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The Effect of Universal Health Coverage on Health Outcomes: The Case of Türkiye

(Research Article)

Genel Sağlık Sigortasının Sağlık Sonuçlarına Etkisi: Türkiye Örneği

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ABSTRACT

This study aimed to examine the effect of Universal Health Coverage practice on life expectancy at birth (as years) in Türkiye. An autoregressive distributed lag bounds testing (ARDL) model was used. The independent variables were the number of physicians (per 1,000 people), the ratio of health expenditures to the gross domestic product, and the Universal Health Coverage practice in the study model. Life expectancy at birth was selected as the dependent variable. The ratio of health expenditures to the gross domestic product (p=0.001) and Universal Health Coverage practice (p=0.011) were found to have statistically significant and positive effects on life expectancy at birth in the long run. Universal Health Coverage practice was also found to have a statistically significant and positive effect on life expectancy at birth in the short run (p=0.001). After ARDL, the robustness of results was tested with Fully Modified Ordinary Least Squares, Dynamic Ordinary Least Squares, and Canonical Cointegrating Regressions.

Anahtar Kelimeler:
Genel Sağlık Sigortası, Doğumda Beklenen Yaşam Süresi, ARDL Sınır Testi

ÖZET

Bu çalışmanın amacı, Türkiye'de Genel Sağlık Sigortası uygulamasının doğumda beklenen yaşam süresi (yıl olarak) üzerindeki etkisini incelemektir. Çalışmada, Otoregresif Dağıtılmış Gecikme Sınırları (ARDL) testi modeli kullanılmıştır. Çalışma modelinin bağımsız değişkenleri, hekim sayısı (1.000 kişi başına), sağlık harcamalarının gayri safi yurt içi hasılaya oranı ve Genel Sağlık Sigortası uygulamasıdır. Bağımlı değişken olarak ise, doğumda beklenen yaşam süresi seçilmiştir. Sağlık harcamalarının gayri safi yurtiçi hasılaya oranının (p=0,001) ve Genel Sağlık Sigortası uygulamasının (p=0,011) uzun dönemde doğumda beklenen yaşam süresi üzerinde istatistiksel olarak anlamlı ve pozitif etkileri olduğu bulunmuştur. Ayrıca, Genel Sağlık Sigortası uygulamasının kısa dönemde doğumda beklenen yaşam süresi üzerinde istatistiksel olarak anlamlı ve pozitif bir etkisi olduğu bulunmuştur (p=0,001). ARDL sonrasında sonuçların sağlamlığı, Tam Düzeltilmiş Sıralı En Küçük Kareler Regresyonu, Dinamik Sıralı En Küçük Kareler Regresyonu ve Kanonik Eşbütünleşme Regresyonu ile test edilmiştir.

1. INTRODUCTION

Türkiye started the Health Transformation Program (HTP) in 2003 and this program has made radical reforms in both health and social security systems. Before the HTP, the Turkish health and social security systems had complex and multi-headed structures in terms of service delivery and financing. There were many public hospitals affiliated with different ministries and public institutions (the Ministry of Health [MoH], 2003). Before the HTP, there was also a multi-headed structuring in the public financing of the health system; there were three different types of social insurance schemes. These were the Self Employment Insurance (SEI) for self-employed workers, the Social Insurance Institution (SII) for private sector employees, and the Government Pension Fund (GPF) for retired public employees (health expenditures of active civil servants were financed by the government budget) (Akbulut et al., 2007; Konca & Yildirim, 2021).

In Türkiye, before the HTP, public hospitals having the most important share among all the public hospitals that were not affiliated with the MoH were the hospitals affiliated with the SII. This institution was both carrying out social insurance activities and providing health care services for people affiliated with the SII through its hospitals. Active civil servants and people affiliated with SEI and GPF utilized health care services provided by the hospitals affiliated with the MoH. Public institutions providing health care services apart from the hospitals affiliated with the MoH and SII were hospitals affiliated with public universities, hospitals affiliated with the Turkish Armed Forces, and hospitals affiliated with some other public institutions. The dispersed structure in the service provision caused problems in many issues, especially issues related to quality, equity, and efficiency (Tatar et al., 2011; Bump et al., 2014). To eliminate these problems and ensure that everyone benefited from governmental health care services equally and efficiently, hospitals belonging to other public institutions than the MoH were transferred to the MoH (the Turkish Government Gazette, 2005). Finally, after the transfer of hospitals affiliated with the Turkish Armed Forces to the MoH in 2016, there were only public university hospitals delivering governmental health care services except the MoH in Türkiye (the Turkish Government Gazette, 2016).

