Determination of the relationship between patient satisfaction and some global economic indicators using multidimensional scaling

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Özkan Görgülü
Ahi Evran Üniversitesi Faculty of Medicine
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Determination of the Relationship between Patient Satisfaction and Some Global Economic Indicators Using Multidimensional Scaling

O Gorgulu

Department of Biostatistics and Medical Informatics, Faculty of Medicine, Ahi Evran University, Kırşehir, Turkey

ABSTRACT

Context: The importance of labor that contributes to the economy and economic power of the country is increasing recently. There is a strong link between health and economy. People are happier, more productive, and provide more contribution to the economy in communities of healthy individuals. In countries with strong economy, serious economic investments are made in the field of health to grow healthy individuals. **Aim:** The purpose of this study is to determine whether patient satisfaction in primary healthcare services is related to economic strength of countries. **Materials and Methods:** The data of European Patients Evaluate General/Family Practice (EUROPEP) scale from 2011 at 17 Organization for Economic Co-operation and Development (OECD) countries are used. The data were compiled from OECD reports and Republic of Turkey Ministry of Health Refik Saydam Hygiene Center Presidency School of Public Health patient satisfaction with primary healthcare services reports. **Statistical Analysis Used:** 17 OECD member countries in 2011 health expenditure data, some health indicators, and patient satisfaction are determined to show how grouping in two-dimensional space with the multidimensional scaling. **Results:** It was observed to vary by countries and groupings that they located in terms of all three criteria. In some countries' economic and health indicators, although quite high compared to the OECD average, citizen satisfaction of healthcare services was low. In some countries, although health expenditure and health indicators are far below the OECD average, citizens' satisfaction with health services has proved to be very high. **Conclusion:** Multidimensional scaling analysis findings reveal that countries have different positions and groups in terms of each three indicators. According to these results, it cannot be said that high expenditures in the field of health will affect patients satisfaction. Having a strong economy or spending too much money on health does not increase human satisfaction in health care. Effective expenditures on the field of health will increase healthcare service satisfaction. Policy-makers should consider international criteria and take the right steps according to citizens' expectation and satisfaction of healthcare service to implement effective spending.

KEYWORDS: *Economic indicators, health care, health expenditure, patient satisfaction, public health*

INTRODUCTION

The current World Health Organization's (WHO) definition of health, which formulated in 1948, is "as complete physical, mental and social well-being, not merely negatively as the absence of disease or infirmity." At that time, this formulation was groundbreaking because of its breadth and ambition.[1,2] The importance of health in the world has been increasing recently.

Address for correspondence: Dr. O Gorgulu,
Department of Biostatistics and Medical Informatics, Faculty of Medicine, Ahi Evran University, Kırşehir, Turkey.
E-mail: ozkangorgulu@gmail.com

Access this article online	
Quick Response Code:	**Website:** www.njcponline.com
	DOI: 10.4103/njcp.njcp_218_17

Healthy individuals in communities lead happier, peaceful, and comfortable life. The ultimate goal of government's' public health policy is to improve and protect nation's health. Decision-makers require reliable health data in both national and international areas. In particular, determining the factors that contribute to international health indicators is extremely important for decision-makers. The general state of health of a nation is affected by economic, environmental, social factors, and so on. For this reason, measuring the general state of health of a country is quite difficult. It is a general acceptance that economic development has a positive impact on health indicators of a country. It is believed that countries which have developed industry allocate more resources for healthcare services. Therefore, there is a casual relationship between level of economic development and citizen's health. In healthy communities, people live longer and provide more contribution to production. In addition, medicine and treatment costs are lower in healthy communities. On the other hand, it is an increasing belief that healthy communities lead to efficient labor force. Thus, studies conducted in the field of public health by policy-makers will make significant contributions to the national economy. Theoretically, it is stated that expenditures in the field of health increase human capital stock and labor productivity, and thus accelerate economic development progress.[3] Especially, human capital which is determined by communal health state and education level is defined as knowledge, skills, and abilities owned by labor. However, while human capital is defined as a result of education and health, an important part of empirical studies focuses on education and economic development. Thus, it is seen that there are limited studies in the field of health indicators and economic development.

