



## Measuring Equality in Primary Health Care Budget Allocation in Iran, Using the Gini Coefficient Method

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### Abstract

**Background:** In Iran, one of the most important and influential sources for financing the Primary Health Care (PHC) is the government budget. This study was conducted with the aim of evaluating the allocation of the PHC budget and evaluating the equality in the allocation of these resources.

**Methods:** In this applied descriptive-analytical study, the study population included all of Iran's 31 provinces. Data was gathered from the registered statistics of the Ministry of Health and the Iranian Statistics Center for the years 2021 and 2022. In this research, the Gini coefficient and the Lorenz curve have been used to measure equality in the allocation of the PHC budget.

**Results:** The results showed that in 2022, the PHC budget increased by 50% compared to 2021. 20 provinces received less than the national average, and 11 provinces received more than the national average. The average allocation budget in urban areas in 2021 and 2022 is 596,452 and 854,936 million rials (\$2,385,808 and \$2,374,822), respectively. The average allocation budget in rural areas in 2021 and 2022 is 1,144,350 and 1,752,936 million rials, respectively (\$4,577,400 and \$4,869,267). The numerical value of the Gini coefficient for the budget allocation in 2021 and 2022 was 0.20 and 0.19, respectively.

**Conclusion:** The Gini coefficient shows that the allocation of the PHC budget is relatively unequal. Advocacy for the reallocation of resources in the health sector based on evidence and based on the deprivation coefficient of demographic groups is one of the most basic ways to support the more deprived and less developed provinces.

**Keywords:** Primary Health Care budget, Equality, Gini Coefficient, Iran

**Conflicts of Interest:** None declared

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### Introduction

Financing is one of the most challenging issues of health systems, especially in low and middle-income countries (LMIC) (1). Based on the evidence, many problems of health systems are related to the problems of countries' financing systems (2). The issue of equitable financing is one of the most important issues in the field of health. The World Health Organization emphasized the importance of this issue in the 2000 report and the methods of achieving equitable financing methods in the 2010

report (3). On the other hand, due to the limited resources in all areas of health systems, attention to equity and equality in the allocation of these resources in all countries, especially for Primary Health Care (PHC) as an essential driving force for advancing universal health coverage (UHC) and the 2030 Agenda for Sustainable Development, is considered by policymakers and government (4, 5).

The Declaration of Alma-Ata in 1978, followed by the

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#### ↑What is “already known” in this topic:

Due to the development of the family health program for cities with more than 20 thousand people in Iran, there is a lot of attention to the distribution of the PHC budget.

#### →What this article adds:

By presenting the state of PHC budget distribution per capita as well as inequality assessment, this study provides policies for budget distribution based on evidence and the deprivation coefficient of population groups in order to support deprived and less developed provinces.

2008 World Health Report and the Declaration of Astana in 2018, all defined the PHC as the foundation of an effective health system and emphasized that all countries should strengthen the PHC system to overcome the emerging challenges (6-8). PHC has been widely considered to be an effective strategy to improve health outcomes by emphasizing disease prevention and health promotion, ensuring equity of access to the most essential interventions (9). Researchers all over the world have shown that the PHC system plays an important role in achieving the effective control of medical costs. Many PHC-related programs have been confirmed to be cost-effective and sustainable (10). On the other hand, since the shortcomings of the health financing system are among the fundamental causes of challenges such as out-of-pocket payments that lead to catastrophic costs for households, which can lead to social inequality and a reduction in equity, equality is one of the main principles of this meeting regarding health. Despite the evidence of a great disparity between countries around the world and even within each continent, there are few countries that pursue health equity and related interventions (11).

Examining the amount of utility of health services in the country shows the inequalities and their depth in different population groups and geographic regions and can be effective in redistributing resources to increase equity in access to services (12). Some health inequalities (assuming older people have poorer health than younger people) are inevitable and acceptable. On the other hand, most other inequalities (such as lower immunization coverage of some population groups, or higher death rates among some ethnic and racial groups compared to other groups, or the amount of disproportionate health expenditures and credits in different regions) can be corrected and are unfair (13, 14).

