

The Evaluation of Ardabil's Rural Districts to possess HealthCare Services with Spatial justice Approach

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ABSTRACT

The healthcare as one of the most important social sections has decisive role in the health of the community members in every community; so, it is underlined by all of the countries in the field of social welfare as one of the universal human rights. The present study aims to evaluate Ardabil's rural districts to possess Healthcare services with space justice approach. This research is practical and descriptive-evaluative in terms of purpose and nature respectively. For this purpose, 13 healthcare indicators were selected according to different texts and available statistics and they were weighed by entropy method and they were determined using this data in order to analyze in different methods (Topsis, Vicor, Saw) and the Copland method was finally determined for development level of healthcare services from the view point of spatial justice in Ardabil's villages. Pearson Correlation Coefficient was also used to examine the relationship among the rural districts development with the population and its distance from metropolitan centers. The obtained results of each method reveals that each of the models indicates different levels of healthcare development in view of spatial justice. So, an integration technique was used as Copeland in order to get general consensus. The results obtained from the performance of Copeland technique revealed that Rezagholi-Ghashlaghi, Dojagh and the Angote Sharghi were in the first grade and Vilkiye-markazi, Meshgine-sharghi and Yortchie-gharbi were in the final grade respectively due to have the healthcare indicators. Also, there is a meaningful relationship between the rural districts' development with the population and their distance from civil centers. The obtained results of the rural districts' ranking based on development grade regarding healthcare indicators in view of spatial justice reveal that Ardabil's rural districts are in an unequal state in terms of having their healthcare indicators. According to the research results, it is proposed that the rural districts with lower grade in terms of the healthcare indicators (more deprived) should be in priority for planning and application of development projects.

Key words: *Spatial Justice, prioritize, healthcare indicator, Multi-criteria decision making, Ardabil's rural districts*

Introduction

In today's world, the crises of human societies are rooted in social inequalities and lack of justice (Rafipour, 1997, 65). One of the most important of these inequalities are in having

general services in residential areas. Such an inequality and lack of space balance in different areas is not a new phenomenon in the world countries at all. But, the space differences are exacerbated in developing countries because

of the obvious social economic differences, inequalities and lack of balance in general services. Today, lack of sufficient service centers, disturbance in distribution and services location are the major problems of residential areas and the quality of life has been compromised with lack of fair distribution of public services in cities and villages. Therefore, the distribution of facilities should be based on the principle of justice and it must be able to provide the space and distributive justice among different areas. So, the topic of spatial inequalities in developing countries and establishing social justice in having residents from public services have been converted to one of the serious problems involving planners and managers (Tabei et al. 2016:4).

The nature of healthcare services is such that needing them is not unique for the special group of people; in fact, all humans in all residential areas require them. Lack of healthcare services especially in rural areas will have negative outcomes which the most important of them is the horrible effects on the humans life (Zarabi et al. 2011: 155). So, the systematic management and services to the villages' people in addition to implement the objective meaning of space justice give rise to proper benefit of people from the mentioned services and decrease rural problems. But, the problem of shortcomings in the provision of these services is one of the most basic available challenges in the world's rural areas especially the villages of developing countries nowadays. The healthcare services is from the most important services given the ascending path of contamination, diseases progression, displacement of population and so on nowadays which should be considered by the government and the authorities based on the people's needs. How to access these services is based on justice category and is considered from the basic aspects to offer healthcare services which is accompanied by such cases as suitable distribution of facilities, fair decision making in resources distribution, responsiveness according to the patients' needs and suitable access to these facilities. (Xavier Cuadras & Pinto, 2005:10). Access to healthcare services has always been studied by researchers in different countries of the world (Hendryx et al, 2012:76) and it has an indisputable role in improving health

level in order to do social activities and creating development space in the society. So, the optimal access to healthcare services is considered as a background to create justice and equal opportunities for success of rural areas.(Hataminezhad & et al, 2012:76).

The weakness and inefficiency of management and rural planning in optimal rural service have made the background to injustice in order to access rural different services especially healthcare services; this problem is necessary for optimal operation of the infrastructures and find out the inequalities of leveling in Ardabil's rural districts. It can made better management and planning by knowing infrastructures and their ranking in the areas level. Ardabil's rural districts are not in similar conditions to have healthcare services. So, the present research is in an unequal state following the villages' ranking based on development grade due to healthcare indicators.

Measuring the healthcare indicators and using the efficient models as the most desirable and suitable evaluation methods of the fair distribution of the healthcare indicators among Ardebil's villages is one of the methods to meet social justice of this part of the state. Also, the importance of this comparative study is that the life level of the people of an area can be well revealed with knowing bottlenecks, abilities and the areas development levels and again can be paid to offer some programs to decrease the deprivation of those areas and the space injustice and can be prepared suitable conditions to make area development. Therefore, the major purpose of this research is to investigate the situation of the healthcare indicators development in the Ardabil's rural districts level for planning in order to decrease spatial inequalities.

Theory and Methodology

Several researches have been done with different attitudes about spatial justice and regional inequalities and identifying lagging areas in geographic different levels which has been tried here to address healthcare level along with other levels for ranking the geographic different regions to the extent that studies are available. A summary of the objectives and results of these studies is presented in Table 1.