One of the important outcomes of healthcare services provided in a country is patient satisfaction. Patient satisfaction surveys provide important information to achieve high-quality healthcare services. These studies determine how expectations of patients are met by institutions and help policy-makers in evaluating the delivery of healthcare. Patient satisfaction is a key indicator used to measure the quality of service. Measurement of patient satisfaction provides control of malpractice claim and clinical outcomes. In addition, it enables prompt, efficient, and patient-oriented quality health service delivery. Besides, patient satisfaction is an effective indicator for measuring the success of doctor, hospital, and national health policy as well.[4] Therefore, this type of research is a guide to improve the quality of healthcare services.[5]

Being in the center of treatment services for patients is not only WHO's opinion but also social, economic,

and technical requirement.[6] New patient-centered treatment concepts assume the patients as a partner in the decision-making process. In this treatment concept, patients are informed better before treatment and discuss optimal management of the condition they are in with their real partners.[7]

It is generally accepted that economic development impacts health service delivery positively, and this effect increases healthcare service satisfaction of citizens. It is considered that accessibility of healthcare service is easier and health service delivery is more satisfying in countries that have economic potential. This study examines whether people's healthcare service satisfaction is high or not in countries that have economic power in reality. In other words, the question of "have high budget expenditures in the field of health increased health care service satisfaction?" has been searched for an answer. Due to the complex interactions in the field of health, the comparison of international data just looking to the averages is not accurate. For this purpose, in this study, we use the multidimensional scaling (MDS) analysis. If a country's health expenditure is low compared to other countries, it could have two reasons: (i) that country does not spend enough on healthcare and (ii) health expenditures of that country is very efficient according to the requirements of society. Therefore, the results obtained from the international comparisons in health expenditures should be considered with variables such as economic achievement and patient satisfaction.

This study consists of four parts. In the introduction part, a general perspective about the aim of the study is presented. In the material and methods part, information related to the data and the method that has been used are given. Empirical findings are devoted to results and discussion part. Finally, findings are evaluated and policy implications are discussed in conclusion.

MATERIALS AND METHODS

In this study, the data of European Patients Evaluate General/Family Practice (EUROPEP) scale (Patients Evaluate General/Family Practice) from 2011 at 17 Organization for Economic Co-operation and Development (OECD) country are used [Austria, Belgium (handling Wallonia and Flanders regions in Belgium separately), Denmark, Finland, France, Germany, Israel, Holland, Portugal, Slovenia, Spain, Norway, Iceland, Sweden, Switzerland, England, and Turkey]. The data were compiled from OECD reports and healthcare service reports of Turkish Ministry of Health (Refik Saydam Hygiene Center Presidency, School of Public Health Directorate) on patient satisfaction. The survey was carried out by the health ministries of the relevant countries after the

necessary permits were obtained. The surveys were conducted face-to-face with randomly selected persons who were entirely voluntary. The EUROPEP scale was developed in 1999 by the European Working Party on Quality in Family Practice (EQuiP), a subunit of the European Office of the World Organization of Family Doctors (WONCA).[5,8] EUROPEP scale consists of 23 items and five dimensions regarding doctor–patient relationship (Q1–6), healthcare services (Q7–11), information and support (Q12–15), organization of healthcare services (Q16 and 17) and accessibility (Q18–23). The scale contains five Likert-type items ranging from 1 = poor/dissatisfied, 3 = acceptable/moderate satisfied to 5 = excellent/very satisfied.[5,9-11] Due to the lack of EUROPEP scale data after 2011 for OECD countries, the analysis only covers the year 2011. In MDS analysis, 23 EUROPEP scale items were used as patient satisfaction indicators. Variables of infant mortality rates (deaths/1000 live births), number of doctors (per 1000 inhabitants), number of nurses (per 1000 inhabitants), number of hospital beds (per 1000 inhabitants), number of computed tomography (per 1,000,000 inhabitants), and number of magnetic resonance imaging units (per 1,000,000 inhabitants) were used as health indicators. In addition, variables of total health spending per capita ($), the share of total health spending in gross domestic product (GDP) (%), the share of public health expenditure in total health spending (%), the share of out-of-pocket health expenditure in total health spending (%), the share of pharmaceutical spending in GDP (%), and the share of pharmaceutical spending in total health spending (%) were used as economic indicators. Statistical Package for Social Sciences version 21.0 Software for Windows (SPSS 21.0, Inc.; Chicago, IL, USA) is used for MDS.

