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REGIONAL HEALTH CARE INEQUALITY IN TURKEY: SPATİAL EXPLORATORY ANALYSIS

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Abstract

This paper aims to lay bare healthcare inequality and spatial interaction in health services in Turkey for the period 1997–2006. While inequality was explored using Theil index, Moran I and LISA ststistics were used in order to reveal spatial interaction. The obtained results indicate that both intra-regional and inter-regional inequality decreased during the mentioned time period. Furthermore, it was determined that the inequality concerning the specialist physician group is higher than the practitioner and total practitioner groups. Also, there is evidence of significant spatial clustering for all three physician groups.

Keywords*: LISA cluster, Moran's I statistic, Regional health care inequality, Theil index.*

JEL Classification Codes: I10, I31, R12, O18

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1. Introduction

Healthcare inequality describes differences, variations, and disparities in healthcare achievements of individuals, genders, race and socioeconomic groups [9].

Regional healthcare inequality might stem from regional development inequalities and public health expenditure policies [7]. Development level and the potential of the region in terms of production factors are the determinants of health level. The unequal delivery of scarce public resources between regions is another important factor [15]. Public expenditures can be grouped as health services (e.g., hospitalization rates (%), daily visits per physician, and daily inpatients per physician) and health resources (e.g., hospital beds, number of health workers, and number of physicians per 10.000 people) [7].

Another factor that affects regional healthcare inequality is health policy. For example, as Walters and Suhrcke (2005) mentioned, despite the existence of social health security, the poor become poorer with the increasing ratio of out of pocket payment.

Inequality in the availability of health opportunities might stem from the differences between the rural and urban areas. The number of hospitals, hospital beds and medicines are limited at rural areas due to insufficient infrastructure and transportation facilities [15].

On the other hand, healthcare is one of the indicators that determines the development level of a country. Different indicators might be used in order to compare the dimensions of health services between the countries, including the number of the specialist physicians, pharmacists and beds at hospital [14].

While some of the researches on healthcare inequality focused on determining the level of healthcare inequalities among individuals (or regions) within a country (e.g., Quadrado et al., [14], other have focused on the level of inequality between countries (e.g., [12]).

Fang et al. (2010) investigated health inequality and determined the distribution of health services and sources as indicators. The result of this research suggested that regional health inequality has increased despite the high growth rate. Hence, Fang et al. (2010) concluded that regional health inequality is related more to the dispersion of health services and sources than wealth distribution in China.

Various methods are used to measure healthcare inequality. Some of them are as follows; Gini coefficient, index of dissimilarity (ID), index of concentration, Atkinson Index and Theil index. In addition, there are regional inequality indexes like; Dahl index, Nagel İndex, coefficient of variation and logarithmic of variance [5] . Gini coefficient is the most known and commonly used inequality index ([13], [8], [11]). According to Blohm and Olsson [4], if we are investigating inequality in healthcare, we should analyse all the population and consider the spatial

dimension. It should be remarked that health services are offered to the entire society. Quadrado et al. [14] analysed the practitioner pyhsicians per 10.000 people over the 1974–1991 period using Theil index. They determined an increase in inequality over the 1974–81 period and a decrease for the later period.

After a brief introduction on regional development in Turkey, we identify the intra-regional and inter-regional inequalities by using Theil T and Theil L indexes in the following section entitled methodology. Lastly, global and local spatial autocorrelation in healthcare are investigated with Moran I and LISA (local indicators of spatial association) respectively.

2. Regional development in Turkey

European Union (EU) obliges its members and candidates to compose statistical regions. Turkey has composed three separate levels of NUTS (nomenclature of territorial units for statistics) regions in accordance with EU harmonization framework in 2002. Under NUTS classification provinces were classified within NUTS 3; economically, socially and geographically related neighbouring provinces were gropued under NUTS 1 and NUTS 2 considering their regional development plans and size of population and a hierarchy of NUTS regions was arranged. In this classification NUTS 1 includes 12 regions, NUTS 2 includes 26 sub-regions and NUTS 3 includes 81 provinces.

As in other countries inter-regional socio-ecenomic development differences are observed in Turkey, as well. The main reasons behind inter-regional socio-ecenomic development differences are geographical structure, climate, distribution of production factors, distance to demanding inner and outer markets, and distribution of rural settlement units.

Generally, the western regions of the country are relatively developed considering the entire country. However, especially Eastern Anatolia, mountainous areas of Black Sea region and Southeastern Anatolia region remain significantly below the country average in terms of income, employment and welfare.

After 1960s, a time when industrialization process gained speed in Turkey, growth spread from İstanbul and Ankara to surrounding provinces. Among these provinces; production in Kocaeli concentrated in chemistry and metal industries while Bursa and Eskişehir had a tendency of specialization in food, textile and automotive industries. During 1970s Konya, which was specialised in wheat production, has joined these trade, industry and service provinces. Tekirdağ has become a centre of attraction for industrial plants overflowing from İstanbul due to ease of transportation. Thus the developed regions of İstanbul and Western Anatolia with Ankara at its center were expanded with the joining of Eastern and Western Marmara regions.

Another centre of economic activity is the Çukurova region, with Adana at the centre, in the southern region of the Turkey. While Adana has specialised in cotton and textile production, Hatay has become prominent in international trade,

due to the port city of İskenderun, and steel production. During late 1980s the region was expanded with the contribution of Mersin province which had an international port and free trade zone. While Hatay subregion of NUTS 1 Mediterranean region attracts qualified workforce due to production and trade with industrial activities in Osmaniye and Kahramanmaraş in addition to Adana sub-region, Antalya subregion became a desirable location with improving provisions in tourism, transportation and trade. Another developing region is the Aegean region with İzmir at its centre. While İzmir has specialised in exporting agriculture based food and textile industrial products, Manisa, Aydın, Denizli, Uşak and Afyonkarahisar also joined the mentioned economic activities.

