Website: http: jebhpme.ssu.ac.ir
EBHPME 2018; 2(2): 109-14 pISSN: 2538-5070

EBHPME

ORIGINAL ARTICLE

Evidence Based Health Policy, Management & Economics
Health Policy Research Center, Shahid Sadoughi University of Medical Sciences

The Relationship between the Distribution of General Practitioners and the Mortality Rate of Children Based on the Gini Coefficient and Lorenz Curve

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ARTICLEINFO

Article History:
Received: 17 Jan 2018
Revised: 20 Mar 2018
Accepted: 17 June 2018

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ABSTRACT

Background: Equity is one of the most important issues in the distribution of resources and access to health services. Although it is very challenging to address health equity issues, it deeply affects policy making, resource allocation, and generally the legal principles of government and society. This study aimed to determine the inequality of distribution of general practitioner in Tehran province.

Methods: This was an applied study that by ecological descriptive method investigated the relationship between the distribution of general practitioners and the mortality rate of children in the cities of Tehran province in 2012-2015. The data collection tool was a researcher-made form including the name of the city, the number of general practitioners, the mortality rate for children under five years old, and the population of each city. The STATA software with the $DASP_{21}$ version 2.1 was used to draw the Lorenz curve. The $SPSS_{19}$ software and Pearson correlation coefficient (P-value < 0.05) were utilized for analyzing data.

Results: Based on the results the Gini coefficient for general practitioners was not significantly changed and was in a relatively equitable position, the Gini coefficient varied from 0.269 to 0.299. The results of the study did not show a significant relationship between the distribution of general practitioners and the mortality rate of children, although, with an increase in the ratio of general practitioners, the mortality rate of children decreased (P-value $\geq$ 0.05).

Conclusion: The results of the study indicate that the distribution of general practitioners was relatively inequitable. Therefore, it is essential for the Ministry of Health to establish the balance in the distribution of the human resources.

Key words: General Practitioner, Gini Coefficient, Inequality

Citation

This paper should be cited as: Hajimaghsoudi M, Baghian N, Raadabadi M. **The Relationship between the Distribution of General Practitioners and the Mortality Rate of Children Based on the Gini Coefficient and Lorenz Curve.** Evidence Based Health Policy, Management & Economics. 2018; 2(2): 109-14.

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Introduction

Health is one of the most fundamental human rights and should be equally accessible to all people in the community. Achieving this goal requires skilled human resources such as physicians, nurses and other healthcare professionals along with other resources that are considered as the main sources of health care organizations. However, the main problem in this area is the limited resources and unlimited needs of the community (1). Due to population growth social and economic systems has faced many challenges for providing equitable access, in particular, in the health sector (2). Development of health facilities plays an important role in access to these services and as a result in promoting overall health; however, it does not necessarily mean better functioning of the health system or adequate access. Distribution and productivity of these facilities should be considered (3). Resource allocation, productivity, effective participation of local, national and international communities at all levels, along with respect for equity and access to decent quality health services are important principles in providing, maintaining and promoting human health (1). Human resources are the most important source of health in all countries (4). In fact, quality and equity, which are fundamental concepts in health systems, are closely linked to the human resources (5). Not only the quantity of human resources but also its distribution in different parts of a country, depending on the demographic, epidemiological and pathological characteristics is very important. The unreasonable increase in the human resources and their irrational distribution is waste of valuable resources. Distributing human resources polices are made at the macro level by the Ministry of Health. However, these policies are not enough to make doctors to work in rural and marginalized areas of the country; therefore, the Ministry of Health needs to use incentive policies. Mostly doctors prefer to work in urban areas due to good facilities and benefits, and in addition they can benefit from working in the private sector (6). Consequently the geographical distribution of the human resources would be heterogeneous (7). Health workforce has a dynamic and variable nature, which has systematically made its distribution as a permanent concern for policymakers (8). Studies conducted by institutions and researchers at different times indicate a kind of inequality and imbalance in the distribution of human resources. The distribution of the hospital beds are varied in different provinces, in 2007 the number of hospital beds ranged from 86 to 126 beds per 100,000 population in provinces such as Sistani Baluchistan, South Khorasan and Kerman to 209 to 249 beds in Semnan, Tehran and Yazd (9). This degree of diversion and differences between the provinces in terms of resources distribution is considerable. Therefore, the present study was conducted to determine the distribution of general practitioners between 2012 and 2015.