As mentioned above, there were different social schemes in health financing for different segments of the population with varying benefits packages, and this caused equity-related problems in health financing in Türkiye. For instance, citizens affiliated with different social insurance schemes paid different premium payments although they get the same salary; they had to utilize health care services provided by different public hospitals; they paid different user contributions when benefiting from health care services; and finally, they received different amounts of pension even if they have done similar jobs in their working life (Organization for Economic Cooperation and Development [OECD], 2009). Similar steps taken in governmental health care provision were also taken in governmental provision of health insurance. The Social Security Institution (SSI) was established by merging three different public insurance institutions (SEI, SII, and GPF). Thus, the above-mentioned problems were tried to be eliminated (the Turkish Government Gazette, 2006).

In addition to reforms in the governmental provision of health and social security services, The HTP has also paved the way for reforms in different areas. Some reforms in the labor market were a product of the HTP practices. The obligation to work full-time in public hospitals for physicians working in these hospitals can be shown as an example of this (the Turkish Government Gazette, 2010). Before the HTP, physicians working in the public sector could open private examinations of their own and work there during a part of their working hours. With the obligation to work full-time in the public sector, all of the physicians with some exceptions working in public hospitals became obliged to work in public hospitals during all working hours (Özalp, 2015). This made it easier for individuals to access physicians.

Considering the above-mentioned practices of the HTP, one might be mistaken that this program was a program implemented only for secondary and tertiary health care services. The HTP focused also on primary health care services. Before the HTP, there were inadequacies in primary health care services in Türkiye. Units providing primary health care services were not fairly distributed across the country and there were problems in accessing primary care (MoH, 2003). To eliminate these problems, family medicine was established and everyone was obliged to be affiliated with a family doctor in 2010 (the Turkish Government Gazette, 2004). Thus, access to primary health care services was facilitated.

HTP was designed essentially as a program centered on access, quality, and efficiency in health care services. Political decision-makers argued that it was necessary for units providing governmental health care services to compete both with themselves and with private sector service providers to increase access, quality, and efficiency. As a result of this view, the belief that it was correct to manage public hospitals with the management techniques used in the private sector emerged, and financial and managerial decentralization was granted to public hospitals in 2011 (the Turkish Government Gazette, 2011). In this way, it was thought that public hospitals could compete both with each other and with private sector hospitals, and accordingly, quality and

efficiency increases would be achieved. However, this application was abandoned in 2017 when decentralization did not provide the desired positive effects (the Turkish Government Gazette, 2017).

Among the HTP practices, perhaps the most important one was the Universal Health Coverage (UHC). This practice aimed to include all citizens under public health insurance coverage. In this study, the effect of UHC practice on life expectancy at birth (as years) was examined. In this context, an autoregressive distributed lag bounds testing (ARDL) model was used. In the model, the number of physicians (per 1,000 people), the ratio of health expenditures to the gross domestic product, and the UHC were selected as the independent variables. Life expectancy at birth was selected as the dependent variable of the study. Life expectancy at birth as a health status indicator can be defined as how long a newborn can expect to live on average under the assumption that current death rates do not change. This indicator is among the most frequently used health status indicators and gains in the indicator can be attributed to some factors including access to quality health care services (OECD, 2023). Hence, this indicator was thought to be a good variable to test the effect of UHC.

With the HTP, important reforms were implemented in the Turkish health and social security systems, and with this study, the effect of UHC, one of the most important components of the HTP, on life expectancy at birth was investigated for the first time in the literature. In this context, first of all, the UHC process in Türkiye was discussed. After that, the relevant literature was mentioned and then the method of the study was presented. Afterward, the findings were obtained and discussed with similar studies in the literature. Finally, some concrete recommendations were given based on the findings.

