because they are not able to pay for these expenses now, if the decimation based on net costs is used in fact, we ignore a portion of the high-decile household spending that they spend and this will automatically reduce the cost gap between the up and down deciles and does not reflect the correct results of the distribution of payment. Therefore, it can be said that the most suitable alternative for household income in calculating the Kakwani index is gross costs.

Other similar previous studies did not consider the differences between gross and net expenditures, and most of them have used net household expenditures to examine inequality in OOPP in Iran.[25] A similar study which was conducted by Zandi examining the effects of targeted subsidy plan on health-care finance showed that this plan resulted in progressive health-care financing.[26] Since that study has used net households' expenditures for making quintiles, its finding is different from our results.

According to the GC, our finding showed that in all studied years, inequality in HEs was less than inequality in TEs in rural and urban areas. Therefore, the Kakwani index was negative for the studied years. A year after implementation, the economic development plan (2009), and a year after the targeted subsidy plan (2011), the Kakwani index has had a decreasing trend (regressive).

Pourasghari *et al*.(2016) have estimated the Kakwani index for the period of 2006–2011 to be negative in the urban areas of Iran (regressive) and positive in rural areas (progressive).[25] Naghdi(2013) also shows a negative Kakwani index for urban and rural areas for a period of 13 years, which means that inequity is more in favor of the poor.[17] Furthermore, Zare *et al*. obtained positive and progressive Kakwani index for the period 1984–2010 for urban and rural areas, which suggests that inequality was in the interest of the rich.[12] Raghfar *et al*. (2014) in a study by calculating the Kakwani index for 1983–2008 shows that this index has been positive for all years. There were no significant changes in this index during this period.[27]

Although the Kakwani index has been negative for most years, according to the results of this study, and represents the larger share of the rich (regressive), by investigating the trend of this indicator, especially after the implementation of subsidies, no significant change is observed, and after 2011, this indicator is set to be positive, especially in the urban area in 2014, which indicates an increase in the share of urban poor in spending on household health expenditure. Hence, the targeted subsidy plan could not reach to its main purpose that was supporting poor people, especially for financial support in health-care sector.

One of the main problems of this plan is that the government pays subsidies to all people (rich and poor). Hence, a huge amount of cash has been injected to economic and this leads to a high rate of inflation. Some countries pay targeted subsidies or define a health-care package for specific groups of people. The experience of these countries, such as Brazil,[28] Mexico,[29] and Chile,[30] has shown some improvements in health-care finance, and these plans have resulted in decreasing inequality in health-care financing.

Ir *et al*. confirmed the positive effect of subsidies on health-care finance.[31] However, in Iran, the positive effect of subsidies was limited to the early years of the implementation of the plan. Unfortunately, the restrictive forces such as high inflation rate, weaknesses of industries, the increase in exchange rate, and high unemployment rate that were appeared due to implementation of this plan have decreased its positive effects, especially for the poor.

Problems of health-care sector, especially in financing, resulted in the implementation of the evolution plan in health-care sector in 2014 in Iran. Equality in health-care financing is one of the main objectives of this plan.[32] This plan has some achievements which are associated with the decrease in OOPP, patient rights, the decrease in informal payments, etc., but this plan does not have sustainable financial resource and this problem can threat this plan in the future. Hence, the effectiveness of this new program should be tested using the financial equity indicators of the costs of the health sector so that policymakers are aware of the equity implications of the implementation of the program.

According to our results, it is recommended for policy-makers to focus on HEs instead of all aspects of households' expenditures. Therefore, they can design a specific package for health-care service and allocate some defined resources such as taxes or subsidies to health-care sector. Furthermore, it is recommended for them to focus on the poor. The poor are very vulnerable regarding paying HEs, and the probability of CHEs is higher in this group of people. Therefore, the programs that focus on health-care finance in the poor can have more effectiveness in financial support.

Conclusions

The result of Kakwani index showed that health-care financing was proportional in 2010 for both rural and urban areas, in which the law of targeted subsidies was implemented. However, total trend of financing was regressive after 2010. The urban areas had more unequal contribution in health-care financing before and after implementation of targeted subsidy law.

Therefore, the targeted subsidy plan could not reach to its purpose in health-care system for supporting the poor from HEs. It is recommended for policy-makers to design a specific plan for health-care financing and to allocate some defined resources such as taxes or subsidies to health-care sector.

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Conflicts of interest

There are no conflicts of interest.

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