MDS brings together techniques from the area of multivariate analysis, which deals with "dissimilarities" between objects to find their configuration in a geometrical space.[12] MDS is designed to construct a diagram showing the relationships between a number of objects, given only a table of distances between the objects; the diagram is thus a type of map that can be in one dimension (if the objects fall on a line), in two dimensions (if the objects lie on a plane), in three dimensions (if the objects can be represented by points in space), or in a higher number of dimensions (in which case a simple geometrical representation is not possible).[13] MDS is highly valuable in psychological research dealing with qualitative data derived from scaling, sorting, or ranking tasks as well as from questionnaires.[14] Furthermore, the applicability of MDS is broad, with potential utility

across many disciplines, such as cognitive, social, neuroscience, marketing political science, sociology, education, medicine, ecology, and others.[15,16] MDS is an extremely flexible multivariate statistical technique, one that can model non-linear relationships and is not bound by numerous assumptions associated with general linear models or other multivariate statistical techniques such as factor analyses. There are no assumptions about data distributions in MDS. Interpretation of MDS output can be stimulating, interesting, and is highly subjective. However, the dimensional outputs of MDS can be regressed with more objective variables, which can provide more confidence in the emergent scaling solution and its interpretation. Due to its flexibility and its relative freedom from strict theoretical boundaries, the use of MDS is evident in various scientific areas.[13,17,18] There are two types of MDS, which are metric scaling and non-metric scaling. Differences between metric and non-metric MDS depend on distance measures.[18] These types can be classified according to whether the input data are qualitative or quantitative, yielding non-metric and metric MDS, respectively. In the metric case, the configuration distances and the data distances are related by the linear or polynomial regression equation. With non-metric scaling, all that is required is a monotonic regression, which means that only the ordering of the data distances is important.[16,17] In this study, we used non-metric and metric MDS for EUROPEP scaling data and economic and health indicators data, respectively. Both economic indicators and health indicators have different measurement unit ($, %, etc.). Therefore, data were standardized to z-score before analysis.

Three different techniques commonly used for judging the goodness of fit of an MDS solution are Kruskal's stress value, Shepard diagram, and scree plot. As an expression of the difference between the multidimensional real form and the form cut in reduced m-dimensional space, the STRESS (Standardized Residual Sum of Squares) index is used:

$$S = \left[\frac{\sum_{i=1}^{n}\sum_{j=i+1}^{n}(\delta_{ij} - d_{ij})^2}{\sum_{i=1}^{n}\sum_{j=i+1}^{n}d_{ij}^2} \right]^{1/2} \tag{1}$$

Here, n presents the number of object or units in the dataset, and δ_{ij} represents the optimal convergence of observed distances in geometric presentation.[19] Small values of stress (close to 0) are desirable. Whereas the high value of stress indicates a bad fitting.[13,20] In scree plot, stress value is plotted against dimension number. The best fitting MDS model has as many dimensions as the number of dimensions at the elbow in the scree plot. The Shepard diagram displays the relationship

between the proximities and the distances of the point configuration. Less spread in this diagram implies a good fit.[16,20]

RESULTS

Primary healthcare satisfaction and economic indicators from 2011 of 17 OECD countries were considered as variables for MDS to specify similarities between countries. To determine the optimum dimension of MDS, scree plots [Figure 1] of Kruskal stress values that correspond to dimension number were consulted. When Figure 1 was analyzed, it can be seen that a decrease in stress values continues as long as the numbers of dimension increase. As a result of this, two-dimensional MDS was performed to all three indicators; S-stress and improvement stress values which are obtained in consequence of analysis are given in Table 1. Due to improvement, stress value is lower than 0.001, economic indicators have ended in the third iteration, health indicators have ended in fourth iteration, and data

analysis about EUROPEP scale iteration has ended in fifth iteration.

Stress value which belongs to economic indicators is found to be 0.131183. This value shows that the good fit between configuration and original distances is at the medium level. Stress and squared correlation (RSQ) value was 93,86%. Sheppard diagram which is another approach used to determine the goodness of fit between configuration and original distances according to configuration distance is shown in Figure 2. Figure 2 shows that the distance of the differences between countries is linear and a good fit according to the distances.