Materials and Methods

This was a descriptive-ecological study that investigated the relationship between equity of the distribution of general practitioners and the mortality rate of children in the cities of Tehran province between 2012 and 2015.

The data gathering tool was designed by the researcher based on the objectives of the study and the views of several experts. This form includes the name of the city, the number of general practitioners, and mortality rate of children under five years and population of each city, which was received after university official permission.

Researchers completed the forms by referring to the health and human resources deputy with the help of experts of the relevant units. Collected data were entered Excel software, then, in order to examine the distribution of general practitioners, each indicator entered the DASP software version 2.1; therefore, the index was calculated based on the population of the cities. Hence, each index was entered into the software and the Gini coefficient was estimated.

To draw the Lorenz curve, the STATA software

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with the DASP version 2.1 was used. The $SPSS_{19}$ software and Pearson correlation coefficient (P-value < 0.05) were utilized to analyze the data.

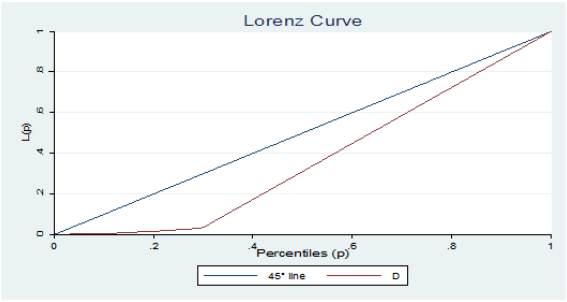
Results

The Gini coefficient for general practitioners based on population did not change significantly and was in a relatively equitable position; the Gini coefficient was varied between 0.267 and 0.299.

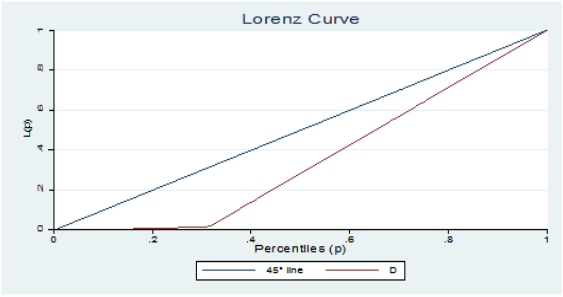
According to the results there was not a significant relationship between the distribution of general practitioners and the mortality rate of children; however, with an increase in the proportion of general practitioners, children mortality rate has decreased (P-value < 0.05) (Table 2).

Table 1. Gini coefficient for distribution of general practitioners in the cities of Tehran in 2012-2015

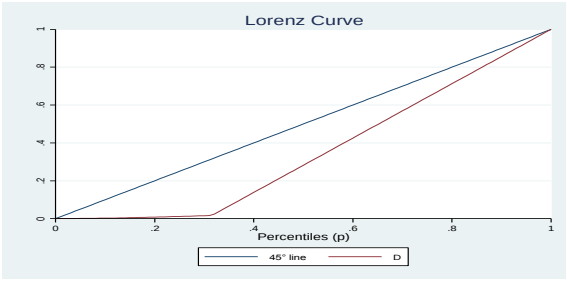
Year	Gini coefficient
2012	0.267
2013	0.297
2014	0.299
2015	0.296



