

Analysis of development levels in the cities of Tehran province regarding health infrastructural index: the strategy of standardized score and Morris' inequality index

Ali Javani¹, Masoud Abolhallaje², Mehdi Raadabadi³, Hanieh Rezaee Dehaghi⁴
Aslan Nazari⁵, Hamed Nazari⁶, Azadeh Chatrouz^{*7}

Received: 12 July 2015

Accepted: 20 September 2015

Published: 25 November 2015

Abstract

Background: One of the main indexes of development is health index or the degree to which a society enjoys health and therapeutic services. The present study was done with the aim to analyze development levels in cities in Tehran regarding health infrastructural index using the standardized score and Morris' model.

Methods: This is a descriptive and pragmatic study which ranks 14 cities in Tehran province using the standardized score and Morris' models based on 10 selected health indexes. The required data were gathered using a researcher-made information list and the information gathered from the Statistics Center and Tehran University of Medical Sciences. The data were analyzed using Excel software.

Results: The development coefficient in the studied cities varies from 0.595 to -0.379 so that Rey city has the highest level of development and Pishva city has the lowest level of development among the studied cities. The more number of the cities (43%) was among the rather undeveloped group and none of the cities (0%) was in the rather developed group.

Conclusion: Regarding the findings, there is a big gap and difference regarding enjoying health and therapeutic infrastructural indexes among the cities in Tehran province. Therefore, it is suggested that development-oriented plans consistent with development levels should be implemented in these cities.

Keywords: Development, Standardized Score, Health.

Cite this article as: Javani A, Abolhallaje M, Raadabadi M, Rezaee Dehaghi H, Nazari A, Nazari H, Chatrouz A. Analysis of development levels in the cities of Tehran province regarding health infrastructural index: the strategy of standardized score and Morris' inequality index. *Med J Islam Repub Iran* 2015 (25 November). Vol. 29:304.

Introduction

According to experts, development is defined in many different ways. One of them is that development is the increase in production, promoting the health and therapeutic services' level, and eliminating problems. Therefore, development as it is con-

sidered by people and national institutions is a complicated and multidimensional process that requires changes in social structure, accelerating economic growth, reducing inequality, eradicating poverty, establishing social justice and equality, and environment stability. Therefore, in order to

¹. M MA in Business Management, Budgeting and Performance Monitoring Center, Ministry of Health and Medical Education, Tehran, Iran. a.javani@gmail.com

². Assistant Professor in Health Services Management, Budgeting and performance Monitoring Center, Ministry of Health and Medical Education, Tehran, Iran. mohme2003@gmail.com

³. MSc in Health Economics, Health Services Management Research Center, institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran. Mehdiraadabadi@gmail.com

⁴. MSc in Planning Economic System, Ministry of Health and Medical Education, Tehran, Iran. honny2904@yahoo.com

⁵. Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran. hnazari89@yahoo.com

⁶. PhD student in Health Services Management, School of Medical Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran. Anazari_1983@yahoo.com

⁷. **(Corresponding author)** MBA, Financial Management, Tehran University of medical science, Tehran, Iran. a.chatrouz@yahoo.com

achieve development, identifying developed and undeveloped regions is of great importance in the first step (1). Codifying and establishing development and success strategies in implicational and executive plans, studying and recognizing capabilities and shortcomings and deficiencies, determining development levels in regions based on a set of appropriate indexes are inevitable requirements through which executive managers will become enable to identify development strategies based on needs and specific conditions in each and propose plans consistent with the conditions in each region (2,3). Assessing and evaluating and determining priorities help executive managers meet necessary needs more quickly. Health and Therapy section is one of the sections in which prioritizing for meeting needs regarding resources limitation is essential (4). Inequality and its dimensions are indexes of underdevelopment because in fact countries are considered developed that have high economic and social indexes and the distribution of incomes and revenues and facilities is rather equal in them while in undeveloped countries the amounts of these indexes are low and there is inequality in their distributions (5). Numerous indexes are considered for assessing development level with the limitations in a time interval or period and place range. Health is among these indexes (6). There has been a lot of efforts to define and design an appropriate instrument which is an indicator of the socioeconomic status of people in a society(7, 8). The findings of studies at an international level reveal different findings. In general, there has been a lot of debates and discussions in this regard. For example, Australian researchers believe that using an index such as the validity of residency place for determining the socioeconomic status of individuals is very questionable. Therefore, it is necessary to use different indexes for determining the socioeconomic status. Among these different development indexes, health care index is one of the most important indexes of progress and development in any country