Table1: some sources related to developmental sensitivity with the space justice approach.

| AUTHORS | TOPIC(RESEARCH ACTIVITY) | RESULTS |
|-----------------------------|--|--|
| Hataminejad et al (2012) | The study and analysis of space justice of health services using Mortis, Topsis and Taxonomy in Mazandaran province | Regarding the concepts of justice, there is a disorder in distribution of health centers, especially in relation to population, as the most important factor in the provision of services, at the provincial level. |
| Tesu et al (2005) | The measurement of integrated accessibility – oriented indicator on justice in urban public services in one of Taiwan's cities | Indicates the unfair distribution of urban public services in the city. |
| Mousavi & colleagues (2015) | Evaluation of West Azerbaijan city in terms of terms of benefiting from development indicators of health services | Indicators of health services development in West Azerbaijan province are not distributed in a balanced way, and there is a huge difference between cities in terms of using health facilities and services. |
| Amini et al (2013) | The Analysis of health indicators in East Azerbaijan province by Numerical Taxonomy | The healthcare facilities have distributed unfairly in the cities of East Azerbaijan. Among the townships of the province. tabriz was recognized as the only pole of the region. The most developed city and the most deprived city in contrast to charai- Mayak township. |
| Ghanbari et al (2011) | The Analysis of the levels of rural areas in Isfahan | The results show that there are many inequalities in quadruple indices such that the ratio is 23 times in Morris process and this difference is about 76% in the taxonomic process. |
| Yazdani et al (2016) | The situation analysis of health care indicators in cities of Ardabil province | The obtained results showed that most of the cities of Ardabil province are at a relatively deprived level to much deprived and are in an instability level in terms of health issues. |
| Sibely & Weiner (2011) | An evaluation of access to healthcare services along the rural urban continuum iv Canada | There is inequality in access to health services between urban and rural communities. |
| Horev et al (2004) | Trends in Geographic Disparities in allocation of Healthcare Resources in the US | The distribution of the physician is unfair in the United States, While the hospital beds is fair in the country. |

A summary and some samples of research records presented in the field of inequality in the development and ranking of regions indicate that most of them are based on different dimensions of development and a number of general and combined indicators of the development of the regions and only a few cases have addressed the one-dimensional study of areas development such as healthcare development and these cases have also addressed the comparison and leveling states together and finally the cities each other. However, the study and analysis of healthcare services with spatial justice approach which is the subject of this research emphasizes the importance of recognizing the case of deficiencies in rural districts of Ardabil province in providing health services with a spatial justice approach. In fact, the innovation of the present research is to rank high levels of rural districts (rural districts of Ardabil province, 69 rural districts), using various methods (topsis, viikour, sav) and the integration method (to access more reliable output) and

emphasizing the space justice which the aforementioned cases have not been performed is in the last similar researches.

Theoretical basics

By the early 1970s, development theories analyzed the non-social dimensions of socio-economic phenomena, and some described the phenomenon of development and its factors (Asadzadeh et al., 2016). The regional development theories after World War II to establish economic and social justice, eliminate inequalities in different dimensions, optimal and efficient distribution of resources and prosperity, resource redistribution, more balanced development of areas as a national and local planning goal Was of interest (Binswanger, 2001, Haughton & counsel, 2004, 2). Regional development theories after World War II was of interest to establish economic and social justice, to eliminate inequalities in different dimensions, optimal and efficient distribution of resources and prosperity, resource redistribution,

more balanced development of areas as a national and local planning goal (Binswanger, 2001, Haughton & counsel, 2004, 2). One of the main pillars of development is social development; social development involves growth in social aspects of life, such as education, nutrition, employment, health and the like, which ultimately provides social welfare and its goals. (Ahadnejad Roshti et al, 2012: 55). Health services should be considered as an integral part of social development that must have clear goals, policies and programs (Nickpour, 2006: 44), and each country must adopt a policy based on these goals and programs that provides healthcare services equitably for all people (rural and urban) (Mohammadi et al., 2013: 158).

The International Association for the Justice in Health, which uses the word "justice" to mean anything in its own right (Mueain, 1993: 2282), states as: The lack of systematic and potential differences in one or more aspects of health in a population, and economic, social, demographic, and geographic subgroups (Heidari chaiane et al, 2014: 23). According to the definitions of justice, social justice is achieved when health care is distributed according to the needs of individuals (Zere et al, 2007: 6). Therefore, access to health services is a precondition for community justice, and the right to healthcare will create equal opportunities in the community (Ahadnejad Roshti et al., 2012: 55).

Social justice is the concept of justice that everyone in society enjoys (Mueain, 1993: 2282). The concept of social justice, at least since Aristotle, has been raised due to the necessity of social organizations as their subject and instructions. Now, if the orientation of justice moves from social classes to geographic spaces, the notion of spatial justice is important (Marsousi, 2003: 30).

Space in geography involves the spatial concept of life or ecumenism, where natural constraints allow social organization (Rahnama, 2011: 10 & Zabihi).

Researchers have attributed the concept and dimensions of spatial justice to the social sciences. For some space justice, only equal access to basic public facilities and services at a given distance, such as access to school, health facilities or cultural activities, etc., is available. The general concept of spatial justice is that you must be treated equally and fairly with all residents wherever they live (Kunzman, 1998: 101). Others also define spatial justice as the same distribution of services based on the needs, tastes, preferences of residents and service standards (Liao et al, 2009: 138).

In addition, Tullen and Ensilin argue that the distribution of spatial distribution of facilities and public services must be emphasized by the spatial distribution of various social economic groups for the analysis of spatial justice (Talen & Anselin, 1998: 598). In sum, the category of justice in this study, from the point of view of the spatial justice of healthcare services, refers to a situation in which there are no gaps and differences among different classes and groups of society, so that inequalities in society continue to be found. With these interpretations, (the spatial) justice in a universal context pays more attention to the equal rights of human beings or social actors, maintaining and protecting their human dignity, providing basic living needs and social self-esteem that is the echo and objective representation of the deliberate or unconscious will of various political and social institutions, the bureaucratic system, national macro policies, executive and legislative systems, regional and local governance, etc. (Javan & Abdollahi, 2008: 137-138). Therefore, the planners should seek to find out how much inequality has been created and which departments have been deprived of society in the pattern of location services and how they are distributed. (Hooko, 2001, 5). Even the issue of environmental justice is also a key issue in the sustainable development paradigm. This concept establishes the common goals for environmental protection and social justice (Michel & Norman, 2012).