2. UNIVERSAL HEALTH COVERAGE AND ITS HISTORICAL BACKGROUND IN TURKIYE

The past decade has seen a growing global demand for UHC, with many countries embarking on UHC-inspired health reforms and UHC being adopted as one of the new Sustainable Development Goals (Horton & Das, 2015). Today, many underdeveloped and/or developing countries have set the UHC practice as a national policy goal because the UHC is an important element in both the utilization of health care services and the financing of these services (Wagstaff & Neelsen, 2020).

UHC can be defined as everyone utilizing the health care services they need regardless of their ability to pay without suffering undue financial/economic hardship in the process (Boerma et al., 2014). The main goal of UHC is to provide everyone with accessible health care services and to enable families who get needed services not to suffer undue financial hardship (Wagstaff & Neelsen, 2020). Although UHC practices vary in some respects across countries (Tao et al., 2020), all the UHC practices try to increase the population covered by public health insurance to the highest possible level and to reduce out-of-pocket health expenditures, especially catastrophic health expenditures, as much as possible by covering more health care services at a higher ratio under public insurance (World Health Organization [WHO], 2010).

When countries that have adopted the UHC practice are examined, it can be seen that this practice can be implemented in countries and/or periods when economic and political stability is ensured (Reich et al., 2016). For example, Türkiye started discussing the UHC practice in the 1960s and was able to implement it in 2012. Türkiye experienced political and economic instability in the 1960-2003 and as a result, had difficulty in implementing the UHC (the Turkish Social Security Institution, 2011). By the end of 2002, a period of political and economic stability that would last for many years had begun for Türkiye. This process of political and economic stability played an important role in the success of the HTP launched in 2003. Similarly, the political and economic stability process was also effective both in establishing the legal infrastructure of the UHC practice, an important component of the HTP, and in bringing this practice to life (Baris et al., 2011; Atun et al., 2013; Reich et al., 2016).

Before the UHC reform in Türkiye, a significant part of the population was deprived of social security in terms of benefiting from health care services. For those within the scope, different types of health insurance benefits were provided by various social security institutions, and there was no uniformity of norms among these benefits (Akbulut et al., 2007; Atun et al., 2013). The problems experienced in health care services, which had a dispersed structure, and benefit conditions were quite different from each other and whose access was not widespread to the whole population, have been discussed for many years, and legal regulations have been made at different dates to solve them. Ultimately, the unity of norms and standards was implemented with the UHC, and access to health care services was provided in an effective, equal, accessible, and high-quality manner (The Turkish Social Security Institution, 2011).

The legal infrastructure of UHC in Türkiye was completed in 2008 and the UHC was put into practice in 2012 (Agartan, 2021). In Türkiye, where the UHC is mandatory, one of the most important aspects of the UHC is that the segments of society it covers have been greatly expanded. Special attention was given to ensure that no one with some exceptions (those who are doing their military service, convicts and detainees, members of the higher

judiciary, parliamentarians, etc.) was left out of the UHC while the legal infrastructure was being prepared. It was especially important to include all citizens under the age of 18 within the scope of UHC, without any conditions. Public health care services, which were previously only available to people subject to compulsory insurance with the health insurance premiums they paid, are now available to all citizens due to the UHC. In the previous system, only people subject to compulsory health insurance were able to benefit from the public health insurance system, however, in the new system, as in the private health insurance system, even an unemployed person is covered by the public health insurance paying a low premium or without any payment based on the income per capita in the house he/she lives in (Pekten, 2006).

Since the establishment of SSI, employees have paid premiums to this institution and both they and their families have received health care services from hospitals affiliated with the MoH, and the SSI has paid the MoH for the health care expenses of these individuals. UHC premium is 12.5% of the premium-based earnings for those subject to short and long-term insurance branches in Türkiye; 5% of this premium is the insured's share and 7.5% is the employer's share. For those who are only subject to UHC, the UHC premium is 12% of the earnings subject to the premium (The Turkish Social Security Institution, 2019).

The health expenditures of the poor without income were covered by the government with a regulation issued in 1992 and this practice was called the "Green Card" (the Turkish Government Gazette, 1992). This scheme initially provided some coverage only for inpatient hospital care, but it started covering outpatient health care services and prescription drugs in 2004. This scheme, rather than a population-based insurance system, could be seen as a means of providing funding for uninsured poor individuals who were not able to meet their health care costs (Atun et al., 2013; Agartan, 2021). After the transition to the UHC, the Green Card practice was terminated. Citizens without any income have been subjected to the income test and after the test; they have been included in the UHC either by paying a low premium or without any payment, according to the income per capita in the house they live in.