In Iran, the three main sources of health care financing include the government's general budget, health insurance payments, and direct payment. In the Iranian health sector, due to the fact that almost all healthcare services are provided by the government (15), therefore Providing financial resources and allocating these resources throughout the country is one of the important duties of the government. Also, the government's health budget allocation is a tool for government intervention and policy-making to regulate the level of health care in provinces with different economic and social statuses and to expand equality in health care financing. In most countries, the distribution of government financial resources can hardly be focused on the areas that have the maximum need in terms of health, economic and social status. Unbalanced distribution of pre-planned facilities, coordination of health budget allocation with general government policies and budget adjustment policy in all economic and social sectors of the country are some causes of inadequate distribution of government resources.

Iran is a country with a population of about 84 million people. In Iran, PHC is mainly financed by the Ministry of Health, and the first level of care is provided to the people free of charge (16). However, it should be noted that the uneven distribution of health costs among the country's

population groups shows a lack of proportionality and extreme inequity and a noticeable increase in the share of out-of-pocket payments among the underprivileged and also in rural areas compared to urban residents (17).

In the last fifty years in Iran, there have been many developments, especially in the field of health. Undoubtedly, one of the key elements of the transformational reforms of the health system in Iran is the implementation of the plan to expand health and treatment networks (1985), the implementation of the family physician program and the referral system for the rural nomadic population and residents of cities under 20 thousand people (2005) and the urban family physician program for the urban population of Fars and Mazandaran provinces (2009). Currently, the establishment and development of a family health program for cities with a population of more than 20 thousand people is on the agenda of the Ministry of Health. Therefore, conducting studies to investigate the performance of the Ministry of Health in the allocation of financial resources in the past years can play a significant role in adopting appropriate policies for the future of family doctors in Iran. Therefore, the current research was conducted with the aim of evaluating the allocation of the country's PHC government budget and finally evaluating the equality in the allocation of these resources.

### Methods

#### Setting

This is a descriptive-analytical study aimed at investigating the equity trend in the allocation of primary health care budget in 2021 and 2022 in 31 provinces of Iran.

#### Data gathering

The variables studied include the PHC budget from the general government budget and the population of the country's provinces separately from urban and rural areas. Excel software was used for data analysis and calculations. In this study, the population of the country's provinces was extracted from the 2021 statistical yearbook of the Statistics Center. Also, in order to obtain the variable of the government health budget, the sum of the concentrated rows of the rural and urban areas of the Ministry of Health (specific to PHC) has been used. Also, 250,000 and 360,000 Rials per dollar (the official exchange rate of Iran announced by the Central Bank) were used to convert the PHC budget rate in 2021 and 2022, respectively.

#### Data analysis

In this research, the Gini coefficient and the Lorenz curve have been used to measure equality in the allocation of government health budgets. The Gini coefficient is an index that is used to evaluate the inequality in income allocation between different socio-economic groups. This index not only measures income inequality but also wealth or other health resources (14, 18, 19).

By periodically checking the Gini coefficient, policy-makers can measure the impact of their policies and actions on inequality and class gap. The Lorenz curve is used to show this index. This index is defined in the range between zero and +1. A Gini coefficient of zero indicates

complete equality, and a Gini coefficient of one indicates complete inequality in income distribution (20). The Gini coefficient is equal to the “bounded area” between the “Lorenz curve” and the “perfectly equal distribution line”. In the case that society's resources and wealth are distributed “perfectly equally” among individuals, the Lorenz curve coincides with the “perfectly equal distribution” line and the Gini coefficient becomes zero. On the contrary, in the case of “completely unequal distribution of wealth” in a society, i.e., absolute monopoly (all the wealth of society is in the hands of one person, while other people have zero wealth), the Gini coefficient will be equal to one. Based on the definition of the Lorenz curve, the horizontal axis shows the cumulative share of the population, in which the population is arranged based on household income and from the poorest population groups to the richest. The vertical axis also shows the income share of these population groups from the total income (21).

