

**The Assessment of Inequality in the Geographical Distribution of Burn Beds in Iran**Sara Geravandi<sup>1</sup>, Marziye Najafi<sup>2</sup>, Roya Rajaei<sup>2</sup>, Saeid Mahmoudi<sup>3</sup>, Mohsen Pakdaman<sup>3</sup><sup>1</sup> M.Sc. Student of Health Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran<sup>2</sup> School of Public Health, Shahid Beheshti University of Medical Science, Tehran, Iran<sup>3</sup> Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran**Type of article:** Original**Abstract**

**Introduction:** In recent years, the World Health Organization (WHO) has emphasized the importance of determining the equality of the distribution of healthcare resources. Inequalities in the healthcare system are one of the world's most important developmental challenges, and the inefficiencies that exist in healthcare systems are the most important reason for these challenges. Thermal burns are one of the common injuries worldwide, and their effects are a significant reason for the mortality and morbidity rates throughout the world. Considering the importance of burns as one of the 30 leading causes of death in Iran, this study was aimed to compare the distribution of burn beds with its disability-adjusted life years (DALY) in Iran.

**Methods:** This applied analytic-descriptive study was conducted in order to determine the distribution of burn beds in Iran using the Lorenz curve. In this way, the distribution of burn beds was analyzed in relation to the population of each province and lost DALY caused by burns in Iran. For each province, the number of burn beds in 2012 was collected from credible and authoritative sources at the Ministry of Health, and the population of each province was obtained using data from the National Center of Statistics. The data were analyzed and presented using Microsoft Office Excel.

**Results:** Isfahan and Khorasan Razavi Provinces had approximately 11 and 10.4% of the country's burn beds, respectively. The Provinces that had the most DALY were Sistan Baluchestan, Fars, and Kerman with 10.75%, 10.34%, and 9.54%, respectively. The Gini coefficients of burn beds in relation to population and DALY were calculated as 0.09 and 0.16, respectively.

**Conclusion:** The Gini coefficients in relation to population and DALY were less than 0.2. Although the Gini coefficient of the burn beds in relation to DALY was more than that for the population, the difference was not significant, and the distributions of beds regarding the two calculated coefficients were equal. It is recommended that healthcare policymakers distribute burn beds in proportion to the populations of the provinces.

**Keywords:** equity, geographical distribution, burn bed, Gini coefficient

**1. Introduction**

The World Health Organization has recognized healthcare and receiving medical treatment when needed as important components of human rights, and many countries consider these to be crucial rights to the extent that some countries have included these rights in their constitutions. Article 29 of the Constitution of the Islamic Republic of Iran states that social security and health services are the public's right and requires the government to provide these services and by funding them from public resources (1). Equal access to healthcare is a fundamental right for all people throughout the world. However, the inequality in the geographical dissemination of health resources is the main obstacle for fair access to health services for people (2, 3). In developing countries, there are shortages in context information, expertise of health, and health planning, and most of the resources are allocated unevenly. In this regard, the distribution of hospital beds (as a resource of health systems) can be considered as one

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of the indicators of access to health services (4). The health experts' main concern in this area is that some patients may suffer from disabilities or even die due to inappropriate access to health services. It is difficult to measure inequality. This term and lack of access have been discussed extensively; they examine the impact of specific policies on inequality (for example health inequalities in upright health is the effect of public policies), while the political atmosphere influences inequality both positively and negatively (for example, persistent differences in "bad health" among social groups). Good and bad health both are considered similarly, but with different points of view concerning the definition of health inequalities. Changes and differences in health achievements of individuals and groups can be seen (1). Despite quick economic development and great achievements in the health sector in the last century, there are various contradictions among diverse nations and regions of each country. Ten years ago, Acheson found that inequality in life expectancy was constant and mainly associated with specific socioeconomic groups. Even in countries with high health status, the average health inequality is greater than it is in developing countries (4). Health inequalities between urban and rural regions and also among different provinces are obvious in China. Because of regional differences, health inequality in urban and rural areas has attracted everyone's attention as a major problem that has political importance (5, 6). Before suggesting resolutions to reduce health inequalities to improve the people's health status, the policymakers must identify the differences in health inequality, which can be measured by various indicators (7). Many of research attempt to expand indicators, ways to measure inequalities of health, and identify health inequalities. It is possible to determine appropriate parameters for measuring the health inequalities, which are systematic variations between social and economic groups, due to the increased interest associated with satellites that provide geographical information. Countries that do not have high income inequality and increase the same amount of improvement in life expectancy over time experience are not inserted in the low ranks of international classification. From the viewpoint of the Commission on Social Determinants of Health (CSDH), health inequality in various countries has a progressive trend (2). Some studies have even emphasized regional changes in receiving equality in healthcare (9). Studies have shown that different factors affect health, such as personal, social, economic and geographical factors (10). Considering the importance of burns, which makes them one of the main 30 causes of death in Iran, the authors aimed to compare the distribution of burn beds in the different provinces throughout the country to determine whether the distribution was equitable or not.