due to its significant role in providing the society's health and the success of national development programs depends highly on achieving these aims (9). A transient look at the health indexes in the country in the past decade shows the fast growing trend of the promotion of the indexes on one hand and inequalities in some indexes in different regions and provinces in the country on the other hand. It is necessary that in Iran like in any developing country, special attention should be paid to the development of health and therapy section in order to improve the country's development status and position among other countries in the world since development in this section is the prerequisite for the development in other sections of the society. Nowadays, the issue of development is a big concern in many countries. In other words, development is nothing more than making the living status and conditions more satisfying for people (10).

A lot of studies have been done about ranking the level of health indexes of development using statistical methods and mathematical patterns. In a research, regions of Portugal were assessed and ranked regarding development using factor and cluster analysis techniques in the time intervals of 1991 and 1995 (11). In studies by Soares et al.(11) in Portugal and Yanis and Andriant (12), regions are ranked using health and economy indexes by factor analysis and clustering and fuzzy logic models. Despite all criticisms to using quantitative models in city issues since 1970, mathematic models can give a clearer picture and understanding of city phenomena if they are established and codified in simple frameworks with limited number of variables. Standardized score and Moriss's models are among quantitative models for assessing and ranking regions. Standardized score model is used for comparing indexes and obtaining a single index from the combinatory results of the indexes. In fact, the standardized score model can uncover main differences among regions regarding the determined indexes (13). Morris' model is

also introduced as a model for ranking regions in terms of development by civil program of the United Nations' organization which is the most recent official model applied at an international level and is capable of being developed, replaced, and applied in the planning environments with various different scales.

Therefore, for achieving this goal and establishing social equality, it is necessary to rank regions and identify their degree or level of development regarding health and therapy indexes, determining capabilities, shortcomings, and deficiencies. The present study addresses the analysis of development levels in cities in Tehran province regarding health infrastructural indexes using standardized score and Morris' inequality models.

Methods

The present study is applied or pragmatic based on its aim and descriptive based on its nature. In this study, the cities in Tehran were ranked based on health indexes in 2012 using standardized score and Morris' models. The studied geographic scope was Tehran province and the statistical population was 14 cities in Tehran. After studying the experts' articles and opinions, 10 indexes were selected as health indexes including the ratio of active medical and therapeutic institutions to a population of one thousand individuals, the ratio of beds at active medical and therapeutic institutions to a population of one thousand individuals, the ratio of health therapeutic and medical centers to a population of one thousand people, the ratio of governmental public health and medical institutions to active health and medical institutions, the ratio of daily medical and therapeutic centers to active health medical and therapeutic centers, the ratio of 24-hour health medical and therapeutic centers to active health medical and therapeutic centers, the ratio of laboratories to a population of one thousand individuals, the ratio of pharmacies to a population of one thousand individuals, the ratio of radiology centers to a population of

one thousand individuals, and the ratio of rehabilitation centers to a population of one thousand individuals. The required data were gathered from the Statistics Center and Tehran University of Medical Sciences using a researcher-made information list including items and questions about the name of the cities, the number of active medical and therapeutic institutions, available beds, the number of health and medical therapeutic centers, the number of governmental public health medical and therapeutic centers, the number of daily health medical and therapeutic centers, the number of 24-hour health medical and therapeutic centers, the number of laboratories, the number of pharmacies, the number of radiology centers, the number of rehabilitation centers, and the population of the cities. After the completion of the lists, the development in cities was ranked and calculated using Morris' inequality and standardized score models in Excel in 2010. The calculations in the two methods are as follows:

First, the indexes were standardized based on the city using standardized score model, as follows:

$$SS_{ij} = \frac{X_{ij} - \bar{X}}{S_{m_i}} \quad (1)$$

Which, SS_{ij} is standardized score of index i for city j , X_{ij} is amount of index i for the city j , \bar{X} is mean of indexes and S_{m_i} is standard deviation of the index i .