In this study, the following relationship was used to calculate the Gini coefficient (GI):

$$GI = 1 - \sum_{i=0}^{k-1} ((X_i + X_{i-1}) * (Y_i - Y_{i-1}))$$

In the above relationship,  $X_i$  shows the relative cumulative frequency of the population (horizontal axis),  $Y_i$  shows the relative cumulative frequency of the PHC budget (vertical axis) and  $k$  is the number of classes under investigation.

## Results

The results showed that the average share of the provinces in the total PHC budget (urban and rural) is 1,740,802 and 2,607,872 million rials (\$6,963,208, 7,244,089) in 2021 and 2022, respectively. These numbers show a 50% growth in the budget in 2021. 20 provinces received less than the national average, and 11 provinces received more than the national average. Also, the three provinces with the highest budget per capita are North Khorasan, South Khorasan, and Sistan and Baluchistan provinces, respectively, and the three provinces with the lowest per capita health budget are Tehran, Alborz, and Qom provinces, respectively.

According to [Table 1](#), in 2021, the first twenty percent of the population (first quintile) will receive 9% of the budget, the first forty percent of the population (second quintile) will receive 27% of the budget, the sixty percent of the population (third quintile) will receive 46% of the budget, and the eighty percent of the population (fifth quintile) 69% have received the health budget. This issue shows the relative inequality in the allocation of the PHC budget among the country's population. It should be noted that in order to achieve complete equality in the country in 2021, the PHC budget should be increased by 36% of the current budget and distributed among different population quintiles in specific proportions. This issue has shown a shortage of 19,669,821 million rials (\$78,679,284) in the country's PHC budget to compensate for the inequality in the allocation of the budget this year.

According to [Table 2](#), in 2022, the total PHC budget has grown by 50% compared to the previous year, with the first twenty percent of the population (first quintile) 10% of the budget, the first forty percent of the population (second quintile) 28% of the budget, Sixty percent of the population (third quintile) received 47% of the budget and eighty percent of the population (fourth quintile) received 67% of the PHC budget. These numbers show the relative inequality in the allocation of the PHC budget among the country's population. The Gini coefficient calculated this year is equal to 0.19, which shows that this year the budget was distributed a little better in terms of equality than the previous year. It should be noted that in order to achieve complete equality in the country in 2022, the PHC budget should be increased by 35% of the current amount of credits and distributed among different population quintiles in specific proportions. This issue has shown a shortage of 28,384,884 million rials (\$78,846,900) in the PHC budget to achieve full equality among the provinces.

According to the obtained results, the average allocation budget in urban areas in 2021 and 2022 is 596,452 and 854,936 million rials (\$2,385,808 and \$2,374,822), respectively. 21 provinces below the national average and 10 provinces above the national average have received a budget ([Figure 1](#)). In the meantime, the PHC budget per capita in urban areas (which is calculated by taking into account the credits received and the demographic dimen-

*Table 1.* How to distribute the PHC budget in 2021

Quintil	Cumulative percentage of population (%)	Allocated budget (million Rials)	Cumulative percentage of budget (%)	Budget in complete equality (ideal state)
First quintile	20	5,152,871	9	11,433,322
Second quintile	40	14,558,793	27	26,880,049
Third quintile	60	25,029,175	46	41,074,953
Fourth quintile	80	37,179,183	69	55,680,549
Fifth quintile	100	53,964,859	100	73,634,680

*Table 2.* How to distribute the PHC budget in 2022

Quintil	Cumulative percentage of population (%)	Allocated budget (million Rials)	Cumulative percentage of budget (%)	Budget in complete equality (ideal state)
First quintile	20	8,223,594	10	16,930,140
Second quintile	40	22,862,568	28	40,869,368
Third quintile	60	37,848,831	47	60,992,529
Fourth quintile	80	54,359,810	67	80,897,416
Fifth quintile	100	80,844,022	1	109,228,906