The provinces in Southeastern Anatolia such as Gaziantep, Şanlıurfa, and Diyarbakır have specialised on specific sectors based on local sources. However, the provinces Şırnak and Siirt are both underdeveloped and raided by terrorist activities though they exist in the same geographical region. Similarly, in the middle–eastern provinces of Hakkari and Tunceli, both mountainous regions and dispersed rural settlements hinder infrastructure provisions such as water, electricity and transportation. The mentioned provinces also frequently experience terrorist activities and are among the least desirable places of living. Western Black Sea, Eatern Black Sea and Norhteastern Anatolia regions are among those regions where industry, trade and tourism have not developed. These regions are generally mountainous and have a dispersed settlement pattern. The mentioned regions are not preferred unless necessary due to insufficient infrastructure, limited socio-cultural and economic activities and lower income. The terrorist activities in the eastern and southeastern regions of Turkey lessen the desirability of the area. In addition to these, central provinces which are relatively developed increase intra-regional inequality.

Problems such as stagnation and lack of investment and services are the major problems of underdeveloped regions. The workforce and capital flowing from underdeveloped and rural regions where productivity and income levels are low and agricultural activities form the main source of income to metropolitan cities results in the accumulation of population in metropolis. Consequently, underdeveloped regions lose the dynamic production factors such as qualified workforce and capital further reinforcing backwardness. Furthermore, increasing civil pressure in developed regions canalizes public investments to these regions and result in a vicious cycle. In short, due to inter-regional socio-ecenomic development differences (public welfare inequality) qualified workforce, including health personnel, prefers developed regions adversely affecting public welfare distribution.

Supplying health services and the potential of access to these services are among the factors that reflect the level of social development in view of sustaining individual health. Moreover, health personnel's choice of developed regions as a part of qualified workforce is directly related to the socio-ecenomic development level of the provinces. Therefore the variable physician per person was used as a health indicator in this study.

Descriptive statistics concerning variables including physicians per person, per capita gross domestic product and population are given in the table below to provide general information, as this study analyses Turkish health sector between the years 1997-2006 based on NUTS 1 regions and provinces. As the provincial and regional values concerning the variable per capita gross domestic product were not available after 2001 these values were not included for the year 2006[1].

Table 1: Descriptive Statistics

Variables	NUTS1				NUTS 3 (Province)			
	Mean	Standart Deviat.	Mini.	Maxi.	Mean	Standart Deviat.	Min.	Maxi.
PPP (2006)	1523	372	784	2081	1793	527	588	3019
PSP (2006)	1828	689	735	2781	2353	966	554	4944
PTP (2006)	823	252	379	1159	1006	333	285	1874
PPP (1997)	1919	575	3023	880	2279	864	646	4658
PSP (1997)	3390	1763	1014	6493	6107	5678	711	35714
PTP (1997)	1202	461	471	2062	1564	740	338	4121
PGDP (1997)	417	171	185	726	371	180	114	1204
PGDP (2001)	2374	935	1114	3959	2170	1165	688	7468
PO (1997)	5522644	2608084	2464498	10392857	790308	1115224	101770	9029018
PO (2006)	6400497	3406053	2547239	12553893	912407	1437756	76403	11770931

NOTE: The abbreviations used in the table above are; PPP, people per practitioner physicians; PSP, people per specialist physicians; PTP, people per total physicians; PGDP, per capita gross domestic product and PO , population.

3. Methodology

The empirical part of this paper consists of two separate analyses. First, regional healthcare inequalities will be illustrated by using Theil Indexes. Then Moran's I will be computed in order to understand global spatial cluster of healthcare. Lastly, the local indicator of spatial association (LISA) will be used in order to determine local cluster.

While different measures such as, Gini coefficient, coefficient of variation or other convergence indicators are mostly used to account for inequalities; we preferred to use Theil Index to understand the healthcare inequalities in Turkey. Because Theil displayed several desirable properties as a measure of regional inequality, i.e., mean independence, population-size independence, Pigou-Dalton Transfer sensitivity [the inequality measure to rise (or at least not fall) in response to a mean-preserving spread] and decomposition [1]. Theil T index for overall regional inequality is defined as;

$$T_T = \sum_i \sum_j \left(\frac{Y_{ij}}{Y} \right) \log \left(\frac{Y_{ij}/Y}{X_{ij}/X} \right) \tag{1}$$

where Y_{ij} is the number of physicians of province j in region i, Y is the total physicians of all provinces, X_{ij} is the population of province j in region i and X is the total population of all provinces.

We can identify the contribution of regions to total inequality with the help of Theil index. This kind of decomposition is named "generalized entropy decomposition". This analysis enables identifying the inequalities between and within regions. Theil index in Equation (1) can be represented as follows;

$$T_T = \sum_i \left(\frac{Y_i}{Y} \right) T_i + \sum_i \left(\frac{Y_i}{Y} \right) \log \left(\frac{Y_i/Y}{N_i/N} \right) \tag{2}$$

In this equation, $T_i = \sum_j \left(\frac{Y_{ij}}{Y_i} \right) \log \left(\frac{Y_{ij}/Y_i}{N_{ij}/N_i} \right)$. Y_i is the number of physicians of region i and it is equal to $\sum_j Y_{ij}$. Lastly, N_i is the total population of region i and $N_i = \sum_j N_{ij}$. The first term on the right hand side of Equation (2) is the "inter-group" component of inequality, while the second term is the "intra-group" component of inequality. In other words, $T_T = T_B + T_W$.

The Theil index, T_T, as defined by Equation (1) and Equation (2) employ shares of physician numbers as weights. Namely, T_T shows the distribution of physicians to groups of people. Another Theil index, Theil index L, uses

population shares as weights. In other words T_L applies, for instance, to the distribution of groups of people to physicians and defined as;

$$T_L = \sum_i \sum_j \left(\frac{N_{ij}}{N} \right) \log \left(\frac{N_{ij}/N}{Y_{ij}/Y} \right) \tag{3}$$

T_L index can also be decomposed. Thus, we can write T_L as; $T_L = T_B + T_W$. If T_L (or T_T) represents zero we say that there is an equal distribution but a higher value of T_L (or T_T) means a higher level of inequality.