## **2. Material and Methods**

### *2.1. Study design and data collection*

In this applied study, which was done in a descriptive-analytic fashion, the DALY-related data of each province were collected from mortality statistics booklets in 29 provinces. Data related to the population of provinces was extracted from the Iran Statistics Center. Note that 27 of the 31 provinces were studied. Then other four provinces, i.e., Tehran, Alborz, Qom, and Ilam, were excluded due to the lack of adequate information. For each province, the number of burn beds in 2012 was collected from credible and authoritative sources at the Ministry of Health. In this way, the distribution of burn beds was analyzed in relation to the population of each province and lost Disability Adjusted Life Years (DALY) caused by burns. For each province, the number of burn beds in 2012 was collected from credible and authoritative sources at the Ministry of Health, and the population of each province was obtained using the data of National Center of Statistics.

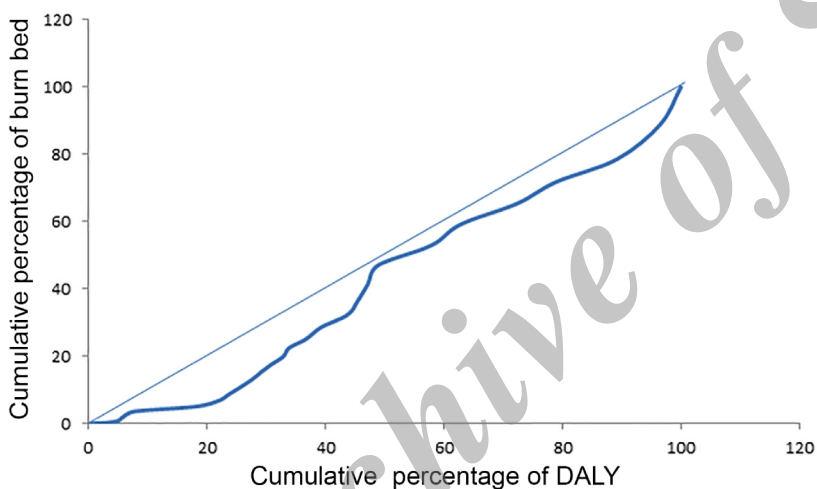
### *2.3. Measurements and analyses*

The Lorenz curve has been used extensively by economists to evaluate wealth distribution, household incomes, and the Gini coefficient, which is obtained from the Lorenz curve and is a brief index that shows the amount of inequality in resource distribution; recently, this index has been used for the analysis of the staff working in the health care centers (doctors, dentists, and nurses) and also the distribution of equipment, such as imaging equipment, diagnostic equipment, and beds (8-12). The Lorenz curve compares the distribution of a special variable with the same distribution of that variable, which represents equity. In the Lorenz curve, the X-axis represents the cumulative percentage of the population. The Y-axis represents the percentage of the variable that is proportional to population aggregation. The 45 degree line is called the "Equality Line" because it displays a fully equal distribution. The farther the Lorenz curve is from this line, the more inequality there is (13). In our study, the X-axis showed the cumulative percentage of the population for each province in the country and their DALYs, and the Y-axis represented the cumulative percentage of burn beds for each province. The Gini coefficient was calculated according to the Lorenz curve, and it included the division of "the area between the diagonal line and the Lorenz curve" on "the whole area beneath the diagonal line." The Gini index was calculated as the following:  $G_1 = 1 - \sum (X_k - X_{k-1})(Y_k + Y_{k-1})$ , where: X = cumulative percentage of population and DALY, and Y = cumulative percentage of burn bed. The numerical value of the Gini index was between 0 and 1, with 0 representing full equality and 1 showing

