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Research Article

The Relationship between Health Indicators and Development Ranks of Provinces in Turkey*

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Abstract

It is known that health has a significant positive effect on the rate of economic development in a country. However current research rarely permits the understanding of what the most important indicators are in the level of development. The aim of this study was to assess the relationship between health indicators and development levels of provinces. The data on the development level of the provinces was obtained from "Socio-Economic Development Ranking of Provinces and Regions," published in 2013 by the Ministry of Development of the Republic of Turkey. The number of health workers per ten thousand people, the number of hospitals, hospital beds, and the infant mortality rate by provinces was obtained from the web site of the Turkey Statistical Institute (TSI). At the end of the multiple regression analyses, it was found that the development ranks of provinces was effected by the number of pharmacists per ten thousand people, and the number of hospitals. According to these findings, the human resources for health, especially the number of pharmacists per ten thousand and the number of hospitals, could be taken into account in research on development rankings, and these indicators could be used as substitution variables for the development levels.

Keywords

Development ranks of provinces • Human resources for health • Number of hospitals • Hospital beds • Infant mortality rate

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In the context of development levels, there are two terms for measuring the relative values of countries, regions or provinces. One of these terms is “economic development,” which depends on social development and modernization, and the other is “economic growth,” which means the change in income per capita level. Even though both of these concepts are seen as synonymous by some researchers, they include different structures (Küçükkalay, 2001, pp. 59–61).

Economic growth is the change in production capacity in a certain time. In this context, the level of economic growth of a country, a region, or a province is measured by GDP, GNI and NI expressed in both absolute and relative size and per capita. So it is important to determine the increase in the society’s wealth. While economic growth is only concerned with the quantitative side of economic activity (an increase in production of goods and services), economic development is interested in both the quantitative side of the economic level and qualitative changes that take place in the economy and society. Therefore, it includes changes in the economic and social life (such as the education level, population growth, unemployment rate, and infrastructure facilities) and health status (Demircan, 2003, pp. 98–99; Haller, 2012, pp. 66–67).

As seen above, economic development is related to improvements in health status. Economic development policies tend to improve the health status, because the health of the population contributes to economic development. Health increases human potential and improves the quality of human resources in order to cut morbidity and mortality, and to provide adequate nutrition, health care and sanitation (Bloom & Canning, 2008, p. 11). Beside this, health effects productivity, labor supply, wages and salaries, education, investment, and savings both at the individual and macroeconomic level (Suhrcke, McKee, Sauto Arce, Tsoleva, & Mortensen, 2005, pp. 20–23).

When researchers examine the link between health status and economic development, they usually use two types of health measures: Health inputs and health outcomes. Inputs are the physical indicators that include nutrition, exposure to pathogens, and the availability of medical care. The number of human resources for health per capita, number of hospitals, or hospital beds are examples for the availability of medical care. Health outcomes include some health indicators such as life expectancy, infant and mother mortality rate etc. (Joumard, Andre, Nicq, & Chatal, 2008, pp. 10–18; Weil, 2005, pp. 4–5).

In many studies, investigators have examined the relationship between health indicators and the rate of economic development. For example, Bloom, Canning and Sevilla, (2003, p. 2), Lorentzen, McMillan, and Wacziarg (2008, p. 81) found improvements in health and life expectancy may increase economic growth. Kabene, Orchard, Howard, Soriano, and Leduc (2006, p. 2) and Zurn, Dal Poz, Stilwell, and Adams (2004, p. 1) expressed significant positive correlation between the level of economic development in a country

and its level of human resources for health in their studies. Beside this, [Mora and Barona \(2000, p. 68\)](#) and [Nishiyama \(2011, p. 630\)](#) found that years lost to premature mortality is one of the most robust indicators of economic growth. Moreover [Holmes, Slifkin, Randolph, and Poley \(2006, p. 467\)](#) said that hospitals are a very important factor for economic development. But unfortunately, while current research on these subjects represents a linkage between health and economic development and growth, the results of studies on causes and effects are still complex ([Mayer, 2001, p. 1025](#)). Also, no study which analyzes the relationship between two or more health indicators and economic development was encountered in Turkish or foreign literature.