The test of spatial autocorrelation has become prevalent at regional analyses in recent years. Tests for spatial autocorrelation for a single variable in a cross-sectional data set are based on the magnitude of an indicator that combines the value observed at each location with the values at neighbouring locations [2]. The most commonly used measure for spatial autocorrelation is Moran's I statistic. In case of positive autocorrelation, there exits locational interaction (or similarities) meanly, interaction (or similar) values of the variables are clustered together across space [6]. Moran's *I* is expressed as:

$$I_i = \frac{n}{s} \frac{\sum_i \sum_j w_{ij} z_i z_j}{\sum_i z_i^2} \tag{4}$$

where n is number of regions, z_i and z_j represent the deviation of the people per physician from its own mean for each region. W is weight matrix with two values, w_{ij} are the elements of W ($n \times n$) and s is the sum of all elements in the W. Weight matrix is determined according to neighbouring descriptions which are related to distance and contiguity. While the similarity or share of common contiguity between locations is measured with contiguity matrix, distance between locations is measured with distance matrix.

Weights are non-zero when two locations share a common boundary or when they are within a given distance of each other. Generally rook (common boundaries), queen (common boundaries and also nodes) or bishop (common node) are used for contiguity neighbourings. A binary contiguity matrix was used adopting the familiar rules. There are two constructions that are used for the binary spatial weight matrix, namely rook and queen. Rook computes only common boundaries, while queen computes both common boundaries and nodes[2]. In the case of our data, there is no different result by using either rook or queen, because all neighbors have common boundaries rather than nodes. Therefore rook boundary neighbouring is preferred in this paper. Weight matrix has been row-standardised.

Moran's *I* statistic captures the global spatial autocorrelation of the variables of interest. But because of being a measure of global autocorrelation, Moran's *I* statistic fails to measure local spatial autocorrelation. Thus, Anselin (1995) generated LISA statistic which computes a measure of spatial

autocorrelation for each individual location. This is a statistic that satisfies the following two requirements [2];

- The LISA for each observation gives an indication of extent of significant spatial clustering of similar values around that observation;
- The sum of LISAs for all observation is proportional to a global indicator of spatial association.

The most common statistic among the LISA statistics is Local Moran I and this statistic, for an observation i may be defined as:

$$I_i = z_j \sum_j w_{ij} z_j \tag{5}$$

Where analogous to the global Moran's I, z_i represents the deviation of people per physician from its own mean for each region. w_{ij} matrix is as defined above. Thus the sum of local Moran is equal to global Moran as given by;

$$\sum_i I_i = \sum_i z_i \sum_j w_{ij} z_j \tag{6}$$

4. Data

In this paper Theil T and Theil L indexes are calculated to understand the regional inequalities in healthcare at the level of NUTS 1. Moreover, along with these inequalities the spatial interaction in health services have also been analysed on province basis.

Moreover, physicians per 10.000 people, hospital beds and people per physician are used as healthcare indicators. We preferred people per physician to analyse the inequality in healthcare over the 1997–2006 period. In addition, physicians are classified in three groups as specialist physicians, practitioner physicians and total physicians (specialists + practitioners).

Data were extracted from Turkish Statistics Office (TUKSTAT). The time period from 1997 to 2006 is analysed because of data availability.

5. The findings of empirical analysis

The graphs concerning Theil T and Theil L statistics for people per total physicians-PTP- are given in Figure 1 and Figure 2. A decrease in regional healthcare inequality might be obviously observed. During the 1997-2006 period, 32 faculties of medicine were set up and 22 of them had graduates, so the number of physicians increased, this accounts for the decrease in overall gap of physicians. As a result, physicians have to work in less developed regions where the gaps in the number of physicians are larger.

Figure 1: Regional health care inequality in Turkey (Theil T)

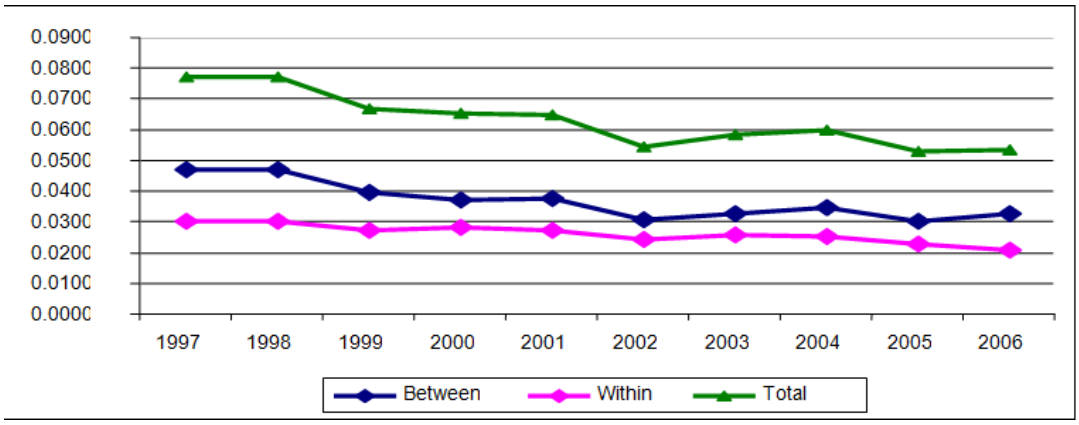


Figure 2: Regional health care inequality in Turkey(TheiL)