The UHC has been in practice since 2012 and it is thought that this scheme has dramatically increased the social insurance coverage in Türkiye. The percentage of the Turkish population covered by public health insurance has increased by approximately 27% since 2013, reaching 98.8% in 2019 thanks to the UHC (STATISTA, 2022). At this point, it is worth mentioning that, in the old system, revealing the exact proportion of the population covered by the social security schemes in Türkiye was not possible because social security institutions did not have reliable information regarding the number of active and pensioned members they covered. Moreover, the number of dependants was estimated based on the average household size in Türkiye, which sometimes caused wrong inferences (Akbulut et al., 2007). After the establishment of SSI, records began to be kept accurately and regularly depending on the development of information technologies and more realistic data began to be obtained.

3. LITERATURE REVIEW

This study employed an ARDL bounds testing model and this cointegration test is a frequently used method in time-based data in health care services. When the recent studies using ARDL bounds testing are examined, it can be seen that the majority of these studies have investigated the relationships between some factors within and/or outside the health care system and health expenditures (Li et al., 2022; Kutlu & Örün, 2023; Lone & Lone, 2022; Hughes & Kaya, 2022; Mujtaba & Ashfaq, 2022). In addition to these studies, there are also various studies that address the determinants of life expectancy at birth via an ARDL bounds testing model, as in the current study. Examples of these studies are presented below.

The study by Sahin (2016) examined the impact of the food production index, inflation, population growth, and growth in gross domestic product per capita on life expectancy at birth for Türkiye using data from 1975 to 2013. The long-run results of the study revealed that food production had a significant positive relationship with life expectancy at birth while inflation and growth in population had an insignificant negative relationship with life expectancy at birth. Also, the study found that the growth in gross domestic product per capita had a significant positive relationship with life expectancy at birth. In addition, the short-run results of the study showed that inflation and growth in the population had an insignificant negative relationship with life expectancy at birth, while the food production and growth in gross domestic product per capita had an insignificant positive relationship with life expectancy at birth.

Ali and Audi (2016) examined if there were any impacts of income inequality, globalization, and environmental problems on life expectancy in Pakistan with a dataset for the period 1980- 2015. The study results showed that inequality in income and environmental problems negatively and significantly affected life expectancy at birth while globalization had a positive and significant effect on life expectancy at birth in Pakistan.

Hossain et al. (2020) explored the effect of environmental conditions on life expectancy at birth in Bangladesh employing the annual data from 1974 to 2014. They found a statistically significant negative impact of environmental degradation on life expectancy at birth both in the short- and long-run.

Ojo Olusoji et al. (2020) investigated the effect of health expenditure on life expectancy at birth in Nigeria utilizing the data for the period 1981 to 2018. According to the results, the long–run and short–run estimates were found to be similar; the results indicated that carbon dioxide emission and primary school enrolment had a significant positive effect on life expectancy at birth, but government health expenditure had an insignificant impact on life expectancy at birth.

In their study covering the period from 1971 to 2017 for Turkiye, Şentürk and Ali (2021) showed that educational factors, purchasing power, and economic development had a significant effect on life expectancy at birth for the Turkish population. They also indicated that population growth and negative environmental conditions were found to be insignificant.

Shah et al. (2021) explored the effect of environmental quality and public spending on life expectancy at birth in China using the data belonging period of 1999–2017. This study revealed that there was a long-run relationship between environmental factors, public spending on the environment, and life expectancy. According to the study results, spending on the environment and enhancing environmental quality increased life expectancy at birth. Another finding of the study was that, in the short run, the population had a statistically significant positive impact on life expectancy at birth.

Azam et al. (2023) examined the factors affecting life expectancy at birth in Pakistan. They investigated the effects of some variables on life expectancy for the 1975-2020 period. They displayed that the inflation rate, carbon dioxide emissions, death rate, and food production index had negative impacts on life expectancy. The authors also indicated that urbanization, per capita income, birth rate, health expenditure, population growth, and education had positive impacts on life expectancy. In addition, in the short run, they showed that urbanization, food production index, birth rate, education, and infant mortality rate had positive impacts on life expectancy, while per capita income, inflation, population growth rate, health expenditure, death rate, and carbon dioxide emissions had negative effects on life expectancy.