Although the concept of environmental justice has been considered as a public concern since the early 1820s, it actually emerged in the mid-1980s as the basis for the challenge of racial equality in the United States (Laurent, 2011, p. 263).

Research Methodology

Ardabil province is in the north west of the country and in the middle of the meridian 47 degrees, 17 minutes and 48 degrees and 55 minutes in the eastern longitude and 37 degrees and 6 minutes, and 39 degrees and 42 minutes in the northern latitudes, and It is limited from the West to East Azerbaijan Province, from North and Northeast to Azerbaijan, from the East and South East to Guilan province and from South to Zanjan province. Ardabil province is a provincial province with a longitudinal distance of 290 km and its southernmost point is 290 km, and the eastern and westernmost

distances are more than 132 km. The area of Ardabil province is 17799 square kilometers, which accounts for about 1.1 percent of the total area of the country. The length of the boundaries of this province is about 370 kilometers with the Republic of Azerbaijan. The number of county cities in the 2012 census was ten.

From 2011 to 2016, the political divisions of the province in the county did not change, and the number of cities in 2016 compared to 2011 which were 10 cities and 69 rural district. The political divisions of the rural districts of the province of Ardabil are shown in figure 1 (Mickey, 2017, 2-3).

The present research is applied in terms of its purpose and is descriptive-analytical in terms of its nature and method. The method of collecting documentary information and the study method according to the objectives, the subject and nature of the research, is documentary, and it is tried to identify and

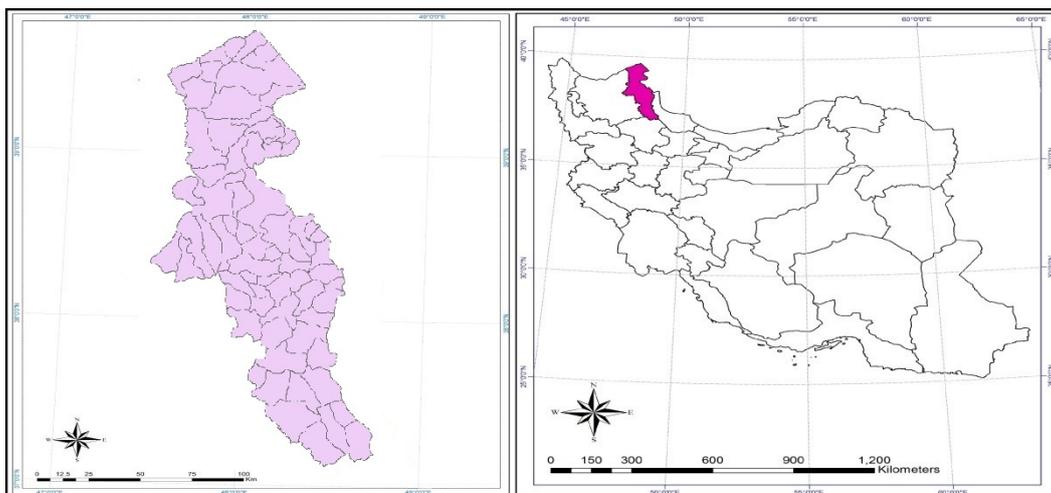


Figure 1: The map of the geographical location of the rural districts of Ardabil province

Analyze the status of the rural districts of Ardabil province within the framework of existing concepts and techniques in relation to the situation and environmental conditions. In the process of work, the data were first compiled using library and electronic resources, and theoretical bases were compiled. Then, in order to determine the levels of access, 13 indicators in the form of health-care component were selected in the rural districts of the province and applied using the entropy models for weighting, Topsis, Vikor and Sav

for ranking and Copeland model to achieve a final rating of use and finally, using the GIS to provide developmental levels as a map, the explanation and analysis of this situation was dealt with. Also, Pearson correlation coefficient was used to study the relationship between village's development with population and their distance from urban centers. The statistical population used in this research includes all districts of Ardabil province along with 13 health and health indicators in the province, as presented in Table

2. It should be noted that cluster analysis has been used to classify villages in terms of development, so that the

degree of development is classified into five categories.

Table 2: The sub- criteria of research

| <i>order</i> | <i>Topic</i> | <i>order</i> | <i>Topic</i> |
|--------------|---|--------------|---|
| 1 | The number of healthcare centers per 1000 people | 8 | The number of dentists per 1000 people |
| 2 | The number of Pharmacy per 1000 people | 9 | The number of paramedic or rural midwives per 1000 people |
| 3 | The number of health home per 1000 people | 10 | The number of practical nurse per 1000 people |
| 4 | The number of rural health center per 1000 people | 11 | The number of veterinarian per 1000 people |
| 5 | The number of maternity facility center per 1000 people | 12 | The number mortuary per 1000 people |
| 6 | The number of family physician per 1000 people | 13 | The number of garbage collection system per 1000 people |
| 7 | The number of doctors per 1000 people | | |

Research techniques

So far, different methods and models have been used to measure and identify spatial inequalities. In this regard, the use of multi-criteria methods is more important. Multi-criteria decision making models can help decision makers interact with the complexity of issues. Multi-criteria decision-making methods (MCDM) include a range of mathematical techniques that are used in various ways depending on the objectives of the study. The Topsis, Vicor and Sav techniques as a member of the MCDM family have now become highly ranked in ranking various concepts in various sciences, the most important of which is the mathematical and transparent logic, as well as the lack of performance problems. The use of these models due to the lack of a pair comparison that requires adjustments in data transfer and data exchange with experts can lead to the validity and reliability of the

research in combination with another technique of this family, such as Shannon entropy. In addition, in the assessment of quantitative criteria, the survey process is subject to collection errors or computations that are always subject to uncertainty. In assessing qualitative criteria, which are often expressed in terms of linguistically by decision makers, judgments include their vague and undisclosed knowledge (Mohammadi et al., 2012, 12-14). Given that multi-criteria decision-making methods are typically related to criteria that are of different importance to decision-makers, it is therefore necessary to have information in relation to the relative importance of the criteria. This item can be obtained by determining the weight for each criterion. Extraction of weights is considered as a key step to understand the priorities of decision-makers (Janice and Reggiani, 2005, 113-141). Table 3 summarizes the models used in this study.