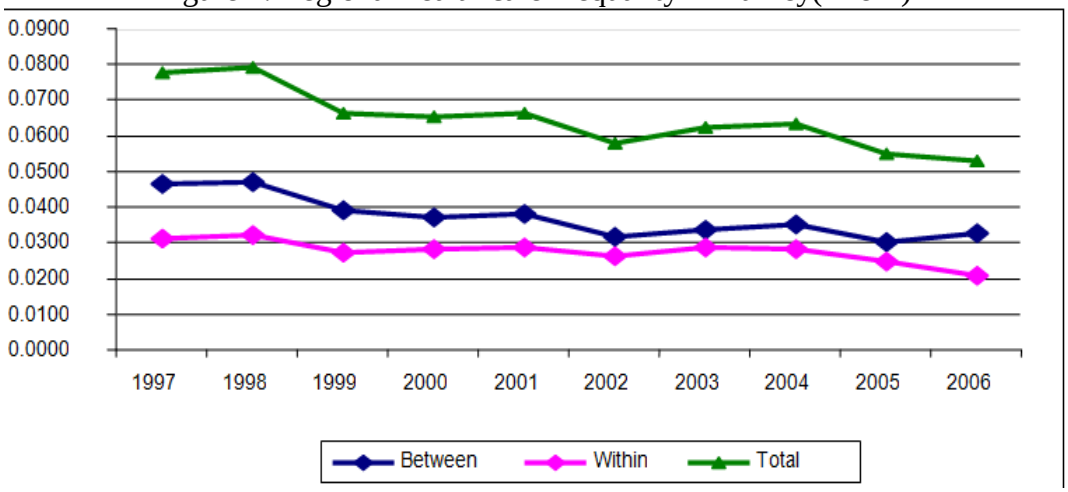


Figure 3 and Figure 4 show the "between" and "within" inequalities for the three groups of physicians according to Theil T statistics. We can conclude that the largest inequality has been observed at the specialist physicians group. Because it is easier for specialists to choose their workplace compared to practitioners. Like many other professionals specialist physicians do not prefer to work in hospitals at the eastern parts of Turkey due to security problems that frequently disturb the region. Moreover, they have to cope with harsh geographical conditions combined with inadequate infrastructure and a limited number of socio-cultural activities. Consequently, specialist physicians prefer hospitals located in the western regions which generally offer better conditions. Also, as we explained before, because the industrial and service sectors are not developed in the eastern regions, urbanization rate is very low. In addition to this,

there are a large number of public, university and pay hospitals in the developed western provinces. Also, the total number of specialists is less than practitioners and total physicians. Because the number of existing specialist physicians is not drastically greater than the specialist physician demand of western regions. Since the east-west dualism might be observed here, as well.

Figure 3: Inter-regional health care inequality

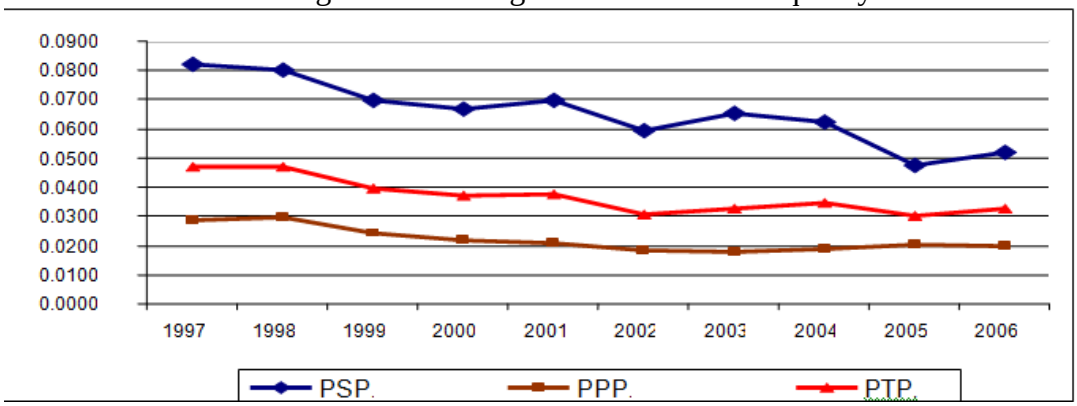
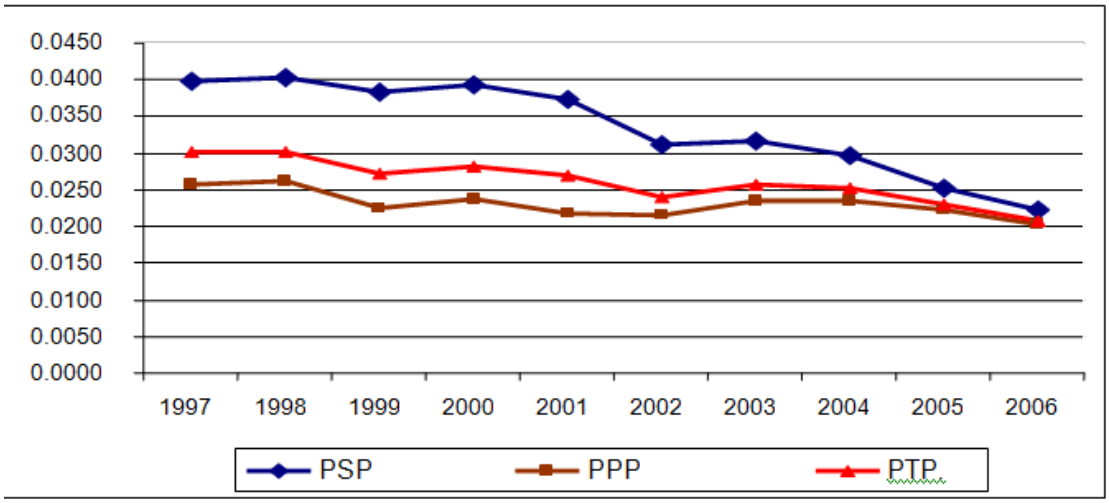


Figure 4: Intra-regional health care inequality



The percentage of inequalities between and within regions and also the values of both Theil T and Theil L are given in Table 2 and Table 3. The inequalities in the specialist physicians group vary between the values of % 29.89 and % 67.76. The same values for the practitioners are higher than specialists' again as in Theil L. This is an already expected outcome. As we have explained above, there are inequalities in the government, university and pay hospital facilities between these regions. Furthermore, the inequality in the number of

specialist physicians is less than practititoners for each region. Thus, it might be asserted that while regional development is more important for specialist physicians, provincial development is more important for practitioner physicians. Another result that might be inferred from the findings implies that intra-regional socio-ecenomic inequalities are relatively minor compared to inter-regional inequalities. The results that were obtained using Theil L index are similar to the results that were obtained using Theil T index.