MDS analysis applied to health indicators has ended at fourth iteration. At the end of fourth iteration, stress and RSQ values are found to be 0.06014 and 0.990455, respectively [Table 1]. Stress values indicate that the goodness of fit between configuration and original distances is quite agreeable. RSQ value shows that stress

Table 1: Iteration history for the two-dimensional solution

|	Economic indicators		Health indicators		Patient satisfaction	
Iteration No.	S-stress	Improvement	S-stress	Improvement	S-stress	Improvement
1	0.18260		0.05807		0.07543	
2	0.14421	0.03839	0.04732	0.01075	0.06342	0.01201
3	0.14336	0.00085	0.04604	0.00128	0.05929	0.00413
4			0.04603	0.0001	0.05734	0.00195
5					0.05635	0.00099
	Stress=0.131183; RSQ=0.93863		Stress=0.06014; RSQ=0.990455		Stress=0.07782; RSQ=0.97627	
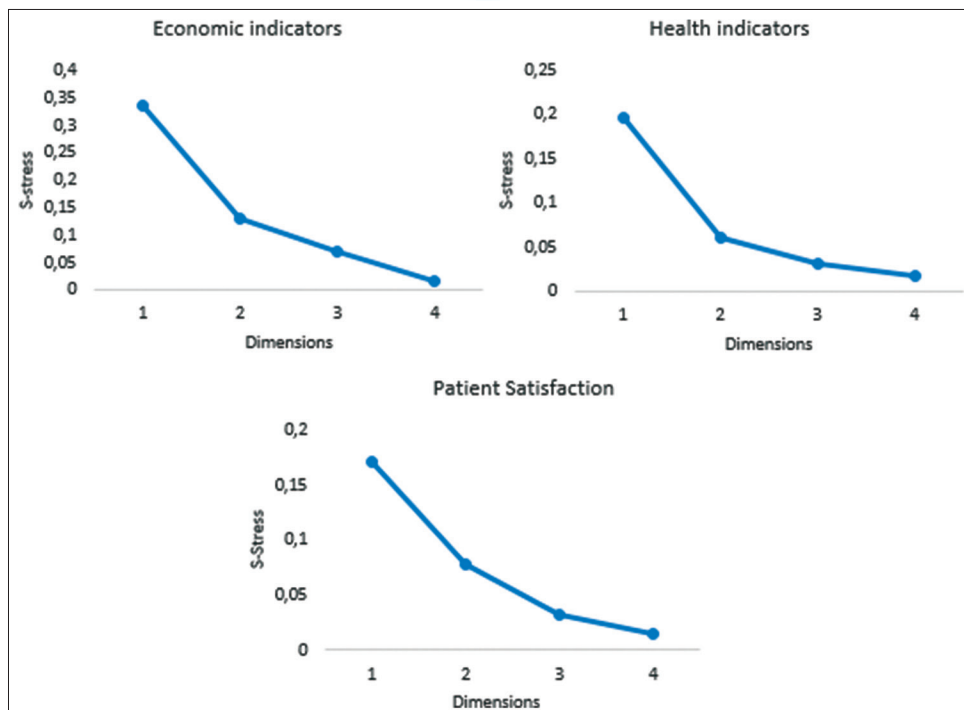
Figure 1: Scree plot of stress values, plotted as a function of by number of dimensions

value has an explanatory at a rate of 99.04%. Sheppard diagram which belongs to configuration distances verifies stress and RSQ values in Figure 2.

Stress value and RSQ value, which are obtained at the end of fifth iteration in the MDS analysis from the data belong to 23 items in the EUROPEP patient satisfaction scale, are 0.07782 and 0.97627, respectively [Table 1]. These values show that the goodness of fit between Sheppard diagram configuration [Figure 2] and original distances is pretty agreeable and linear.

According to MDS analysis findings in terms of economic indicators, the positioning of 17 OECD member countries in two-dimensional space is shown in Figure 3. Figure 3 indicates that countries show a disorganized positioning generally. Especially Turkey, England, and Israel are positioned separately and away from other OECD member countries. In addition, Norway and Denmark are positioned together like Portugal, Slovenia, and Spain.