Table 3: The models used in the research and their brief description

| The work steps and formulas | The model's name and its description |
|--|--|
| <p>To determine p_{ij}</p> <p>The entropy of each index (E_j)</p> <p>To determine the uncertainty or degree of diversion of each indicator (d_{E_j})</p> <p>To determine the weight of each index w_j</p> <p>If the decision maker considers a definite subjective weight like w_j for the index, the adjusted weight is equal to:</p> $W_j = \frac{A_j W_j}{\sum_{j=1}^n A_j W_j}$ | <p>Shannon entropy: It is one of the common methods to determine weight or the extent of indexes importance. The basic idea of this method is that the more dispersion in the values of one indicator, the more indicator are more important (Janice & Reggiani, 2005).</p> |
| <p>To form decision – making matrix</p> <p>To normalize decision – making matrix</p> <p>Weighing the normal matrix</p> <p>To determine the highest and lowest numbers of weight normal matrix</p> <p>To determine the suite(s) and dissatisfaction indicators(R)</p> <p>To calculate Q value and the final ranking</p> | <p>Vicor model: It has been made as a multi- criteria decision-making method to solve a discrete decision making problem with unsuitable measures (the various measurement units) and conflicting development (Kalantari, 2007).</p> |
| <p>To form decision matrix</p> <p>The unscaled decision matrix</p> <p>To determine the weight of the criteria vector</p> <p>To choose the best option</p> | <p>Simple Weighting Approach (SAW): It is one of the multi-criteria decision making methods. This method has been proposed by Howang and Yun. In this method which also called as weighted linear combination, the weighted unscaled decision matrix was obtained using criteria weighting coefficients and finally the score of every option was calculated according to this matrix (Ataee, 2010).</p> |
| <ol style="list-style-type: none"> 1. to create decision – making matrix 2. To convert the existed decision making matrix to unscaled matrix 3. to make weighed unscaled matrix 4. to determine the positive and negative ideal solution 5. to get the size of the distances 6. to calculate the relative proximity to the ideal solution 7. ranking options | <p>Topsis Model: It is considered as a multi- index decision – making method and a simple but efficient method in prioritizing in 1992, this method has been proposed by "Chen & Howang" with referencing Howang & Gwo- Hshung, 2004).</p> |

Research Finding

In the research findings, 13 sub-criteria in terms of health and health indicators in the framework of spatial inequality were determined by the developmental and spatial disorientation methods (Topsis, Vicor and Saw) and the ranking of each rural district in Ardebil province. As Table 4 shows, according to the developmental coefficients obtained from each method, the ranking of villagers varies and fluctuates. So that, the higher ranked one to three in Topsis model were

related to eastern Angot villages, Rezagholi ghashlaghi and Balghelu in Victor model were related to western villages, eastern Arshaq and Dojaq and they were related to Dojaq, Rezagholi ghashlaghi and Kalkhoran villages in Sav model and conversely in Topsis model, Dojaq village which was in higher grade in two previous models is in the last grade in this model. Also, Balghelu village which had the penultimate place in Saw model is one of the high ranks in other two models.

Table 4: Ranking of rural districts based on developmental coefficients with triple research models