Das and Debanth (2023) investigated the net impact of carbon dioxide emission (as metric ton per capita) on life expectancy at birth in India for the period 1991–2018. The authors found out a long-run and quadratic relationship between life expectancy at birth and carbon dioxide emission.

4. METHODOLOGY

4.1. Variables

This study employed the number of physicians (per 1,000 people) (Phy), the ratio of health expenditures to the gross domestic product (He/Gdp), and Universal Health Coverage (UHC) as the independent variables. Life expectancy at birth (as years) (Leab), an important indicator of health status, was employed as the dependent variable. The related literature indicated that Phy (Gilligan & Skrepnek, 2015; Mondal et al., 2019; You & Donnelly, 2022; Roffia, 2023), expenditure for health care services (Linden & Ray, 2017; Ojo Olusoji et al., 2020; Nkemgha et al., 2021; Roffia, 2023), and gross domestic product (Heijink et al., 2013; Sahin, 2016; OECD, 2017; Azam et al., 2023) were among the main determinants of Leab. Because the main incentive of the current study was to investigate the effect of UHC on Leab, the UHC was also employed among the independent variables. UHC was included as a dummy variable in the study and this variable was produced via a binary structure like 0-1, where 0 was used for the period 1974-2011 and 1 was used for 2012-2018.

When the previous section of the study, "Literature Review", is examined, it can be noticed that indicators related to environmental problems have been frequently used among the explanatory variables thought to affect Leab with an ARLD bounds testing model. However, because this study focused only on explanatory variables within the health and social security systems and indicators related to environmental problems could not be accessed specifically in Türkiye for the years covered by the study, environmental problem indicators could not be used among the independent variables of the current study.

The study covered 1974-2018 for Türkiye. The data were taken from the health database of the OECD (2022). The natural logarithms (log) of the variables except the categorical variable were taken and thus Log(Leab), Log(Phy), and Log(He/Gdp) were obtained.

4.2. Analysis

ARDL bounds testing approach was used in the current study. This analysis is used in a very wide range of sectors including health care. ARDL bounds testing approach can reveal the long-run and the short-run effects of

independent variables on the dependent variable. Pesaran, Shin, and Smith (2001) introduced this approach and since then it has widely been employed by studies using time series.

For this approach to be used, the series should integrate at the order level (I(0)) and/or at the first difference I(I). This is one of the most important advantages of the approach (Pesaran, et al., 2001). There are also some other cointegration tests such as Johansen (1988) and Engle & Granger (1987), but, these tests cannot be used in cases when different variables have different orders of integration (Khandelwal, 2015). The other important advantage of the approach is that this approach can be employed even if there is a limited number of observations when the other approaches cannot be used (Tang, 2003).

According to this approach, first of all, the existence of a long-term relationship between the series is investigated, and then, if a long-term cointegration is found between the series, the short-term relationships between the series are obtained. For the long-term cointegration an F-statistics is employed. Error Correction Model (ECM) is adopted in ARDL to obtain the short-run results and the error correction term with lag (ECT(-1)) in the ECM should be negative and statistically significant (Anand et al., 2019).

Some diagnostic tests should be used to reveal the robustness of study models having time series. These tests examine the existence of serial correlation, heteroscedasticity, model specification error, and normality-related problems. These tests were employed in the current study. In addition, some stability tests can be used to be informed about the decisiveness of study models with time series, and thus, CUSUM and CUSUM of Squares (CUSUM-SQ) tests were used in the current study.

After the ARDL, the robustness of the results was tested with Fully Modified Ordinary Least Squares (FMOLS) by Phillips and Hansen (1990), Dynamic Ordinary Least Squares (DOLS) by Stock and Watson (1993), and Canonical Cointegrating Regression (CCR) by Park (1992).

In time series, an appropriate lag determination process can be run before the cointegration tests to determine the optimal lag. Therefore, a Vector Autoregressive (VAR) model was adopted in the study. Eviews 10 was used and 95% was determined as the confidence level in all of the tests used in the study.