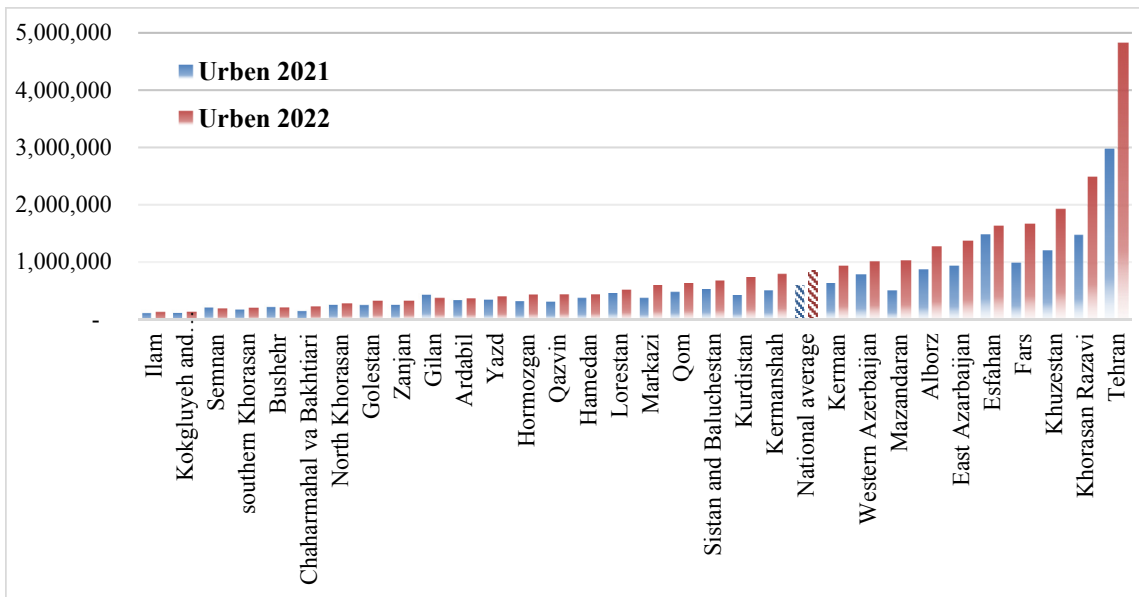


Figure 1. Provincial comparison of PHC budget allocation in urban areas

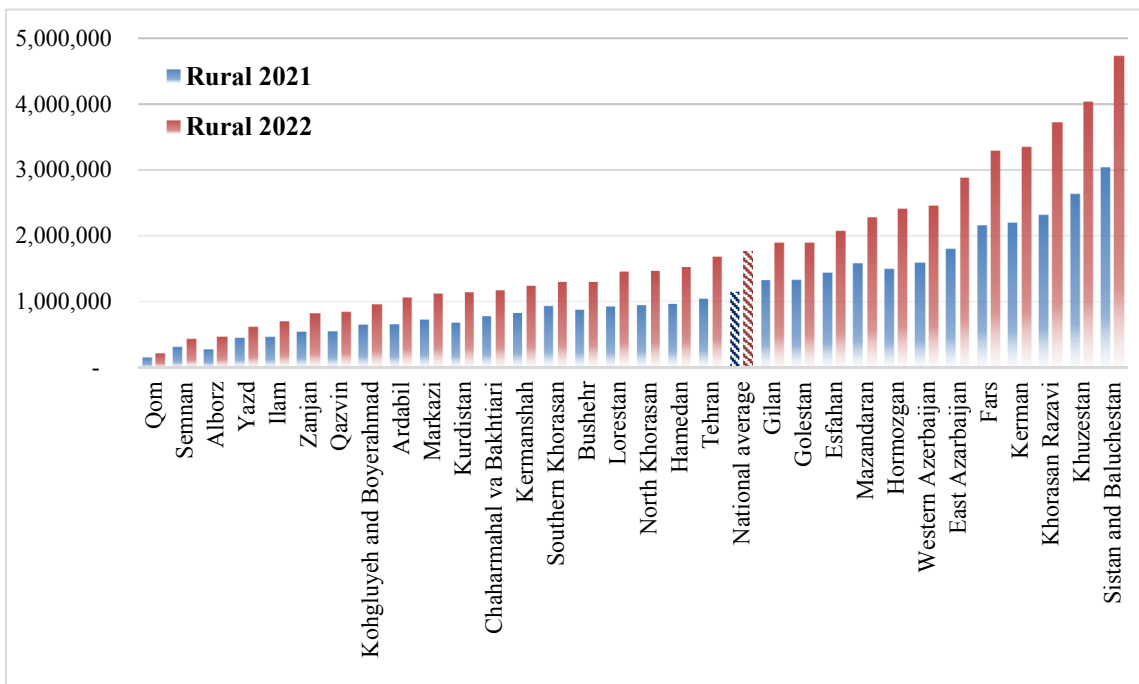


Figure 2. Provincial comparison of PHC budget allocation in rural areas

sion of the cities) in 2022. It was the lowest in Gilan, Bushehr, and Golestan provinces and the highest in Kurdistan, North Khorasan and Markazi provinces, respectively. Also, the health per capita of urban areas in 2021 was the lowest in Tehran, Golestan, Chaharmahal, and Bakhtiari provinces and the highest in North Khorasan, Lorestan, and Ardabil provinces, respectively. It is important to mention that in order to achieve complete equality in the allocation of PHC budgets in urban areas, the allocation budget should reach 31,130,716 million rials (\$124,522,864) in 2022 from 26,503,002 million rials (\$73,619,450). These numbers show shortage of

4,627,713 million rials (\$12,854,758) in the allocated budget of this field.

Regarding the comparison of the allocation budget in rural areas, the average allocation budget in rural areas in 2021 and 2022 is 1,144,350 and 1,752,936 million rials, respectively (\$4,577,400 and \$4,869,267). 19 provinces below the national average and 12 provinces above the national average have received the budget. Also, the per capita budget of rural areas in 2021 is the lowest in Mazandaran, Razavi Khorasan and Tehran, respectively, and the highest in the urban areas of South Khorasan, Bushehr and North Khorasan respectively (Figure 2). Also, the per