Then, the standardized score of each of the studied indexes in each city are added up together and the result is divided by the total number of indexes. The obtained score is the average of the standardized score or the development index of any city that makes the comparison regarding development status possible as a single index:

$$SS_j = \frac{1}{n} \sum_{i=1}^n SS_{ij} \quad (2)$$

Which, SS_j is the index for city j and N is the number of considered indexes.

In Morris' model, the development status or position of each region among other regions is determined based on the selected indexes using the gathered information for each region. This method is used for reporting human resource development by the United Nations and the obtained index is the evidence showing countries' ranking regarding human resource development. In this method, the deviation of the numerical values of the index i in any region or area from the minimum of the index i among the regions or areas is divided by the range of the changes of that index, and the degree of the inconsistency or inequality of the numerical value of the index in relation to the dispersion index of its changes or variation range is computed ($R = X(\max) - X(\min)$).

$$MII_{ij} = \frac{X_{ij} - X_{(\min)i}}{X_{(\max)i} - X_{(\min)i}} \quad (3)$$

Which, MI_{ij} is the value of Morris' inequality index for I index in the region or neighborhood j , X_{ij} is the numerical value of the index i in the region or neighborhood j , $X_{(\min)i}$ is the lowest value of the index i and $X_{(\max)i}$ is the highest value of the index i .

In the next step, the mean of the numerical values of Morris' inequality index for indexes in each region or neighborhood is applied as the criteria for determining the ranking or development status from the highest value (the first ranking) to the lowest (the last ranking):

$$MI_{ij} = \frac{1}{n} \sum MI_{ij} \quad (4)$$

Which, MI_j is development index for region or neighborhood j and n is the number of considered indexes.

In addition, for determining the developmental gap in health and therapy section in cities, 5 classifications of developed, rather

developed, intermediately developed, less developed, and undeveloped were considered. Then, for determining the distance between cities in 5 levels, first the range of changes in scores was obtained using A formula and then the distance between levels was calculated by B formula and as a result the cities were classified in 5 groups.

$$R = X_n - X_i \quad (A)$$

$$a = \frac{R}{k} \quad (B)$$

Results

Based on the standardized score model, Rey city has the best, and Pishva city has the worst condition in terms of health indexes (Table 1).

Based on the standard score model, 28% of the cities were placed in developed group and 43% of the cities were in undeveloped group (Table 2).

Based on Morris' inequality model, Rey has the best state and Pishva has the worst state (Table 3).

Based on Morris' inequality model, 28% of the cities were placed in developed group and 43% of the cities were placed in undeveloped group (Table 4).

Discussion

The first step for developing health and therapy section and reducing the gap re-

Table 1. Ranking and the development coefficient of the cities using the standardized score model

City	Ranking	Development Coefficient
Rey	1	0.595
Firoozkooh	2	0.590
Tehran	3	0.508
Damavand	4	0.489
Robat Karim	5	0.225
Eslam Shahr	6	-0.122
Varamin	7	-0.151
Pakdasht	8	-0.169
Ghods	9	-0.270
Baharestan	10	-0.300
Shemiranat	11	-0.302
Shahriar	12	-0.350
Malard	13	-0.363
Pishva	14	-0.379

Table 2. Levels of development in the enjoyment of health indexes in the cities (standardized score model)

Group	The Distance between Levels	Degree of Development	City	Number of Cities	Percentage
First	0.401-0.595	Developed	Rey, Firoozkooch, Tehran, Damavand	4	28 %
Second	0.40-0.207	Rather Developed	-	0	32 %
Third	0.206-0.013	Intermediately Developed	Robat Karim	1	8 %
Fourth	0.012-(-0.181)	Less Developed	Eslam Shahr, Varamin, Pakdasht	3	21 %
Fifth	-(-0.182-0.379)	Undeveloped	Ghods, Baharestan, Shemiranat, Malard, Pishva	6	43 %

Table 3. The ranking and development coefficient of the cities using Morris' inequality model