5. RESULTS

Firstly, descriptive statistics are presented as the first findings of the study (Table 1). Accordingly, the mean Leab was found to be 68.16, and its standard deviation was found to be 7.13; the minimum and the maximum Leab were found to be 55.70 and 78.30 respectively. The mean Phy was found to be 1.15, and its standard deviation was found to be 0.45; the minimum and the maximum Phy were found to be 0.53 and 1.88 respectively. Finally, the mean He/Gdp was found to be 3.46, and its standard deviation was found to be 1.27; the minimum and the maximum He/Gdp were found to be 1.49 and 5.53 respectively.

Table 1. Descriptive Statistics

	Leab	**Phy**	**He/Gdp**
Mean	68.16	1.15	3.46
Maximum	78.30	1.88	5.53
Minimum	55.70	0.53	1.49
Standard deviation	7.13	0.45	1.27
Observations	45	45	45

After descriptive statistics were obtained, Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) Tests, both of which are commonly used unit root tests in the literature, were employed to avoid spurious regression. The unit root tests were used to understand if the study variables were stationary at their levels (I(0)) or at their first differences (I(I)). As can be seen from Table 2, the study variables were not stationary at their levels and they became stationary at their first differences.

Table 2. ADF and PP Unit Root Tests

	Intercept		**Trend and Intercept**		**None**	
			***I*(0) (t-Statistic)**			
	ADF	***PP***	***ADF***	***PP***	***ADF***	***PP***
Log(Leab)	-1.921892	-1.849884	-0.847054	-0.940157	6.252404	5.353811
Log(Phy)	-1.445804	-1.621528	-0.364363	-0.012207	-0.601610	-0.606931
Log(He/Gdp)	-1.011522	-1.060691	-1.591071	-1.866559	0.635467	0.562922
			***I*(1) (t-Statistic)**			

	ADF	*PP*	*ADF*	*PP*	*ADF*	*PP*
Log(Leab)	-5.780640**	-5.846959**	-6.153810**	-6.161708**	-2.098706*	-3.692310**
Log(Phy)	-4.020360**	-4.182559**	-4.299632**	-4.366618**	-2.204090*	-2.139279*
Log(He/Gdp)	-7.066631**	-7.000074**	-7.101896**	-7.019721**	-6.840021**	-6.834655**

* shows significance at 95% confidence level; ** shows significance at 99% confidence level

VAR results were presented in Table 3. It can be understood from Table 3 that the maximum lag length for the ARDL model of the current study was 2 because it was the most preferred lag length by the Akaike information criterion (AIC), the Schwarz information criterion (SC), and the Hannan-Quinn information criterion (HQ) (Table 3).

Table 3. VAR Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	99.54455	NA	8.75e-08	-4.899720	-4.729099	-4.838503
1	300.7738	350.8613	6.60e-12	-14.39866	-13.54555	-14.09257
2	339.5779	59.69858*	2.11e-12	-15.56810	-14.03250*	-15.01714*
3	354.0749	19.32937	2.45e-12	-15.49102	-13.27294	-14.69519
4	373.4747	21.88694	2.37e-12	-15.66537	-12.76480	-14.62467
5	393.8098	18.77087	2.46e-12	-15.88768	-12.30463	-14.60211
6	422.6209	20.68484	1.99e-12*	-16.54466*	-12.27912	-15.01422

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

It can be inferred from the results of the F-statistics bound test that there is a long-term relationship among the study variables (Table 4). According to Table 4, the F-statistic value (34.72) is higher than the upper bound at both 5% (3.63) and 1% (4.84) suggesting that there is a long-term relationship among the study variables.

Table 4. Cointegration Results

Selected model 1,0,0,2	**F-Bound Test**		**H_0: No cointegration between the series**		
	Test Statistics	**Value**	***p***	**I(0)**	**I(1)**
		34.72	10%	2.01	3.12
			5%	2.45	3.63
			1%	3.42	4.84

It is understood from the Ramsey Reset test that the study model does not have any model specification error ($p>0.05$). Jarque-Bera test displays that the study model is distributed normally ($p>0.05$). Breusch-Godfrey Serial Correlation LM test shows that the study model does not contain serial correlation ($p>0.05$). Finally, it is considered that the study model does not have trouble regarding heteroscedasticity based on the results of the Breusch-Pagan-Godfrey test ($p>0.05$) (Table 5).