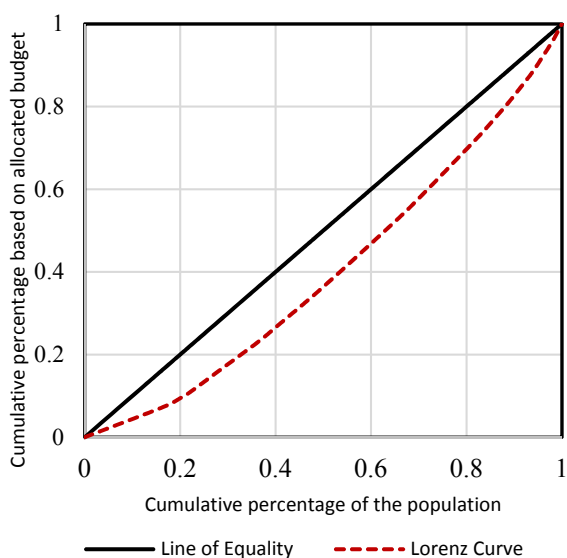


Figure 3. Lorenz curve of total PHC budget allocation in 2021

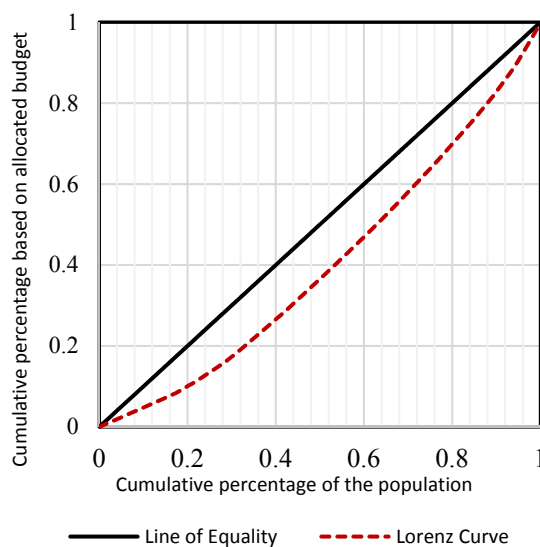


Figure 4. Lorenz curve of total PHC budget allocation in 2022

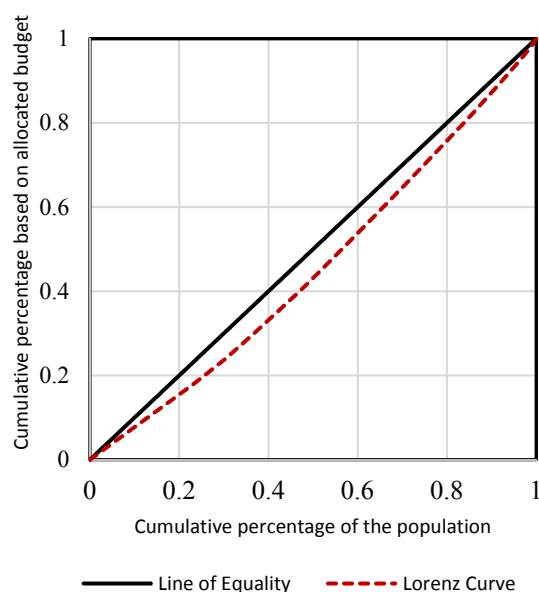


Figure 5. Lorenz curve of urban budget allocation in 2021

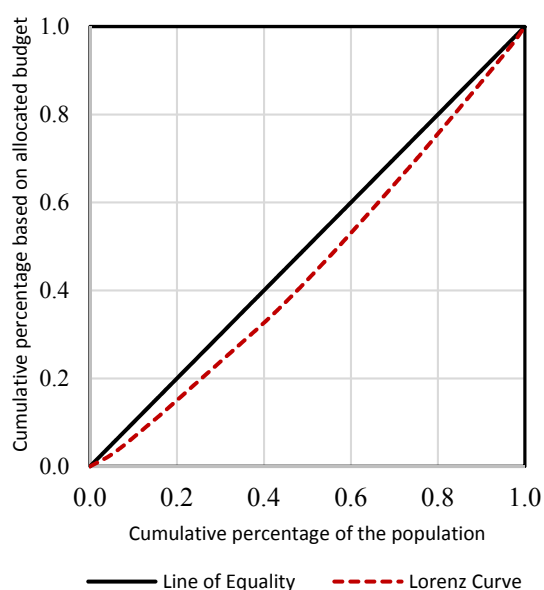


Figure 6. Lorenz curve of urban budget allocation in 2022

capita budget of rural areas in 2022 was the lowest in Mazandaran, Razavi Khorasan and Tehran respectively, and the highest in South Khorasan, North Khorasan and Bushehr respectively.

In the following, the Gini coefficient was used to investigate the inequality in the allocation of the total PHC budget (urban and rural) among the provinces. The Lorenz curve was used to show the Gini coefficient, and this curve was presented in Figures 3 and 4 for the allocation of PHC budgets. According to Figures 3 and 4, the Lorenz curve is far from the full equality line, which means that

there is relative inequality in the allocation of PHC budgets in the country. The numerical value of the Gini coefficient for the budget allocation in this study in 2021 and 2022 was 0.20 and 0.19, respectively. Also, according to Figures 5 and 6, the numerical value of the Gini coefficient calculated for the specialized PHC budget for the urban sector in 2021 and 2022 was 0.09 and 0.10, respectively. In the same way, according to Figures 7 and 8, the numerical value of the Gini coefficient for the specialized PHC budget for the rural sector in 2021 and 2022 was calculated as 0.14 and 0.13, respectively (Table 3).