Table 2: Regional Health Care İnequality in Turkey (Theil T)

	PSP			PPP			PTP		
	TheilT	T(Between)	T(Within)	TheilT	T(Between)	T(Within)	TheilT	T(Between)	T(Within)
1997	0.1219	67.29%	32.71%	0.0546	52.75%	47.25%	0.0769	60.78%	39.22%
1998	0.1201	66.53%	33.47%	0.0559	53.00%	47.00%	0.0773	60.86%	39.14%
1999	0.1082	64.52%	35.48%	0.0468	51.84%	48.16%	0.0668	59.39%	40.61%
2000	0.1062	62.86%	37.14%	0.0456	47.93%	52.07%	0.0651	56.73%	43.27%
2001	0.107	65.17%	34.83%	0.0423	48.86%	51.14%	0.0647	58.33%	41.67%
2002	0.0905	65.59%	34.41%	0.0397	45.86%	54.14%	0.0546	55.94%	44.06%
2003	0.097	67.43%	32.57%	0.0416	43.28%	56.72%	0.0584	55.78%	44.22%
2004	0.0922	67.76%	32.24%	0.0421	44.09%	55.91%	0.0598	57.94%	42.06%
2005	0.0728	65.23%	34.77%	0.0423	47.63%	52.37%	0.0531	56.89%	43.11%
2006	0.0743	70.11%	29.89%	0.0402	49.75%	50.25%	0.0535	61.30%	38.70%

Table 3: Regional Health Care İnequality in Turkey (Theil L)

	PSP			PPP			PTP		
	Theil L	T(Between)	T(Within)	Theil L	T(Between)	T(Within)	Theil L	T(Between)	T(Within)
1997	0.1374	62.06%	37.94%	0.0529	52.88%	47.12%	0.0778	59.91%	40.09%
1998	0.1406	59.90%	40.10%	0.055	52.63%	47.37%	0.0792	59.60%	40.40%
1999	0.1193	60.18%	39.82%	0.0452	52.09%	47.91%	0.0664	59.02%	40.98%
2000	0.1144	60.31%	39.69%	0.0454	47.90%	52.10%	0.0652	56.91%	43.09%
2001	0.1159	61.82%	38.18%	0.0434	48.06%	51.94%	0.0665	57.14%	42.86%
2002	0.1035	60.72%	39.28%	0.0402	45.88%	54.12%	0.0579	54.83%	45.17%
2003	0.1094	62.60%	37.40%	0.0426	41.76%	58.24%	0.0624	53.64%	46.36%
2004	0.101	62.69%	37.31%	0.0429	42.56%	57.44%	0.0633	55.24%	44.76%
2005	0.0778	61.34%	38.66%	0.0417	46.60%	53.40%	0.0549	54.85%	45.15%
2006	0.0766	68.23%	31.77%	0.0383	50.48%	49.52%	0.053	61.09%	38.91%

We calculated Moran's I statistics for all three groups to measure the spatial spillover of healthcare. While significant results were not obtained for NUTS 1 regions, a significant spatial interaction was determined on province basis (NUTS 3). The values obtained through the Moran I are given in Table 4. The values are significant which indicate an interaction. However, the interaction has decreased in time. For example, the Moran I statistic of total physician is 0.4536 in 1997, but it is 0.1439 in 2006. The decrease was also observed for both specialist and practioner physicians.

Table 4: Global autocorrelation of health care (Moran I)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
PSP	0.3415*	0.3855*	0.4081*	0.3653*	0.3884*	0.4128*	0.4642*	0.3414*	0.3406*	0.2516*
	(4.5821)	(5.4698)	(5.6608)	(5.3062)	(5.6148)	(5.8743)	(6.2806)	(5.1891)	(4.8304)	(3.6030)
PPP	0.3840*	0.3560*	0.2974*	0.2265*	0.3966*	0.3757*	0.3971*	0.3210*	0.2427*	0.0384
	(4.9837)	(4.8577)	(3.9833)	(3.1120)	(5.5209)	(5.2673)	(5.8851)	(4.3939)	(3.2802)	(0.6751)
PTP	0.4536*	0.4320*	0.3928*	0.3771*	0.4191*	0.4065*	0.4555*	0.3436*	0.2800*	0.1439*
	(5.4730)	(5.6220)	(5.1045)	(5.0013)	(5.6492)	(5.2179)	(5.9391)	(4.8383)	(3.8690)	(2.0129)

Values in parentheses are the Z values and (*) denotes significance at 5 percent

LISA is used to identify local clusters of healthcare indicators. Local Moran statistic is visualized in the form of significance and cluster maps which depict the locations with significant Local Moran statistics.

LISA cluster maps show the significant locations which are color coded by type of spatial autocorrelation and insignificant locations which are not color coded. Additionally, LISA cluster maps have a different type of spatial autocorrelation: high-high (also known as hot spots) and low-low (also known as cold spots) for positive spatial autocorrelation; low-high, high-low (also known as spatial outliers) for negative spatial autocorrelation.