Table 5. Diagnostic Tests

	p
Model test: Ramsey Reset	0.851
Autocorrelation test: Breusch-Godfrey Serial Correlation LM	0.162
Heteroscedasticity: Breusch-Pagan-Godfrey	0.625
Normality: Jarque-Bera	0.127

The stability of the study model was tested via CUSUM and CUSUM-SQ graphs (Figure 1). Figure 1 shows that the study model is stable according to the CUSUM graph; however, CUSUM-SQ graph shows a slight deviation. This slight deviation can be interpreted that it does not deteriorate the stability of the study model because it is again in the confidence level as Yakisik and Çetin (2014) stated.

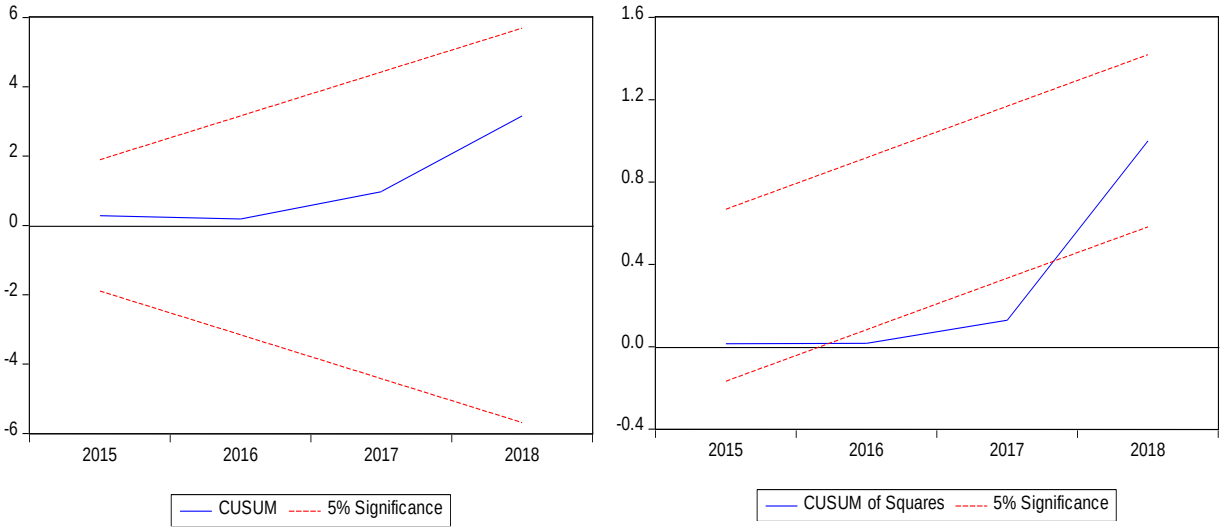

Figure 1. Stability Tests

Long-run results of the study model are presented in Table 6. It is clear that Log(He/Gdp) and UHC statistically significantly and positively affect Log(Leab) in the long run ($p<0.05$). It is also clear that Log(Phy) negatively affects Log(Leab) in the long run, but, it is not statistically significant ($p>0.05$).

Table 6. Long-Run Results

Variable	Coefficient	Standard error	t- Statistics	*p*
Log(Phy)	-0.631	0.711	-0.888	0.380
Log(He/Gdp)	2.358	0.294	8.007	0.0001**
UHC	1.187	0.447	2.652	0.011*

* shows significance at 95% confidence level; ** shows significance at 99% confidence level

It is understood from the results that one lagged of UHC statistically significantly and positively affects Log(Leab) in the short run ($p<0.05$), and also, it is the only independent variable significantly affecting the dependent variable for the short run. The coefficient of ECT (-1) (-0.005) is significant and displayed that about 0.5 percent deviation of Log(Leab) from its long-run level is adjusted in one year (Table 7).

Table 7. Short-Run ECM Estimation Results

Variable	Coefficient	Standard error	t- Statistics	*p*
d(Log(Phy))	0.007	0.029	0.239	0.812
d(Log(He/Gdp))	-0.006	0.006	-0.971	0.337
d(UHC)	-0.005	0.004	-1.386	0.173
d(UHC(-1))	0.044	0.004	10.295	0.0001**
ECT(-1)	-0.005	0.001	-7.364	0.0001**

* shows significance at 95% confidence level; ** shows significance at 99% confidence level

It is understood from Table 8 that the results of ARDL bounds testing were compatible with those of FMOLS, DOLS, and CCR. According to the results of three regressions, Log(He/Gdp) and UHC significantly and positively affected Log(Leab) while Log(Phy) significantly and negatively affected ($p<0.05$).