In terms of health indicators, countries positioning in two-dimensional space is shown in Figure 4. Figure 4

reveals that Turkey is positioned in a very remote location from the other countries. Norway, Sweden, and Austria are positioned in separately from other countries and stand-alone. Portugal–Spain and Slovenia–France are positioned too close as well.

MDS analysis which is conducted according to 23 items in EUROPEP survey which measures patients' primary healthcare service satisfaction results shows how countries take position in two-dimensional space as shown in Figure 5. These findings show that Portugal, Finland, and France are positioned in a different place from the other countries. These three countries are positioned separately and isolated in two-dimensional space from the other OECD countries. While Israel and Netherlands are positioned close, Turkey, Spain, and Belgium – Wallonia are positioned together.

The mean of 17 countries according to the 23 items that measure patient satisfaction with EUROPEP survey are given in Figure 6. It shows that highest satisfaction is determined in Switzerland (91.57) and the lowest in France (64.43). OECD average is 80.98 as well. In
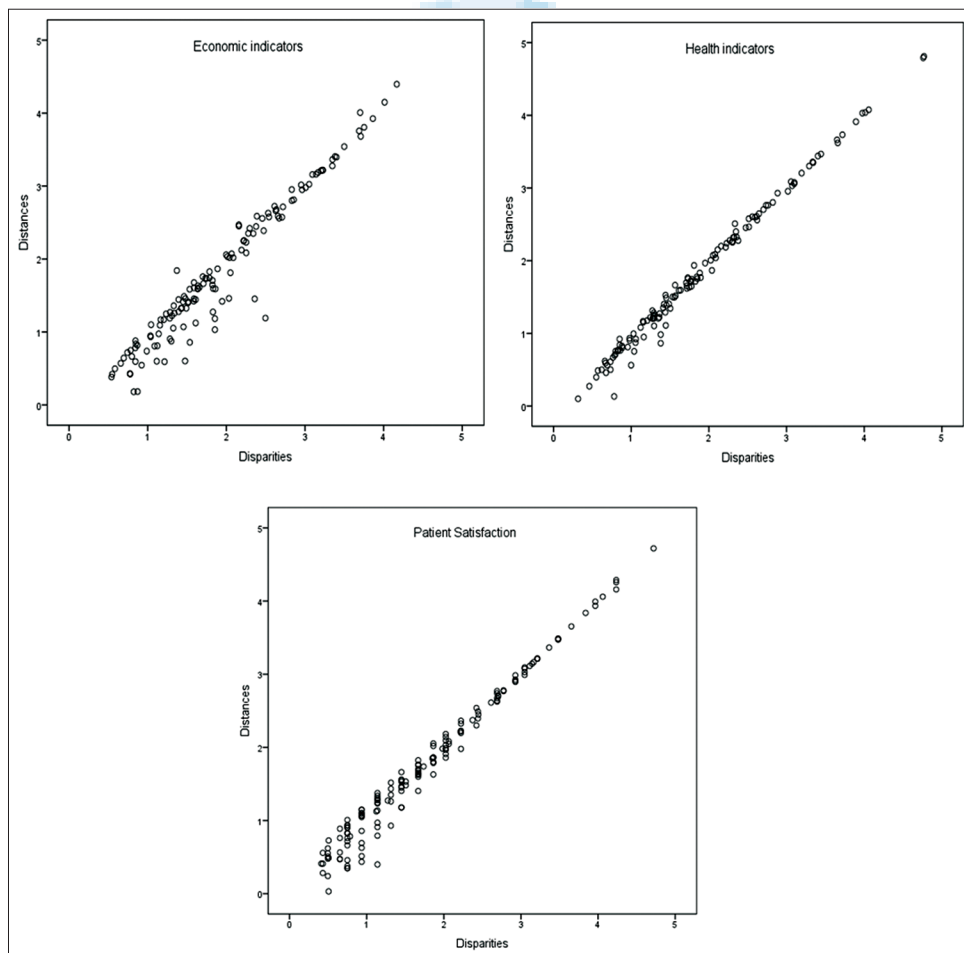

Figure 2: Sheppard diagram for configuration distance

addition, 9 of 17 countries that are subjected in the study remain below the OECD average.