LISA cluster maps for the three physician levels are given from Figure 5 to Figure 10 (in appendix). Also the provinces in HH, LL, LH and HL clusters are given in Table 5 and Table 6 (in appendix). The common regions of clusters are shadowed in the map. In our analysis, HH or hot spots show the cluster of places with the highest number of people per physician. LL or cold spots show cluster of provinces with the lowest number of people per physician. Lastly, LH and HL (spatial outliers) determine the neigbouring of the provinces with high people per physician and provinces with low people per physician. Meanly, LH and HL indicate spatial clustering of dissimilar values.

The provinces which are included in HH cluster for specialist physicians in 1997 are Batman, Şırnak and Mardin. These provinces are in one of the least

developed regions of Turkey, South-eastern Anatolia region. The provinces in LL cluster are at the most developed regions of Turkey, Marmara and Aegean regions.

For practitioners, provinces in HH cluster in 1997 are seen mostly at the east and south-east Anatolia regions. On the other hand, LL cluster includes provinces from the Aegean, Inner Anatolia and Marmara regions. The results of total physicians are similar to the results of practitioners and specialists. Consequently, the east-west dualism is identified again.

When we look at Table 5, we see that there is not any concentration of provinces in a region for LL cluster in 2006 relative to 1997. Besides, the number of provinces in HH cluster decreased in 2006. Also, LL cluster does not merely consist of provinces from the same region. We understand from these results that there is a decrease of east-west dualism.

6. Conclusion

Healthcare inequality is a major problem in health policy all over the world. It is also considered as one of the development indicators of a country. In this paper, we investigated inequalities in healthcare at the level of NUT 1 in Turkey. Accordingly, people per physician indicator has been selected for our purpose and the Theil T and Theil L indexes were computed. The results indicate that inequalities both between and within regions decreased over the 1997–2006 period. In addition, the inequality concerning the specialist physician group is higher than the practitioner and total practitioner groups.

Lastly, we determined the global and local clusters in health. Global Moran's I statistics are significant for all three groups of physicians. In addition, both the regional inequality and spatial cluster have decreased over the 1997–2006 period, since the autocorrelation coefficient is positive and high. Then, Local Moran statistic is visualized with LISA cluster map. The cluster maps of 2006 shows a decrease in east-west dualism relative to 1997.

ENDNOTES

Per capita gross domestic product figures are given in million TL.