Table 8. FMOLS, DOLS and CCR Results

FMOLS				
Variable	**Coefficient**	**Standard error**	**t-Statistic**	***p***
Log(Phy)	-3.263796	0.437841	-7.454297	0.0001**
Log(He/Gdp)	3.488859	0.134842	25.87361	0.0001**
UHC	1.217652	0.457849	2.659503	0.0111*
DOLS				
Variable	**Coefficient**	**Standard error**	**t-Statistic**	***p***
Log(Phy)	-2.836940	0.452772	-6.265721	0.0001**
Log(He/Gdp)	3.106256	0.257797	12.04921	0.0001**
UHC	1.233479	0.445134	2.771026	0.0095**
CCR				
Variable	**Coefficient**	**Standard error**	**t-Statistic**	***p***
Log(Phy)	-3.156959	0.406052	-7.774759	0.0001**
Log(He/Gdp)	3.481551	0.132850	26.20665	0.0001**
UHC	1.135081	0.477148	2.378886	0.0221*

* shows significance at 95% confidence level; ** shows significance at 99% confidence level

6. DISCUSSION AND CONCLUSION

UHC is a major driver of health care utilization. Thus, many underdeveloped and developing countries are looking for ways to implement the UHC scheme. Türkiye started to fully implement the UHC scheme in 2012. This study investigated the effect of UHC practice on life expectancy at birth, an important health outcome indicator. According to the results of the current study, the UHC practice increases life expectancy at birth both in the long and the short runs. These results support the view that insurance related barriers to utilization of health care services have been removed and access to health care services has become easier with UHC.

There are some other studies supporting the results obtained in the current study in the literature. Shou-Hsiaand and Tung-Liang (1997) showed that after the introduction of UHC in Taiwan, the newly insured consumed more than twice the amount of outpatient physician visits and hospital admissions than before UHC was implemented. They also displayed that UHC ensured the previously insured group had a small but statistically significant increase in outpatient visits. In their study, Moreno-Serra and Smith (2012) suggested that broader health coverage led to better access to health care services and improved population health, particularly for poor people. In their study assessing health care utilization by 1165 homeless in Toronto, Ontario, from 2005 to 2009, Hwang et al. (2013) indicated that homeless people had substantially higher rates of emergency department and hospital use than general population controls in a universal health insurance system. Kruk et al. (2018) found that UHC could prevent 8.6 million deaths per year provided that the expansion of health care service coverage was accompanied by investments into high-quality healthcare systems. In their systematic review, Erlangga et al. (2019) arrived at the conclusion that increased health insurance coverage increase access to health care services, improve financial protection and improve health status.

This study also showed that the ratio of health expenditures to the gross domestic product affected the life expectancy at birth in Türkiye in a positive way in the long run. The related literature indicates that health expenditures positively affect life expectancy at birth. For example, Jaba et al. (2014) found a significant relationship between health expenditures and life expectancy at birth in 175 countries. Kim and Lane (2013) revealed a positive relationship between health expenditures and life expectancy at birth for 17 OECD countries. The findings of the study by Radmehr and Adebayo (2022) unveiled that health expenditure enhances life expectancy at birth in some Mediterranean nations. The ratio of health expenditures to the gross domestic product, as well as health expenditures, is also an important factor for life expectancy at birth because this variable reveals how much importance countries attach to health status in their economic activities. Therefore, the ratio of health expenditures to the gross domestic product was employed in this study and results showed that this ratio positively affected the life expectancy at birth in Türkiye in the long run.

The main concern of the current study was if the UHC practice significantly affected the health status in Türkiye, and results indicated that it significantly and positively affected life expectancy at birth. UHC is an important driving factor that increases health care utilization. Life expectancy at birth, which is an indicator of health status, is affected by health care services along with genetic, environmental, and behavioral factors. Easily

access to health care services in times of need contributes to an increase in life expectancy at birth by reducing deaths. UHC increases access to health care services and, as a result, contributes to health status. In this respect, the implementation of UHC, especially in underdeveloped and developing countries, is among important issues for these countries.

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