| Health rank | Rural Districts | Topsis | Rural Districts | Saw | Rural Districts | Vicor |
|-------------|-----------------------|--------|----------------------|---------|---------------------|-------|
| 1 | East Angot | 0.895 | West Angot | 0.447 | Dojagh | 0.056 |
| 2 | Rezagholi Ghashllaghi | 0.887 | East Arshagh | 0.356 | Rezagholi Gheslaghi | 0.068 |
| 3 | Balaghlu | 0.883 | Dojagh | 0.326 | Kalkhoran | 0.081 |
| 4 | Center Arshagh | 0.85 | Shahroud | 0.32 | Center Arshagh | 0.088 |
| 5 | Abgarm | 0.837 | Gogtapeh | 0.294 | palanga | 0.092 |
| 6 | Mehmandust | 0.826 | Anjirlu | 0.29 | North vilkij | 0.114 |
| 7 | Aslanduz | 0.821 | Hir | 0.288 | East Angot | 0.115 |
| 8 | Gharasu | 0.82 | Sardabeh | 0.286 | West meshgin | 0.124 |
| 9 | mahmodabad | 0.819 | North phouladlu | 0.284 | east | 0.127 |
| 10 | dasht | 0.817 | Shal | 0.265 | lahroud | 0.143 |
| 11 | western | 0.811 | Western khandbil | 0.256 | East sanjbad | 0.145 |
| 12 | North gheslaqi | 0.803 | Palanga | 0.255 | mahmoudabad | 0.146 |
| 13 | Paen barzan | 0.799 | Zarjabad | 0.255 | South gheshlagh | 0.148 |
| 14 | savalan | 0.787 | East | 0.255 | North arashgh | 0.149 |
| 15 | kalkhoran | 0.783 | Kalkhoran | 0.254 | arjestan | 0.151 |
| 16 | Tazecand | 0.74 | Baleghlu | 0.243 | shahroud | 0.153 |
| 17 | East gheshlagh | 0.774 | East khandbil | 0.241 | salavat | 0.154 |
| 18 | South vilkij | 0.751 | savalan | 0.239 | Dorson khajeh | 0.156 |
| 19 | salvat | 0.734 | Rezagholi ghashlaghi | 0.238 | Center ajarud | 0.161 |
| 20 | Western Ghshlaghi | 0.734 | South khoresh rostam | 0.237 | West gheshlagh | 0.171 |
| 21 | Ani | 0.734 | East Sanjbad | 0.232 | North Fooladlu | 0.172 |
| 22 | Dorsun khajeh | 0.733 | West Arshagh | 0.23 | Ani | 0.174 |
| 23 | Gogtapeh | 0.721 | Tazakand | 0.229 | Paenbarzand | 0.178 |
| 24 | East Khandbil | 0.721 | East Meshgin | 0.225 | South Khorshrostan | 0.18 |
| 25 | Azadlu | 0.717 | West Gheshlagh | 0.223 | South Vilkiij | 0.18 |
| 26 | East | 0.715 | South Gheshlagh | 0.227 | Mehmandoust | 0.181 |
| 27 | Yaft | 0.708 | North Sanjabad | 0.22 | Anbaran | 0.188 |
| 28 | South Fouladlu | 0.707 | East Ajirud | 0.0.215 | Zarjabad | 0.188 |
| 29 | West Ajirud | 0.706 | Aslanduz | 0.212 | West Arshagh | 0.189 |
| 30 | North Ajirud | 0.705 | Paen Barzand | 0.212 | Abgarm | 0.19 |
| 31 | Palanga | 0.703 | Alvares | 0.213 | East Youtche | 0.19 |
| 32 | Arjestan | 0.698 | South Fouladlu | 0.208 | Gardeh | 0.195 |
| 33 | East Yurtchi | 0.694 | West Savjabad | 0.206 | Tazekand | 0.197 |
| 34 | Shaban | 0.689 | Naghdi | 0.204 | South Fouladlu | 0.2 |
| 35 | North Fouladlu | 0.687 | South Sanjabad | 0.204 | Yaft | 0.202 |
| 36 | North Khoreshrostan | 0.686 | West Anghout | 0.204 | North Sanjabad | 0.202 |
| 37 | Sardabeh | 0.683 | Mahmoodabad | 0.196 | Hir | 0.203 |
| 38 | Dolatabad | 0.677 | North Khoreshrostan | 0.193 | Dolatabad | 0.21 |
| 39 | West Sabjabad | 0.676 | North gheshlagh | 0.191 | Alvares | 0.211 |
| 40 | lahroud | 0.674 | West Ajroud | 0.19 | ghararsou | 0.214 |
| 41 | South Gheshlagh | 0.663 | Yaft | 0.182 | Aslandouz | 0.215 |
| 42 | Gordeh | 0.661 | lahroud | 0.181 | North Ajroud | 0.216 |
| 43 | North Sanjbad | 0.66 | North Arashgh | 0.181 | Minabad | 0.217 |

| | | | | | | |
|----|---------------------|-------|-----------------|-------|--------------------|-------|
| 44 | West Angot | 0.653 | East Gheshlagh | 0.18 | Naghdi | 0.218 |
| 45 | East Ajaroud | 0.644 | Abgarm | 0.179 | Sabalan | 0.225 |
| 46 | Hir | 0.641 | West Meshgin | 0.176 | North Khorshrostan | 0.229 |
| 47 | Naghdi | 0.636 | Anbaran | 0.174 | Anjirlou | 0.2 |
| 48 | Sabalan | 0.632 | Arjestan | 0.171 | Azadlou | 0.232 |
| 49 | Center Ajaroud | 0.63 | West Yourtchi | 0.164 | East Gheshlagh | 0.237 |
| 50 | Alvares | 0.628 | Sabalan | 0.164 | shaban | 0.248 |
| 51 | South Sanjbad | 0.622 | Ani | 0.163 | Sardabeh | 0.259 |
| 52 | Minabad | 0.621 | Central Ajiroud | 0.161 | Savalan | 0.265 |
| 53 | Anjirlou | 0.62 | Savalan | 0.16 | West Anghot | 0.268 |
| 54 | East Arshagh | 0.617 | Dasht | 0.153 | West Agiroud | 0.275 |
| 55 | West Meshghin | 0.608 | North Ajiroud | 0.152 | South Sanjabad | 0.279 |
| 56 | Central Vilkiy | 0.606 | Azadlou | 0.146 | West Yourtchi | 0.281 |
| 57 | North Arshagh | 0.605 | East Anghout | 0.146 | Gogtapeh | 0.287 |
| 58 | Zarjabad | 0.6 | Central Vilkiy | 0.144 | East Ajiroud | 0.2 |
| 59 | Anbaran | 0.598 | North Vilkiy | 0.13 | Dasht | 0.299 |
| 60 | West Khandabi | 0.598 | Dolatabad | 0.127 | East Meshgin | 0.309 |
| 61 | East Meshgin | 0.596 | Gharasou | 0.127 | North Gheshlagh | 0.317 |
| 62 | Shal | 0.594 | Central Arshgh | 0.122 | West | 0.318 |
| 63 | North Vilkiy | 0.593 | Minabad | 0.121 | Shal | 0.321 |
| 64 | West Arshagh | 0.593 | South Vilkiy | 0.119 | West Sanjabad | 0.337 |
| 65 | South Khoreshrostan | 0.598 | Shaban | 0.116 | Central Vilkiy | 0.348 |
| 66 | West Yourtchi | 0.389 | Dorson Khajeh | 0.1 | West Khandbil | 0.352 |
| 67 | Shahroud | 0.388 | Mehmandost | 0.94 | East Khandbil | 0.372 |
| 68 | East Sanjbad | 0.388 | East Yourtchi | 0.87 | Baleghlou | 0.4 |
| 69 | Dojagh | 0.153 | gordeh | 0.074 | East Arashgh | 0.9 |