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Appendix

Lisa Cluster

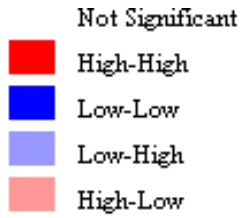

Figure 5: People per Specialist Physicians (PSP) - LISA cluster map for 2006

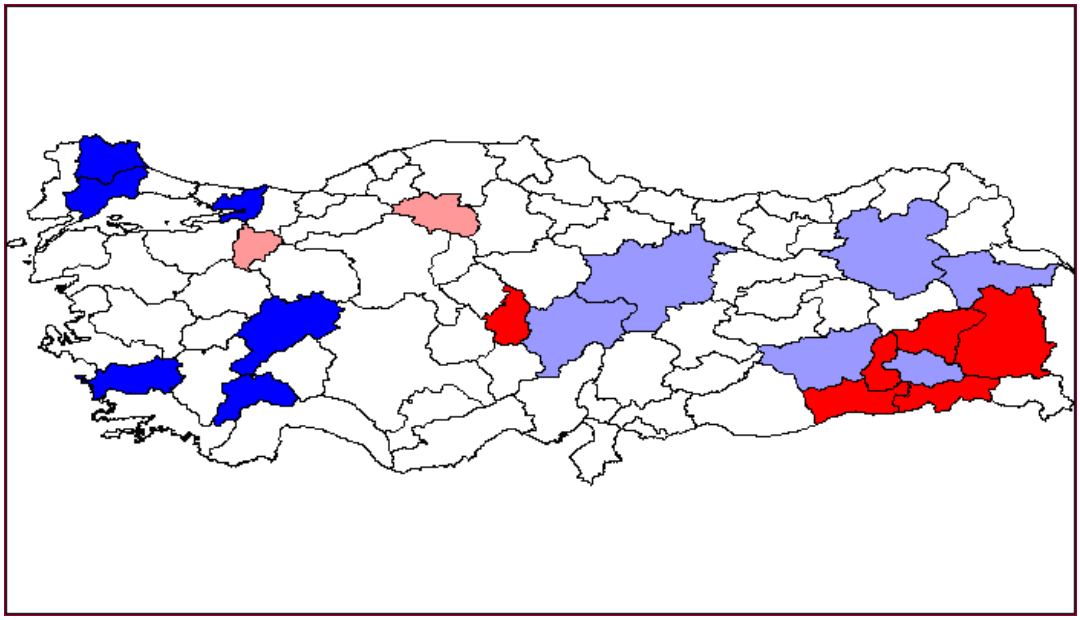

Figure 6: People per Practitioner physicians (PPP) LISA cluster map for 2006

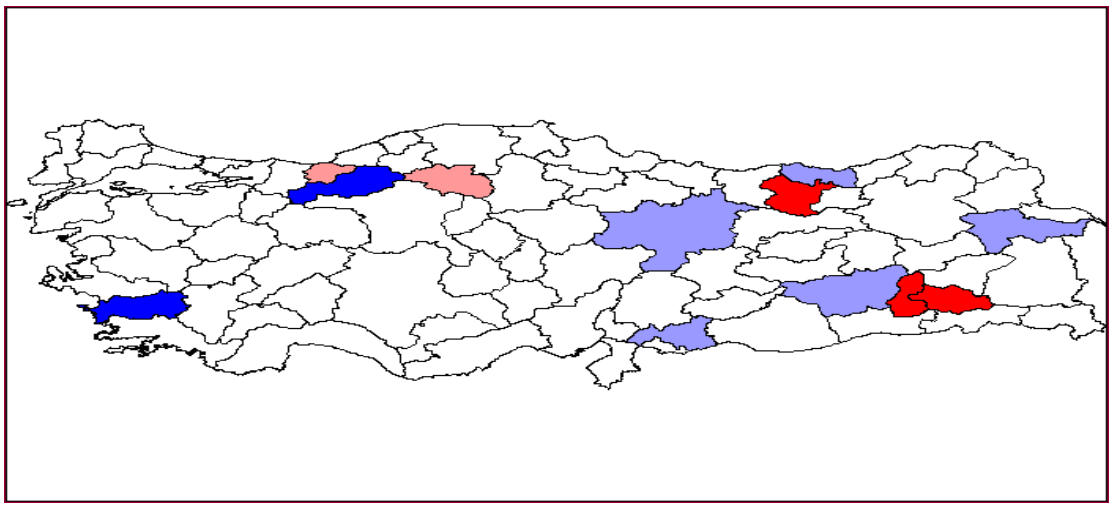

Figure 7: People per Total physicians (PTP) LISA cluster map for 2006

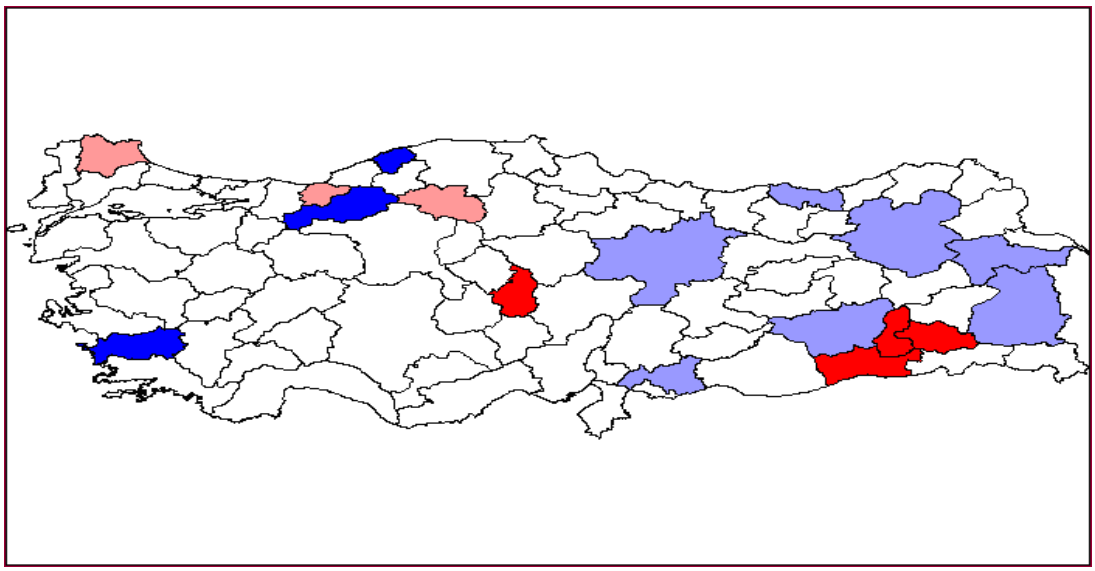

Figure 8: People per Specialist physicians (PSP) LISA cluster map for 1997

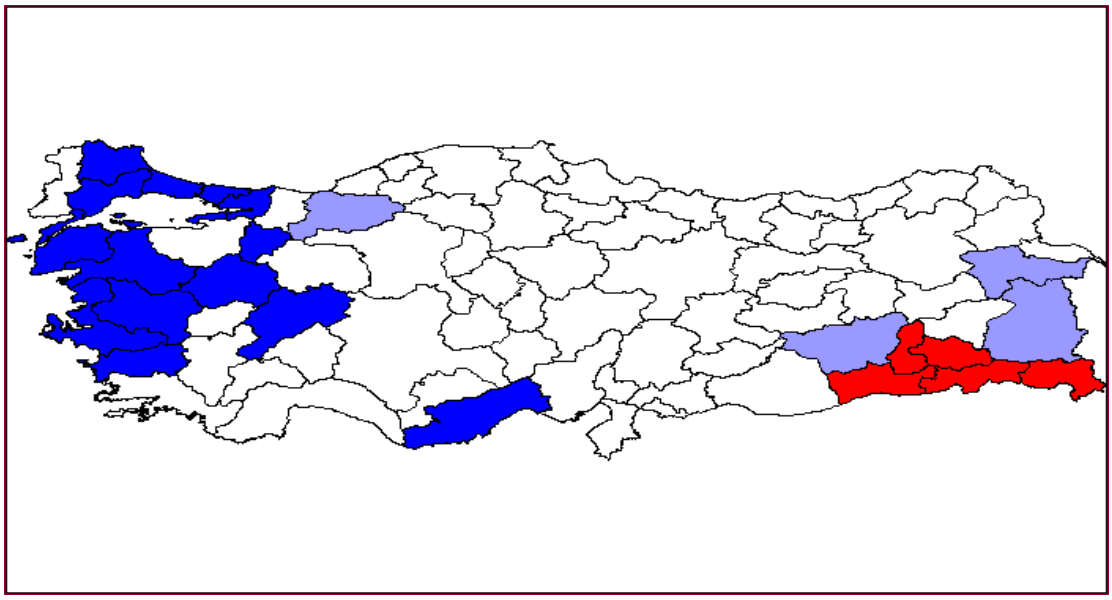

Figure 9: People per Practitioner physcians (PPP) LISA cluster map for 1997

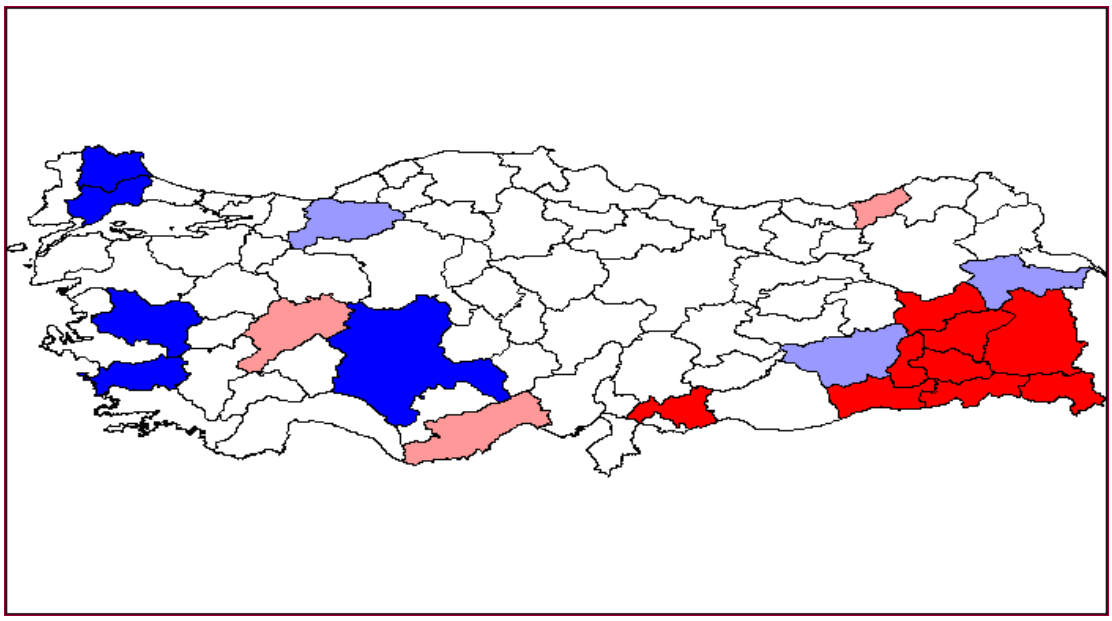

Figure 10: People per Total physicians (PTP) LISA cluster map for 1997

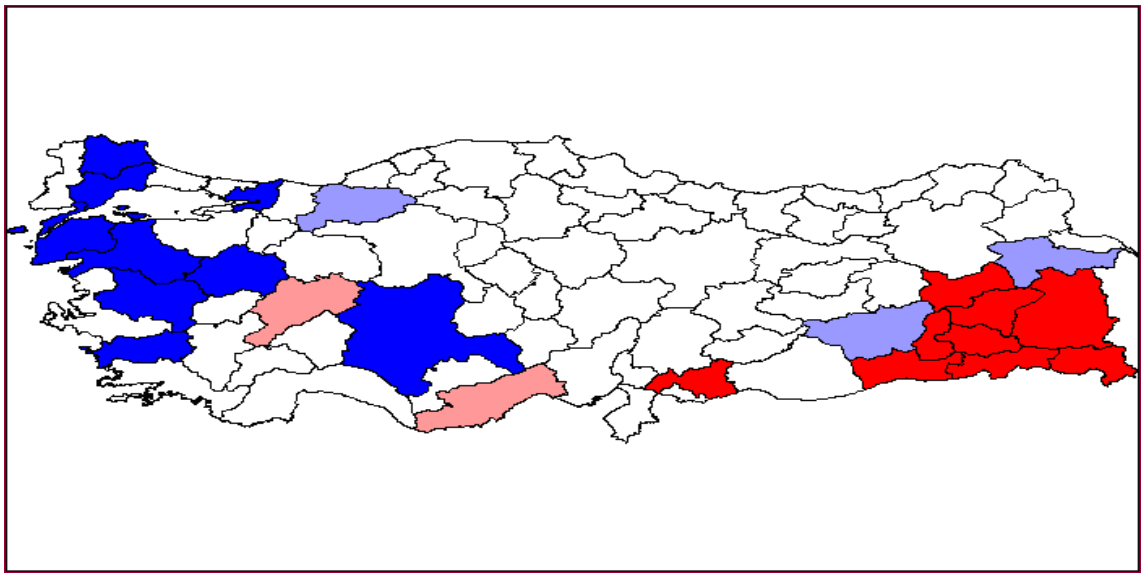

Table 5: Significance LISA for 1997 $(p = 0.05)$

	PSP	PPP	PTP