The effect of health on economic development among countries, regions or provinces is of critical importance in policy issues such as determining priorities, allocation of human resources for health, and deciding in health investment. So more investigation must be conducted on the causes and effects of health on economic development in different levels such as countries, provinces, households, or individuals.

Method

Purpose and Importance of the Study

It is known that health has a significant positive effect on the rate of economic development and growth in a country. However, current research rarely permits the understanding of the most important indicators used to determine the level of development among countries, regions, or provinces. The aim of this study was to assess the relationship between health indicators and development levels of provinces in Turkey.

Universe and Sample

The research population constitutes 81 provinces in Turkey. Data on the variables (human resources for health, hospitals, number of hospital beds, and infant mortality rate) used in this study were obtained from the data sets of the Turkey Statistical Institute. For human resources for health to population ratios, all physicians (general practitioners, assistants and specialists), pharmacists, dentists, nurses, and midwives were included in the analysis. The number of health workers or health personnel per ten thousand people was found by dividing the number of health workers by the population of the cities in the same source.

Data on the ranks of economic developments of provinces was obtained from Socio-Economic Development Ranking of Provinces and Regions, computed and published by the Ministry of Development of the Republic of Turkey. In this report, 2010 data was used. So, for comparison purposes, health indicators were used for the same year in this study.

Data Analysis

The SPSS package was used to analyze the data. Correlation analysis was conducted to investigate relationships among variables and multiple regression analysis was conducted to evaluate the factors affecting the economic development level. A p -value $< .05$ was considered statistically significant.

Findings

Mean and standard deviations of 81 provinces by health indicators are outlined in Table 1. When the results for human resources for health are examined, pharmacist density (Mean = 3.04; SD \pm .99) and dentists per ten thousand people (Mean = 1.99; SD \pm .84) are the lowest in Turkey, while the nurse-population ratio is highest (Mean = 13.82; SD \pm 3.3284).

Table 1
Descriptive Statistics of 81 Provinces by Health Indicators

	N	Minimum	Maximum	Mean	Std. Deviation
Physicians	81	6.02	30.24	12.4481	.50601
Dentists	81	0.52	4.40	1.9953	.09388
Pharmacists	81	0.60	5.28	3.0401	.11016
Nurses	81	7.67	23.10	13.8212	.36914
Midwives	81	3.38	20.21	7.7980	.27679
Hospital Beds	81	83.00	483.00	243.8025	9.78321
Hospitals	81	1.00	217.00	17.2469	2.79591
Infant Mortality	81	5.80	18.00	12.0852	.30368

Correlation analysis results on the relations between economic development and health indicators have been presented in Table 2. According to this table, there are positive and significant relations ($r = -.391$ and $-.878$; $p = .000$) between health indicators and development ranks. Except the number of midwives per ten thousand ($r = -.166$), all other factors are related to the economic development level. The relations between the number of nurses per ten thousand, hospital beds and infant mortality rate, and development level are weak ($r = -.482$; $r = -.420$; $r = -.391$; $r = .476$ respectively); the relationship between development rank and number of physicians per ten thousand people is average ($r = -.601$). Number of dentists ($r = -.878$) and pharmacists per ten thousand ($r = -.822$) are highly correlated with economic development.

Table 2
Correlations Among Variables

	Development Level	Physicians	Dentists	Pharmacists	Nurses	Midwives	Hospital Beds	No. Hospitals	Infant Mortality
Development Level	1	-.601**	-.878**	-.822**	-.482**	-.166	-.420**	-.391**	.476**
Physicians	-.601**	1	.653**	.568**	.702**	.110	.761**	.355**	-.350**
Dentists	-.878**	.653**	1	.824**	.522**	.151	.396**	.444**	-.544**
Pharmacists	-.822**	.568**	.824**	1	.573**	.311**	.484**	.244*	-.449**
Nurses	-.482**	.702**	.522**	.573**	1	.442**	.772**	.070	-.337**
Midwives	-.166	.110	.151	.311**	.442**	1	.317**	-.239*	-.085
Hospital Beds	-.420**	.761**	.396**	.484**	.772**	.317**	1	.112	-.157
No. Hospitals	-.391**	.355**	.444**	.244*	.070	-.239*	.112	1	-.132
Infant Mortality	.476**	-.350**	-.544**	-.449**	-.337**	-.085	-.157	-.132	1

For multiple regression analyses, as recommended by [Tabachnick and Fidell \(2008, p. 75\)](#), the independent variables should not be strongly related to each other. So in this study, the number of dentists per capita was excluded because it is highly correlated with the number of pharmacists per capita.