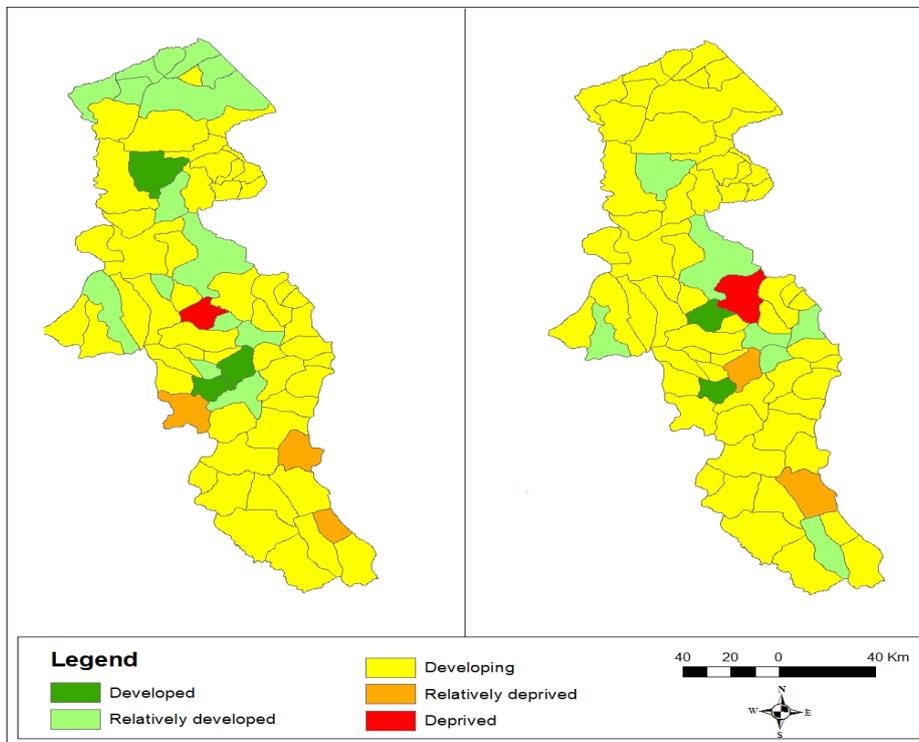


Figure 3: Spatial inequality in the rural districts of Ardabil province by Topsis method

Figure 2: Spatial inequality in the rural districts of Ardabil province by Vicor Method

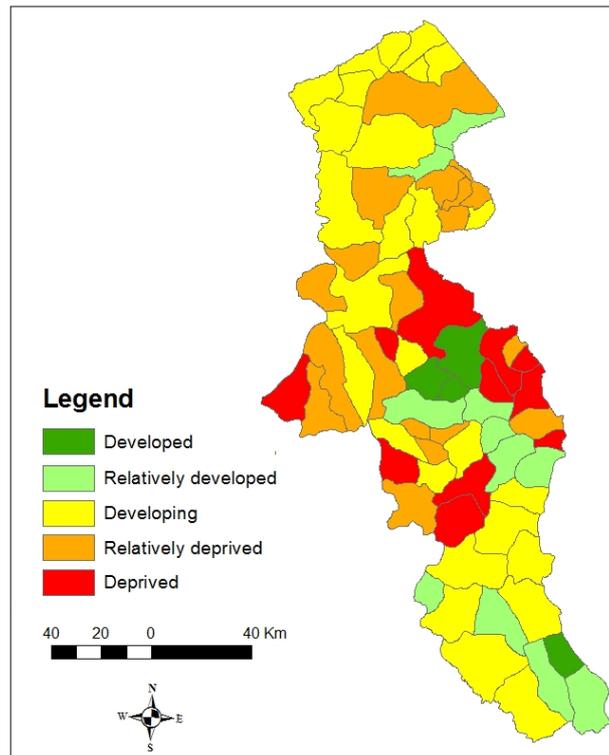


Figure 4: Spatial inequality in the rural districts of Ardabil province by SAW Method

Looking at Table 4 of Figures 2 to 4 on leveling, we can conclude that the use of developmental models, including multi-criteria decision-making methods, yields different results. Because from 69 studied villages and according to performed cluster analysis in SPSS software in Topsis model, 17 rural districts were in developed state(3 villages') and relatively developed (14 villages), 48 villages were in developing state and 4 villages were in a relatively deprived state(3 villages) and deprived(1 village). Now, in the Vicor model there are 9 rural districts (2 rural) and relatively developed (7 rural districts), 56 rural areas in development and 4 rural districts in a relatively deprived (3 rural) and deprived (1 rural) districts. . And in the Saw model, there are 15 rural districts (4 rural) and relatively developed (11 rural districts), 25 rural districts in development and 29 rural districts in poor condition (18 rural districts) and deprived (11 rural districts).

According to the results obtained, it can be concluded that in each of the models, the location of the villages in the development classes can be different

from the other model. Therefore, the integration methods such as the average rating method, the vector and Copeland method can be used in order to more accurately analyze and compare the results of the methods with each other and to obtain a more accurate result, which was used for the consensus on the Copeland method in this study.

The Copeland technique specifies the number of runs and the number of losses for each criterion; that is, if one criteria was priori to another with the majority of votes in a paired comparison, it is indicated by M (win) and if there is not the majority vote or the votes were the same, they are coded by X (loss). In this method, M is the priority of the row on the column, and X is the priority of the column on the row. In the following, by summing up each row, the number of C (Σ) and also each column of the number of losses (R) Σ (for each criterion) is determined (Table 5). Finally, the score that the copywriter gives each option decreases the number of losses R (Σ) from the number of wins C (Σ). In Figure 5, the ranking of rural districts in the Ardabil province is shown by the Copeland method. In this

regard, cluster analysis has been used to illustrate the degree of development and spatial inequality.