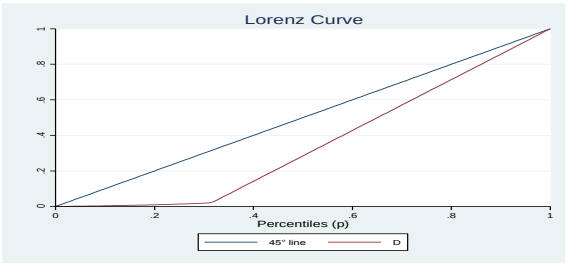
(G = 0.26) 2012 Year



(G = 0.29) 2013 Year



(G = 0.29) 2014 Year



(G = 0.29) 2015 Year

Figure 1. Lorenzo curve for cities of Tehran in 2012-2015

Table 2. The relationship between the distribution of pediatricians and gynecologists and children mortality rate

Year	Statistics	Mortality rate of children under five years
2012	Correlation coefficient (r)	- 0.201
	P^{8}	0.21
2013	Correlation coefficient (r)	0.187
	P	0.28
2014	Correlation coefficient (r)	- 0.240
	P	0.09
2015	Correlation coefficient (r)	0.199
	P	0.20

*Significant at the 0.05 level

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Discussion

Distribution of general practitioners was relatively suitable; however, it was not distributed completely equitable. The results of a study in Shahr-e-Kord in this regard showed that distribution and access to health services was not equitable in health centers. Spatial distribution maps of population, distribution of health units, population covered by each health center indicate that north, north-east, south-west and south-east parts of the city lack the facilities and services; however, the inhabitants of the central areas of the city benefit more from such services. There is a functional interference in health centers; therefore, there is a waste of resources which is consistent with the results of the Shaeli study in the urban areas of Tehran (11). A study in Kermanshah showed that distribution of health centers is not according to population density and the centers have not been located in suitable places (12). These results are consistent with the Zahedi asl (13) study that showed there is a significant difference in the access of health services in different regions of Iran. In the study of Taghvaee (14) on the distribution of health services in Iranian cities, the results are similar to present study and about 90% of the cities are deprived.

According to study of Sharifzadegan (15) on inequality in access to public health services in Isfahan, for the development of urban health, location of public health centers should be considered.

The Gini coefficient varied from 0.2 to 0.35 for general practitioners and specialists. Gini index from 0.2 to 0.3 show equity in the distribution ranges from 0.3 to 0.4 show inequality, and values between 0.4 and 0.6 represent a high degree of inequality in distribution. Values above 0.6 represent a complete inequality. Since the most important part of equity is the allocation and distribution of resources according to need (16), the present study was faced with a small degree of inequality in the distribution of health facilities. However, due to the fact that these centers were at the primary level of health services, even small inequality could lead to huge problems in the health system.

In the study of De Bruin et al. (17), in 24 Dutch university hospitals during 2004-2006, the Gini coefficient was 0.65 and 0.5, which clearly indicates unequal distribution of hospitals beds. Toiea Horo et al. (18), investigated the geographical inequality in resource allocation in the United States, they had pointed to a downward trend in the distribution of doctors to hospital beds over a 30-year period. Considering variables such as the number of physicians as the basis of equity, there was inequity in health services in some areas. Although equity in the distribution of health resources, and especially measuring it, is so challenging, it has a major impact on the policy making and resources allocation (19).

The World Health Organization has also emphasized on equity in the distribution of resources, inequality in the geographical distribution of health resources poses difficulties for people to access these services (20).

Developing countries due to the weakness in the recording systems, collecting, storing and analyzing information face more inequity in distribution of resources; hence, it should increasingly focus on the level of geographical equity in the distribution of health resources as a public health index (21).

Conclusion

The results of the study indicate that the distribution of general practitioners is inequitable. Therefore, in order to establish the balance in the distribution of the general practitioner, it is essential for the Ministry of Health to assess the human resources in its centers.

Acknowledgements

The authors express their gratitude to the authorities of the relevant departments for their help in conducting this study. This research has been supported by Tehran University of Medical Sciences & health Services grant 93-04-61-27409.

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Conflicts of Interest

The authors declare that they have no conflicts of interests.

Authors' contributions

Raadabadi M designed research; Raadabadi M conducted research; Baghian N and Raadabadi M analyzed data; and Hajimaghsoudi M and Raadabadi M wrote the paper. Raadabadi M had primary responsibility for final content. All authors read and approved the final manuscript.

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