City	Ranking	Development Coefficient
Rey	1	55.23
Firoozkooch	2	54.29
Tehran	3	52.15
Damavand	4	52.03
Robat Karim	5	42.95
Eslam Shahr	6	33.42
Varamin	7	32.28
Pakdasht	8	31.86
Ghods	9	29.02
Baharestan	10	28.23
Shemiranat	11	28.02
Shahriar	12	26.19
Malard	13	26.16
Pishva	14	25.97

garding health among different regions is to achieve a thorough understanding of the condition of the healthcare sector in the region. Indexes of development in developing countries are not distributed equally in the regions and geographical zones. One of the main indexes of development is health index or in other words, the degree to which a society benefits from the health and therapeutic services and facilities. Iran is not an exception. The developmental gap of these indices can be easily observed in the prov-

inces and cities in the country.

The findings showed that regarding the rate of development in the health sector, there is a deep development gap among the cities in Tehran and the distribution of health services and facilities in the cities of the province seems unbalanced and unequal. For determining the development of cities in the standardized model, five levels of highly developed, developed, developing, deprived, and very deprived were considered. Based on standardized score and Morris' inequality, only 28% of the cities were placed in the developed countries and this is in line with the results obtained by Tofighi et al (14) and Mirvis (15). Therefore, planners and policy makers should focus their efforts to find the cause of the gap in development. Given the values of Tables (1) and (3), Rey city has maintained its superiority over other cities and was considered as the developed city and Pishva got the last ranking for the development of health indexes. The noticeable point is that Tehran is in the third ranking despite the fact that it is the capital city which indicates

Table 4 levels of development in the cities regarding the enjoyment of health indexes (Morris' inequality model)

Group	The Distance between Levels	Degree of Development	City	Number of Cities	Percentage
First	25-31	Undeveloped	Ghods, Baharestan, Shemiranat, Malard, Pishva	6	43 %
Second	31-37	Less Developed	Eslam Shahr, Varamin, Pakdasht	3	21 %
Third	38-43	Intermediately Developed	Robat Karim	1	8 %
Fourth	44-49	Rather Developed	-	0	0 %
Fifth	49-55	Developed	Rey, Firoozkooch, Tehran, Damavand	4	28 %

that the geographical location cannot be considered as the factor influencing the development of a city and this was confirmed in other studies (14). Bahadori et al. (16) also investigated the ranking of the health structural indexes in Golestan province using Scalogram method. The results showed that there is a large gap regarding the benefits of the health structural indexes among the cities in Golestan province. Aqqala city with 97 points enjoyed the most and Azad city with 41 points enjoyed the lowest level of the benefits of health structural indexes respectively. In this Study, the highest score of development was nearly twice the lowest development score. In the studies by Nastaran (17) and Zarabi in Isfahan (18), Amini in all the provinces in the country (19) and Taghvaei in all the provinces in the country (20), similar results were obtained about the gap in enjoying the health structural indexes. Therefore, it is suggested that officials, authorities, and planners pay attention to eliminating the mentioned problems, achieving growth and equal regional development, balancing the pattern of the distribution of health services and facilities, and decentralization of them in some cities (21). The distribution of health services and facilities should be done based on the level or degree of underdevelopment in cities. In general, ranking the country's cities and provinces in health sector makes it possible for the related authorities to make more accurate planning, identify strengths and weaknesses, and prioritize resources adapted to the needs of each city and province. In summary, the results showed that statistical methods are effective tools for ranking and determining the status of development in the health sector. The results of this study concerning the allocation of the health sector resources would be useful for health planners and policy makers.

Conclusion

Structural indexes have always been considered as one of the main factors influencing health status and life. Thus, to achieve a

fair, balanced, and equal state of health in the province, it is suggested to make plans and take actions based on facts and the development situation of provinces and cities in order to reduce the gap in accessing and enjoying health facilities and services among the cities. Furthermore, it is suggested that in the first stages of city development, authorities need to focus on short term policies and equity in access and pay attention to the development of necessary services in developing and deprived cities over a medium and long term plan.