When MDS maps that belong to economic, health, and EUROPEP scale indicators of 17 OECD countries are examined together, significant results have been found related to patient primary healthcare service satisfaction in two-dimensional space. Portugal is positioned in the same group with Spain and Slovenia in terms of economic indicators in the field of health [Figure 3]. She showed a close position with Spain in terms of health indicators as well [Figure 4]. When Figure 5 is examined, it is seen that Portugal is located separately and away from the other OECD countries. Portugal citizens' primary healthcare service satisfaction value is found to be the lowest according to EUROPEP scale (77.74) [Figure 6]. According to the results, although some countries' economic and health indicators are higher than the average, citizens' healthcare service satisfaction is fairly low. Figure 5 expresses that France and Finland

are positioned close to each other in terms of patient satisfaction. While Finland is positioned close with Spain, Slovenia, and Iceland in terms of economic indicators [Figure 3], she is positioned close to France according to healthcare service satisfaction. This result asserts that in each country, citizens' healthcare service expectation should be re-examined. In this sense, the most stunning result in OECD countries is obtained for France. Although France has a better position in economic and health indicators than the other OECD countries in terms of 4014.3$ total health spending per capita, the share of total health spending in GDP (%) (10.7%), life expectation, number of hospital beds (per 1000 inhabitants), and number of health staff (per 1000 inhabitants),[21] she has the lowest EUROPEP average scores in 17 OECD countries according to the mean of 23 items.[5,8]

Germany stands close to Belgium and France in terms of economic indicators [Figure 3] and close to Netherlands and Belgium in terms of health indicators [Figure 4]. Germany has high healthcare service satisfaction according to EUROPEP survey (87.13) [Figure 6].
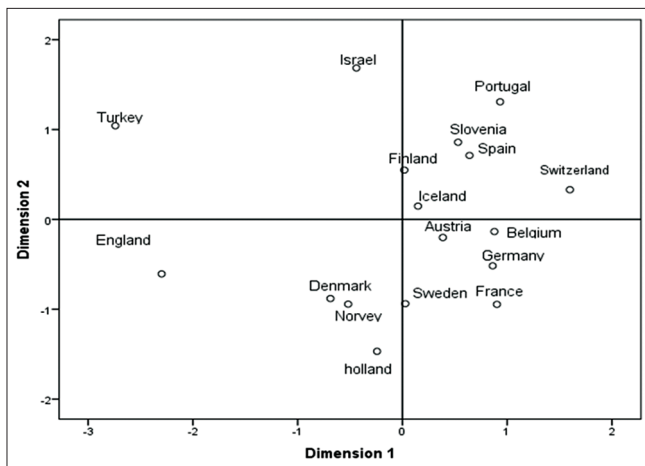

Figure 3: Configuration of countries from a two dimensional MDS of economic indicators
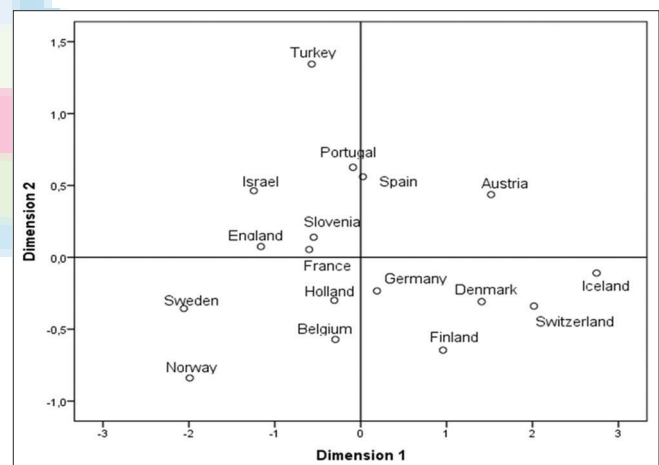