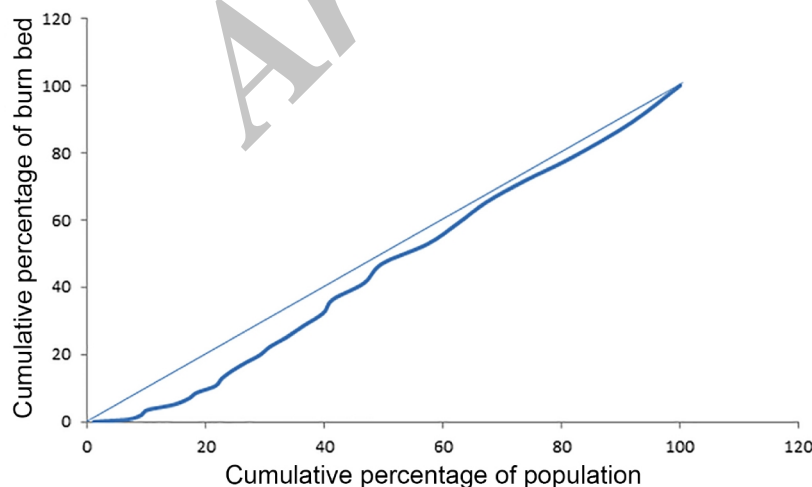
full inequality. There was full equality in the distribution when the Gini index was less than 0.2; when the index was between 0.2 and 0.3, there was high equality in the distribution; when the index was between 0.3 and 0.4, there was inequality; when the index was between 0.4 and 0.6, there was high inequality, and when the index was greater than 0.6, there was full inequality in the distribution (14). Microsoft Excel software was used to analyze the data. The total number of burn beds for each province was collected using reliable sources and documents from the Ministry of Health.

### 3. Results

The findings of this study showed that there were 864 burn beds in the 27 provinces that were studied. That translates to about 1.55 beds per 100,000 in Iran based on the 27 provinces. The highest numeric values of burn beds were reported for Isfahan Province (95) and Khorasan Razavi Province (90). The statistics showed that approximately 11 and 10.4% of the beds were in Isfahan Province and Khorasan Razavi Province, respectively. Also, the lowest numeric values of burn beds were for Semnan (no beds), Chahar Mahal Bakhtiari (2 beds) and Gilan (5 beds) Provinces. The total DALY due to burns was calculated as 74632.6. The maximum DALY were for Sistan and Baluchestan Provinces with 10.75%, Fars Province with 10.34%, and Kerman Province with 9.54%. The minimum DALY were for Semnan (0.64%), Qazvin (0.91%), and Zanjan (0.98%) (Figure 1). According to the Iran Statistics Center, the highest population among the studied provinces was in Khorasan Razavi Province (10.08%), followed by Isfahan (8.21%) and Fars (7.81%). The most sparsely populated provinces were Semnan (1.06%), Kohgiluyeh-Boyer Ahmad (1.143%), and South Khorasan (1.147%) (Figure 2).



**Figure 1.** The Lorenz curve of burn bed distribution in regard to DALY of burns.



**Figure 2.** Lorenz curve of burn bed in population level.

#### 4. Discussion

The purpose of this study was to evaluate the inequality in the geographical distribution of burn beds in Iran using the Gini coefficient. In this study, we investigated equity in the distribution of burn beds in 27 provinces. The study of the distribution of beds according to population indicated equity in the geographical distribution of beds. The DALY index can be used as an indicator of the incidence and prevalence of diseases and the effectiveness of treatment. Distribution of burn beds in relation to population and DALY were studied in this survey. The Gini index, which was used to measure equity in the distribution of beds, is used extensively in the health arena for the measurement of equity in the distribution of resources. The Gini index for distribution of burn beds in the provinces considering population and DALY was less than 0.2. Although the Gini index of burn bed distribution in relation to DALY was more than its value in relation to population, this difference was not significant, and the distribution of beds considering the two calculated indexes seemed equal. Note that our analysis was conducted at the province level and considering the fact that most of the beds exist in big hospitals of the province's centers. If analyses were conducted at the town or small city level, the Gini coefficient would have been higher than the value obtained in this study. A study conducted simultaneously on the distribution of Non-Cardiac Intensive Care Beds in Iran showed that the numbers of ICU, Post ICU, and NICU beds per 100,000 people in the country were 5.3, 0.4, and 1.6, respectively, and the Gini coefficients for ICU, Post ICU, and NICU beds were reported as 0.17, 0.15, and 0.23, respectively (15). From the viewpoint of the Commission on Social Determinants of Health (CSDH), health inequality in various countries has a progressive trend (2). Studies in some countries, such as England (16), Turkey (17), Italy (18), Australia (19), and the USA (20) have shown that inhabitants of the rural areas or areas in the vicinity of big cities have lower levels of accessibility to intensive care. The results of this study indicated equity in the distribution of burn beds, but this should not be interpreted to mean that the existing number of beds is adequate.

#### 5. Conclusions

Our findings showed that the Gini index was less than 0.2 for the distribution of burn beds in the provinces we studied, considering population and DALY. This study indicated that there was equity in the distribution of burn beds, but it did not, by any means, suggest that the existing number of beds was adequate or that equality exists in the geographical distribution of burn beds in Iran. It is recommended that burn beds be distributed according to the needs and the populations of the provinces.

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#### Conflict of Interest:

There is no conflict of interest to be declared.

#### Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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