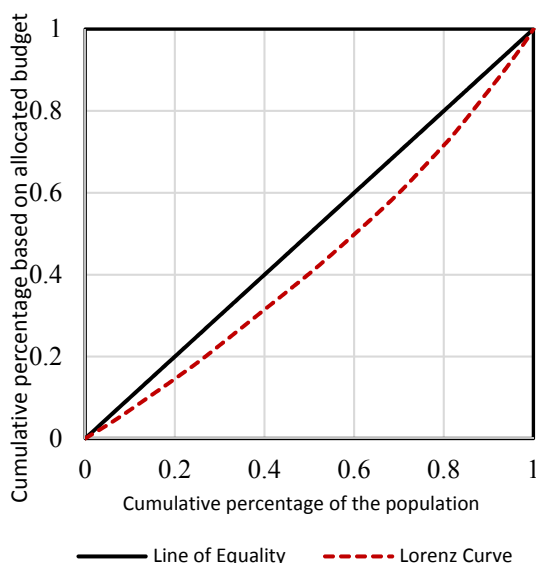


Figure 7. Lorenz curve of rural budget allocation in 2021

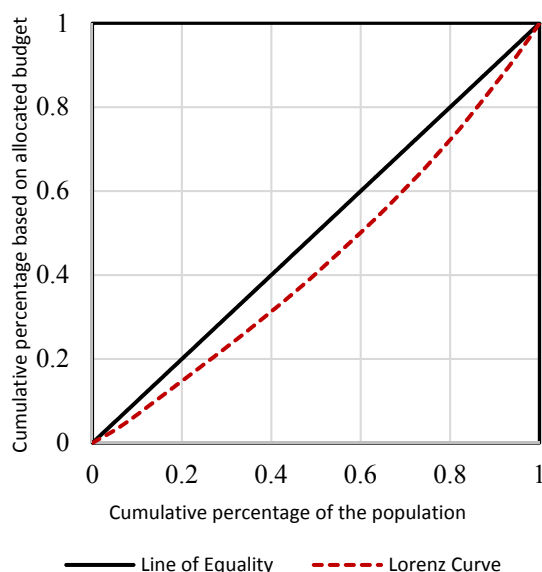


Figure 8. Lorenz curve of rural budget allocation in 2022

Table 3. Gini coefficient for the budget allocation in 2021 and 2022

	2021	2022
Allocation of the total PHC budget STD	0.20	0.19
	0.27	0.28
Allocation of budget in urban areas STD	0.09	0.10
	0.28	0.31
Allocation of budget in rural areas STD	0.14	0.13
	0.28	0.29

### Discussion

One of the most important and influential sources for financing the country's PHC is the government budget. Therefore, most of the health expenses in Iran are covered by the government, and equality in the allocation of these costs plays a significant role in developing equity and creating infrastructure for all people. On the other hand, considering that the main policy-makers and decision-makers of the health system should be aware of the situation of inequality in the allocation of resources and make decisions based on the available evidence (22), in the present study, the allocation of government budget of PHC in the years 2021 and 2022 was investigated. In general, the evaluation shows that regarding the allocation budget per capita, the number of provinces with a numerical value lower than the national average (especially in the rural sector) is more than the provinces with a numerical value higher than the national average. Since The Gini coefficient is one of the most frequently used measures of economic inequality, in this study, this coefficient was used to determine the allocation of the PHC budget. The main features of this coefficient are that it does not depend on the size of the population and reflects situations where income is transferred from the richer group to the poorer group. The Gini coefficient shows that the allocation of the government budget in the provinces of the country is relatively unequal.