Table 5: The final Rating Ardabil's rural districts in the healthcare section with Kapland method

| Health Ranking | Rural District | Kapland | Status | Health rating | Rural District | Kapland | Status |
|----------------|---------------------|---------|------------|----------------|---------------------|----------|---------------------|
| 1 | Rezaghli-gheshlaghi | 66 | Developed | 36 | North arshagh | -6 | developing |
| 2 | Dojagh | 62 | | 36 | South Khoreshrostan | -6 | |
| 3 | East angot | 60 | | 38 | Anjirlou | -7 | |
| 4 | Center Arshagh | 59 | | 39 | East Sanjab | -10 | |
| 5 | Kalkhoran | 58 | | 40 | North gheslagh | -13 | Relatively deprived |
| 6 | Palanga | 54 | | 41 | Naghdi | -13 | |
| 7 | West | 52 | | 42 | West Meshghin | -16 | |
| 8 | Mahmoodabad | 45 | | 43 | West Arash | -16 | |
| 9 | West Gheslagh | 38 | | 44 | East Gheslagh | -17 | |
| 10 | North Foladlu | 38 | | 45 | Central Ajiroud | -18 | |
| 11 | Baleghlou | 37 | | 46 | Shaban | -19 | |
| 12 | Gogtapeh | 31 | | 47 | East Ajiroud | -21 | |
| 13 | Salavat | 25 | | 47 | Alvares | -21 | |
| 14 | South Gheslagh | 25 | | 49 | Gharasou | -22 | |
| 15 | Aslandouz | 24 | | 49 | East Arshagh | -22 | Deprived |
| 16 | Arjestan | 22 | | 51 | West Ajiroud | -23 | |
| 17 | Tazekand | 24 | | 51 | Gordeh | -23 | |
| 18 | Yaft | 24 | | 53 | East Yourtchi | -24 | |
| 19 | Arjestan | 22 | | 54 | Dasht | -26 | |
| 20 | Paeenbarzand | 20 | | 54 | Anbaran | -26 | |
| 21 | Mehmandoust | 17 | | 56 | Sabalan | 27 | |
| 22 | North Khorshrostan | 17 | | 57 | Azadlu | -28 | |
| 23 | Abgarm | 16 | 58 | North Ajiroud | -30 | | |
| 24 | Ani | 16 | 59 | West Angot | -31 | | |
| 25 | Lahroud | 14 | 60 | North Vilki | -32 | | |
| 26 | Dorson Khajeh | 13 | 61 | West Sanjabad | -34 | Deprived | |
| 27 | Hir | 10 | 62 | Dolatabad | -36 | | |
| 28 | Sharghi | 9 | 63 | South Sanjabad | -37 | | |
| 29 | Shahroud | 9 | 64 | Minabad | -44 | | |
| 30 | Shahroud | 5 | 65 | Shal | -46 | | |
| 31 | Zarjabad | 5 | 66 | West Khandbil | -48 | | |
| 32 | South Foladlu | 3 | 67 | Central Vilki | -49 | | |
| 33 | South Vilki | 0 | 68 | East Meshgin | -56 | | |
| 34 | East Khandbil | 0 | 69 | West Yourtchi | -64 | | |
| 35 | North Sanjabad | -5 | Developing | | | | |

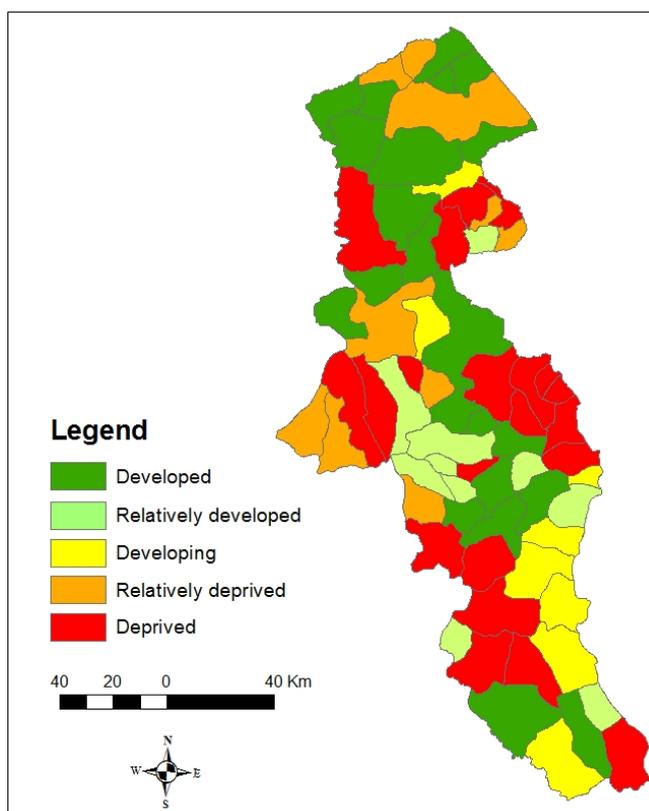


Figure 5: Leveling the districts of Ardabil province using the Copeland method

According to Table 5 and Figure 5, and according to outputs related to the Copland integration model and cluster analysis, Ardabil districts were ranked in 5 levels in terms of degree of development and development of health indicators; so that, in the first floor which is concerned with the developmental stage of health, there are 22 villages with Rezaghli Ghashlaghi as a head. In the relatively developed class, 9 rural districts, on the developing level, 8 rural districts on a relatively deprived level, 9 rural districts and 21 rural districts in a deprived level which the last rural district is the western Uortchi settlement in terms of health status.