References

1. Charlton K, Webster J, Kowal P. To Legislate or Not to Legislate? A Comparison of the UK and South African Approaches to the Development and Implementation of Salt Reduction Programs. *Nutrients* 2014;6(9):3672-3695.
2. Currie G. Gap analysis of public transport needs: measuring spatial distribution of public transport needs and identifying gaps in the quality of public transport provision. *Transportation Research Record: Journal of the Transportation Research Board* 2004;1895(1):137-146.
3. Sajjadi HS, Seyedin H, Aryankhesal A, Sarabi Asiabar A. A systematic review on the effectiveness of thermography in diagnosis of diseases. *International Journal of Imaging Systems and Technology* 2013;23(2):188-193.
4. Sanson-Fisher RW, Perkins JJ. Adaptation and validation of the SF-36 Health Survey for use in Australia. *Journal of clinical epidemiology* 1998; 51(11):961-967.
5. Nel E, Rogerson C. Re-thinking spatial inequalities in South Africa: lessons from international experience. *Urban Forum* 2009; 20(2):141-155.
6. Wilson J, Tyedmers P, Pelot R. Contrasting and comparing sustainable development indicator metrics. *Ecological Indicators* 2007;7(2):299-314.
7. Tello JE, Bonizzato P. Social economic inequalities and mental health II. Methodological aspects and literature review. *Epidemiology and Psychiatric Sciences* 2003;2(04):253-271.
8. Rezapoor A, Roumiani Y, Ebadifard azar F, Ghazanfari S, Mirzaei S, Sarabi asiabar A, et al. Effective factors on utilization and access to health care: a population-based study in Kerman. *Journal of Health Administration (JHA)* 2015;18(60):Pe24-Pe35, En36.
9. Lawson JS, Black D. Socioeconomic status: the prime indicator of premature death in Australia. *Journal of Biosocial Science* 1993;25(04):539-552.

10. Le Fanu G. International development, disability, and education: Towards a capabilities-focused discourse and praxis. *International Journal of Educational Development* 2014;38(0):69-79.
11. Soares JO, Marquês MML, Monteiro CMF. A multivariate methodology to uncover regional disparities: A contribution to improve European Union and governmental decisions. *European Journal of Operational Research* 2003;145(1):121-135.
12. Phillis YA, Andriantiatsaholiniaina LA. Sustainability: an ill-defined concept and its assessment using fuzzy logic. *Ecological Economics* 2001;37(3):435-456.
13. Scipioni A, Mazzi A, Mason M, Manzardol A. The Dashboard of Sustainability to measure the local urban sustainable development: The case study of Padua Municipality. *Ecological indicators* 2009;9(2):364-380.
14. Hamouzadeh P, Moradi Hovasin N, Sadeghifar J, Tofighi SH. Ranking West Azerbaijan districts regarding utilization of structural indices of health care. *The Journal of Qazvin University of Medical Sciences* 2013; 17(2):41-9.
15. Mirvis DM, Chang CF. The relationship between health and development: health as an economic engine. *Tenn Med* 2003;96(1):29-31.
16. Bahadori M, Shams L, Sadeghifar J, Hamouzadeh P, Nejati M. Classification of health structural indicators using scalogram model in Golestan province, northern Iran. *Iranian journal of public health* 2012;41(5):58.
17. Nastaran M. Analysis and measuring degree of concentration and distribution of health indices in Isfahan. *Journal of The Faculty of Literature and Humanities* 2001;27(1):145-62.
18. Zarabi A, Mohammadi J, Rakhshanasab H. Spatial analysis of health and medical services development indices. *Geography* 2008;10(32):199-215.
19. Amini N, Yadollahi H, Inanlou S. Ranking of Country Provinces Health. *Social Welfare Quarterly* 2006;5(20):27-48.
20. Taghvaei M, Shahivandi A. Spatial distribution of health services in Iranian cities. *Social Welfare Quarterly* 2011;10(39):33-54.
21. Jafari M, Bastani P, Ibrahimipour H, Dehnavieh R. Attitude of health informationsystemmanagers and officials of the hospitals regarding the role of information technology in reengineering the business procedures: A qualitative study, *HealthMED* 2012;6(1):208-15.