A multiple regression analyses technique was used to examine the proportion of variance in economic development as explained by a set of independent variables. We did a multiple regression analyses with socio-economic development levels of provinces as dependent variables. The aggregate density of human resources for health (nurses, midwives, physicians, pharmacists, dentists), number of hospitals, number of hospital beds per ten thousand, and infant mortality rates were independent variables in the set of regressions.

According to Table 3, which shows the effects of health indicators on their economic development levels, the model accounted for 71% of the assessments related to the economic development. In terms of significance level, it is clear that the model was significant at all levels as a whole ($F = 97.308$; $p = .000$). The Durbin Watson coefficient, used to test whether there is any autocorrelation in the model, was 2.019, and Durbin Watson values of 1.5 to 2.5 showed that there was no autocorrelation. Another important statistic in Table 3 is the VIF, indicating whether there is any multicollinearity problem in the model. VIF values were 1.063, showing that there was no multicollinearity between independent variables.

Table 3
Multiple Regression Results

Independent Variables	UnStd. B Coefficiency	Std. β Coefficiency	t	p	VIF
(Constant)	99.980		21.764	.000	
Pharmacists	-18.326	-.772	-12.366	.000	1.063
No. Hospitals	-.189	-.203	-3.245	.002	1.063
		$R^2 = .707$	$F = 97.308$	$p = .000$	Durbin- Watson = 2,019

Table 3 also lists parameter values of the model obtained as a result of estimation and related statistics values and significance levels. According to the table, higher density of pharmacists and number of hospitals are very important factors for economic development. The effect of pharmacist density is greater than number of hospitals to development level. That is, while investigating the development of an economy, the number of pharmacists and hospitals must be taken in to account.

Discussion, Results and Recommendations

This study was conducted in order to assess the relationship between health indicators and development levels of provinces in Turkey. Our results confirm that the most important factors contributing to variation of economic development levels across provinces was the density of pharmacists and number of hospitals. 70.7% of the difference in economic development levels is explained by the number of hospitals and pharmacists to population ratios, which are the most effective independent variables. This finding is related to private practices. Pharmacists and hospitals which are in the private health care sector are located in developed provinces. [Friesner, Rosenman, and Bozman \(2009\)](#) found that pharmacists working in outpatient and retail settings were often geographically separate from the other sources of health care, and this made the economic impact of these pharmacists on the regional economy distinct and more easily quantified, compared to other types of health professionals. Regarding hospitals, [Holmes et al. \(2006\)](#) found that closure of the sole hospital in a community reduces per-capita income by \$703 ($p < .05$) or 4 percent ($p < .05$) and increases the unemployment rate by 1.6 percentage points ($p < .01$).

In Turkey, there are few institutional studies on economic development of provinces that use the same data set from TSI. The first report was delivered by [Dinçer, Özaslan, and Kavasoglu \(2003\)](#). In this report, the number of pharmacists per ten thousand and number of hospitals was used to calculate the economic development level of provinces. However, “Socio-Economic Development Ranking of Provinces and Regions,” published in 2013 ([Türkiye Kalkınma Bakanlığı, 2013](#)) by the Ministry of Development of the Republic of Turkey, only uses number of pharmacists and “Research on Development Level of Provinces with 2010 and 2012 Data,” published in 2014 by Turkey İş Bank ([Türkiye İş Bankası, 2014](#)), used number of hospitals.

According to these findings, investment in human resources for health and hospitals can be considered a part of economic development and growth strategies. Human resources for health, especially the number of pharmacists and number of hospitals, could be taken into account for research on development rankings, and these indicators can be used as substitution variables for the development levels.

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