Also, Pearson correlation test was used to study the relationship between rural development status and population and distance, so that the rural development level (developed, relatively developed, developing, The result of Pearson test shows that there is a significant relationship between rural development and its population (0.013), and this type of relationship is relatively strong with high Pearson correlation coefficient (0.641). This relationship is also direct in

relatively deprived and deprived), with the demographic situation of the rural districts (less than 5 thousand people, 5-10 thousand, 10-15 thousand, 15-20 thousand and More than 20 thousand people) and distances between districts from residential centers (around the border, around the city, around the city center, around the province center) were measured.

Table 6: The relationship between the health development of Ardabil's Rural Districts with the population and their distance from urban centers.

| Rural Districts development | Correlation Coefficient | Sig | Test Result |
|---|-------------------------|-------|-------------|
| Rural Districts population | 0.641 | 0.013 | Approved |
| The distance of rural distance from urban centers | 0.127 | 0.048 | Approved |

direction, that is, they have become more developed with increasing the population of rural districts and we have seen their deprivation in the healthcare sector with a decrease in population. As the villages of Balaglou, West Kalkhoroun, Gogh Tapeh, Rostam,

Savalan, Aslandoz are among the rural districts of more than 10 thousand people, they are at the developed level in terms of health, and are located in the eastern archipelago, Shal, Western Kandibil, Eastern Meshgin, Azadlou West and North Ajarod, Southern and Western Senjed, Northern Wilkij, Anbar, Dawlat Abad, Minabad, East and West Ursa are also among the villages with a population of less than 10,000 people (mostly under 5,000 people) are at the deprived level of development.

Although there is a significant relationship (0.048) regarding the relationship between rural developments from urban centers, but, this type of relationship is a subset due to low correlation coefficient (0.127) and in this way it can be said that this weak relationship is also confirmed by the results of the Copeland merger model. Most of the developed rural districts are located around the city of Ardabil, Pars Abad and Bilsavar, and their most deprived are around Namin, Garmi and Kosar.

Conclusion

13 healthcare indicators were studied for 69 rural districts of Ardabil province in this paper using Topsis, Vico and Saw models and finally Copeland method in order to assess the extent of deprivation and inequality of each Ardabil rural district in this section for better management and identifying the status of different districts.

The results of analyzing different models showed that each model shows different answers and cannot be trusted. Therefore, Copeland's integration technique was used for the final analysis to overcome this problem. The results of Copeland's technique show that the most developed districts of Ghashlaghi, Daudak, and Angoute are the most developed and West Urutchi villages, Eastern Meshkins and Central Wilkej are the most deprived rural districts in Ardabil province respectively in terms of facilities and health indicators. The results of the research on the rural districts of the Ardabil province indicate that there is a severe

inequality of spatial disparity among fully developed rural areas with relatively deprived and deprived rural districts in having healthcare indicators and the rural districts with more populations and near urban centers, especially the provincial capital, have a high level of development, indicating a high level of attention to these areas in the past.

Also, the findings of this study are consistent with the research on health rating and access to health sector indicators in the provinces of the country in 2006 by Amini et al. and Tahari Mehrjardi and colleagues in 2012; so that there is a severe spatial inequality in terms of health and health indicators in the study.

This pattern of healthcare can be explained based on the theory of the center and the periphery. In the center of the province and the city center, resources and promising economic activities flourish, while the perimeter remains marginal and undeveloped in the development process, and the severe polarization phenomenon emerge due to the unbalanced growth into the region. Accordingly, given that developed rural districts are mostly located in the center of the province or in the center of the cities, peripheral and border rural districts are at a moderate to low level in terms of enjoyment.

In a general conclusion, it must be acknowledged that caution is required in the application of quantitative models, and the mere use of one or more quantitative models can not reflect the realities of a society. This can be attributed to several factors, including the weakness of quantitative methods in providing accurate analysis of the current status of human communities and their behavior, the impossibility of quantifying all qualitative issues, and ultimately the need to reduce the number of variables in quantitative models. However, if used appropriately, quantitative models and methods can be used simply to facilitate planning and decision-making processes and also as a reciprocal point for planners in the basic knowledge of the issues.

To achieve a final result, using the above methods used in this study, Copeland's integration technique is one of the most important methods. The results regarding the situation in rural districts of health indicators show that the rural districts of Ardabil province are in a state of inequality (imbalance in the distribution of health indicators), so that about one third of the rural districts are on the developed level, one third are no longer developed in the underprivileged class, and one third of the remainder are also relatively moderately advanced to relatively deprived. However, in terms of space, rural developmental areas do not follow a particular order and distributed in all regions of the province, developed villages and deprived of development.

While conducting field studies to understand geographic realities and distribution of health indicators is necessary and imperative, however, due to the gap and inequality between rural districts of Ardabil province in terms of health indicators, it is suggested to prioritize the deprived and relatively deprived rural districts in view of health development to improve the sanitary conditions of the province's rural districts and to be more balanced.

Considering the results obtained in order to improve the situation of deprived villages in the health sector in order to better manage this sector in the province, the following suggestions and solutions can be presented:

- To develop a comprehensive development-based program to reduce gaps;
 - Strengthening and paying attention to the main and infrastructure indicators of healthcare development in proportion to the population of each rural district;
- Deprived rural districts (Western Uortchi, Eastern Meshgin, Central Wilkij, West Khandbil, Shal, Minabad, Southern Sangbod, Dolat Abad, Western Sangbod, Northern Wilkij, Western Angoute, North Egerud, Azadlou, Sabalan, Anbar, Plain, Oriental Euroatche, Pollen, West Eridor, East Arash and Qarshoo) should be considered as a priority in the

development and implementation of development projects and increased specialist skills in them.

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