Similar studies were also carried out in this regard, including the results of Jian Jin's study titled "Equal Allocation of Health Resources in China," which showed that the resources at the disposal of the health system, including medical facilities, hospital beds, and specialized human resources, are unequally distributed and the calculated Gini coefficient was equal to 0.19, 0.07 and 0.07, respectively (22). In another similar study in the same field, Kazemian et al. concluded that based on the Gini coefficient, the Concentration index and the Kakwani progressive index, the allocation of government health budgets in the provinces of the country and the direct payments of households for government health care are inequitable, which the Gini coefficient of income distribution among households was estimated as 0.38 (19). In Jamshidi's study, the Gini coefficient and the Concentration index for the quality of hospital services were calculated as 0.128 and 0.166, respectively, which indicated better quality of services for those with higher economic status from patients' point of view and inequity in hospital service quality from the experts' point of view (23). According to the findings of the present study, the Gini coefficient was 0.20 and 0.19 in 2021 and 2022, respectively. In this way, it can be said that in the past years, at the same time as the country's health per capita increased, the allocation of income among the provinces has experienced better conditions than in previous years.

Mohammadzadeh also showed that with the aim of investigating equity and measuring inequalities in health insurance payments of households, there is an unequal distribution of expenses across demographic groups separately for urban and rural areas, and also the Kakwani index was calculated in a regressive (inequity) manner. In

this study, the Gini coefficient of urban areas from 1983 to 1989 was calculated as 0.40 on average and on average 0.38 in rural areas (24). The results of Alizadeh et al.'s study, similar to the present study, showed that medical expenses were significantly distributed to the detriment of the weaker sections of society to the point where about 4% of the country's population suffered from catastrophic health expenses (14). Dong's study with the aim of measuring the inequality in the distribution of health system resources using the Tile index, the Gini index and the Moran index in China showed that the inequality in the distribution of resources experienced a decreasing trend during the years 2011 to 2016. However, some areas that need more resources were identified (9). According to the results of the present study, the Gini coefficient decreased slightly in the second year and the equality index in the allocation of financial resources in the urban area is better than in the rural area.

#### Study limitations

PHC budgets may be spent differently depending on the different infrastructures in each province of the country. Therefore, conducting a study on the general allocation of the budget among the provinces cannot show equality and justice in creating infrastructure and health facilities, benefiting from services, and improving health and prevent diseases. In this study, only the allocated budget of the Ministry of Health was considered and other variables were not investigated.

#### Implications for Future Research

It is suggested that a comprehensive systematic review should be conducted considering all dimensions of equity, including the wide dimensions of equity and equality, as well as various studies, each of which has examined only certain aspects of the subject. Also, studies should be conducted to examine and compare the use of budgets allocated to the provinces of the country through the examination of health outcomes (health status) using standard indicators and the level of health infrastructure in these provinces.

#### Conclusion

Inequality in health budget allocation, especially in deprived areas, can make the people of that area poorer, in addition to the burden of medical expenses on people, and in this way, we will witness population growth in the face of catastrophic health costs in the country. Advocacy for the reallocation of resources in the health sector based on evidence and based on the deprivation coefficient of demographic groups is one of the most basic ways to support the low-income sections of society. Based on the results of this study, it seems that the border provinces and deprived provinces have higher per capita health than the national average, and according to the health status of these provinces, it shows the correct policy of the Ministry of Health in the field of PHC in these provinces. In Iran's health system, the provision of PHC services in rural areas is being done with the least weakness. While the develop-

ment of prevention services in urban areas is one of the necessary policies due to the increase in the urban population and the spread of non-communicable diseases in these areas. It is hoped that the results of this research will provide valuable information to policymakers and managers of the health system in order to plan and implement targeted reforms of the healthcare financing system.

#### Authors' Contributions

Prof. Mohsen Barouni developed the theoretical formalism, performed the analytic calculations, and performed the numerical simulations. Both Dr Hosien Farshidi and Mohammad Arab. authors contributed to the final version of the manuscript. Hamed Nazari supervised the project. Somayeh Karimi and Farzaneh Ghasem did the data collection.

#### Ethical Considerations

This research was approved by an ethical committee at the Tehran University of Medical Sciences with IR.TUMS.SPH.REC1398.323 code.

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#### Conflict of Interests

The authors declare that they have no competing interests.

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