Figure 4: Configuration of countries from a two dimensional MDS of health indicators
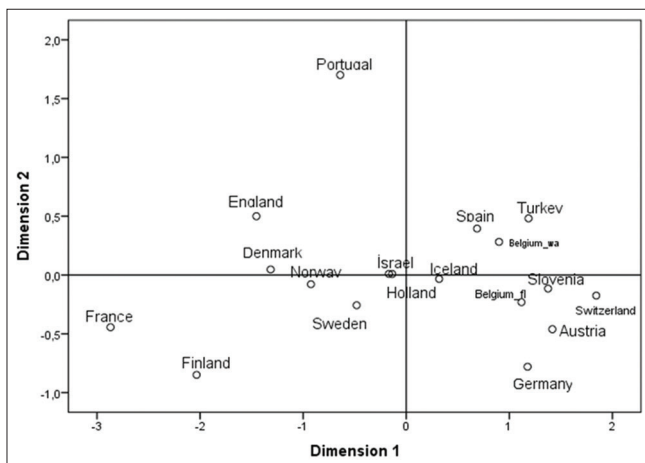

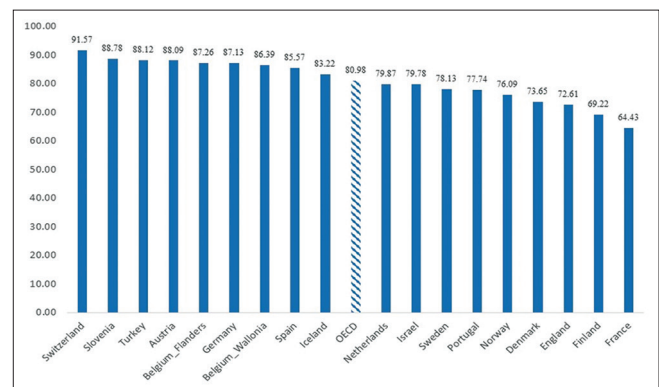Figure 5: Configuration of countries from a two dimensional MDS of EUROPEP

Figure 6: EUROPEP average scores of OECD countries[5-8]

In terms of economic indicators [Figure 3] and health indicators [Figure 4], Turkey is positioned away from the other OECD countries. Although Turkey falls behind other OECD countries in terms of both economic and health indicators, the Turkish citizen healthcare service satisfaction shares similarity with Spain and Belgium's Wallonia region [Figure 5]. This result might have arisen from Turkish people's low expectation of healthcare services, considering expectations of public and effective health policies according to these expectations applied by policy-makers.

DISCUSSION

In this study, economic indicators based on health expenditures, some indicators in the field of health, and EUROPEP data belonging to primary healthcare service satisfaction for 17 OECD countries in 2011 are examined with MDS multivariate analysis method. With the help of multivariate analysis, it is determined how 17 countries position and form groups in two-dimensional space according to economic and health indicators and EUROPEP scale values. Analysis findings reveal that countries have different positions and groups in terms of each three indicators. According to these results, it cannot be said that high expenditures in the field of health will affect patients' healthcare service satisfaction. On the contrary, effective expenditures on the field of health will increase healthcare service satisfaction. Therefore, policy-makers should consider international criteria and take the right steps according to citizens' expectation and satisfaction of healthcare service to implement effective spending.

In 2010, OECD countries compose 20% of world's population and 84% of world health expenditures with 6.5 trillion dollars.[22] In this sense, it is required that this budget should be managed with an effective plan in right fields to increase healthcare service satisfaction. There are many factors that affect whether patients satisfy healthcare service or not. These factors include culture, education, social life, and so on. Countries should determine citizens' satisfaction criteria and their own culture properly while spending in the field of health. Statistics based on economic and health indicators and economic and health development of countries indicate that people who live in that country satisfy the healthcare service. However, high expenditures on health do not bring happiness to the citizens at any time. To make people satisfied, policy-makers should determine the expectations and priority of citizens and invest in the right areas. Individual's expectation and satisfaction in the field of health fluctuate from human to human and society to society. Thus, policy-makers implement true policies in their country from region to region by

a wide public polling and develop healthcare service to increase healthcare service satisfaction.

CONCLUSION

Finally, many researchers have a common view that countries' health indicators are positively impacting economic development. Health indicators have direct effects on countries' income and wealth, labor productivity, demographic structure, and human capital factors. Policy-makers and authorizeds should consider the international health indicators.They should make plan investments according to the expectations and satisfaction criteria of the citizens to increase satisfaction of healthcare service.

Financial support and sponsorship
None.

Conflicts of interest
There are no conflicts of interest.

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