HH	Batman, Şırnak, Hakkari Mardin, Siirt	Bitlis, Hakkari, Muş, Batman Siirt, Şırnak, Van, Mardin Gaziantep	Bitlis, Hakkari, Muş, Batman Siirt, Şırnak, Van, Mardin Gaziantep
LL	Manisa, İstanbul, Tekirdağ Kırklareli,Kütahya, Yalova Aydın Balıkesir, Konya Afyonkarahisar, İzmir	Manisa, Tekirdağ, Kırklareli Aydın, Konya Çanakkale, Aydın, Kocaeli Balıkesir, Bilecik, Mersin	Manisa, Tekirdağ, Kırklareli Kütahya, Çanakkale, Kocaeli,
LH	Van, Bolu, Diyarbakır, Ağrı	Bolu, Diyarbakır, Ağrı	Bolu, Diyarbakır, Ağrı
HL	None	Rize, Afyonkarahisar, Mersin	Afyonkarahisar, Mersin

Table 6: Significance LISA for 2006 $(p = 0.05)$

	PSP	PPP	PTP
HH	Batman, Şırnak, Van Nevşehir Mardin, Bitlis, Nevşehir	Gümüşhane, Batman, Siirt	Batman, Siirt, Mardin,
LL	Burdur, Kırklareli, Aydın Kocaeli, Afyonkarahisar	Aydın, Bolu	Bartın, Aydın, Bolu
LH	Erzurum, Siirt, Kayseri, Diyarbakır, Sivas, Ağrı	Trabzon, Diyarbakır, Ağrı Sivas, Gaziantep	Trabzon, Erzurum, Diyarbakır, Van, Gaziantep, Sivas, Ağrı
HL	Çankırı, Bilecik	Çankırı, Düzce	Kırklareli, Çankırı, Düzce