THE EFFECT OF POVERTY, LITERACY, URBANISATION AND NUMBER OF INSTITUTIONS AFFILIATED TO THE MINISTRY OF HEALTH ON THE NUMBER OF SUICIDES: A PANEL DATA ANALYSIS ON TÜRKİYE

Yoksulluk, Okuryazarlık, Kentleşme ve Sağlık Bakanlığına Bağlı Kurum Sayısının İntihar Eden Kişi Sayısına Etkisi: Türkiye Üzerine Bir Panel Veri İncelemesi

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Öz: This study examines the influence of socioeconomic and demographic factors on suicide rates across Türkiye's NUTS-2 regions from 2015 to 2023. Utilizing panel data analysis, we assess how poverty rates, literacy levels, urbanization, and the number of health institutions impact suicide incidences. Findings indicate that higher poverty correlates with increased suicide rates, highlighting the mental health challenges posed by economic hardship. In contrast, elevated literacy rates are linked to lower suicide rates, suggesting education enhances coping mechanisms and resource access. Urbanization presents a dual effect: while urban areas offer better healthcare access, they may also foster social isolation and stress, potentially raising suicide risks. Additionally, a greater number of health institutions correspond to reduced suicide rates, underscoring the importance of accessible mental health services. These insights are crucial for policymakers and public health officials. Strategies such as reducing economic disparities, investing in education, managing urban development thoughtfully, and expanding healthcare infrastructure are vital in mitigating suicide rates. By focusing on these factors, more effective, targeted suicide prevention approaches can be developed, enhancing mental health outcomes across Türkiye.

Keywords: Poverty, Literacy, Urbanisation, Suicide.

Öz: Bu çalışma, 2015-2023 yılları arasında Türkiye'nin İBBS-2 bölgelerinde sosyoekonomik ve demografik faktörlerin intihar oranları üzerindeki etkisini incelemektedir. Panel veri analizi kullanılarak yoksulluk oranları, okuryazarlık düzeyleri, kentleşme ve sağlık kurumlarının sayısının intihar vakalarını nasıl etkilediği değerlendirilmiştir. Bulgular, yüksek yoksulluğun artan intihar oranlarıyla ilişkili olduğunu, ekonomik zorlukların ruh sağlığı üzerindeki etkisini vurgulamaktadır. Buna karşılık, yüksek okuryazarlık oranları daha düşük intihar oranlarıyla bağlantılıdır, bu da eğitimin başa çıkma mekanizmalarını ve kaynaklara erişimi artırdığını göstermektedir. Kentleşme, daha iyi sağlık hizmeti erişimi sağlarken, sosyal izolasyon ve stres riskini de artırarak çift yönlü bir etki yaratmaktadır. Ayrıca, daha

fazla sağlık kurumu, intihar oranlarının azalmasıyla ilişkilidir, bu da erişilebilir ruh sağlığı hizmetlerinin önemini vurgulamaktadır. Bu bulgular, politika yapıcılar ve halk sağlığı yetkilileri için kritik öneme sahiptir. Ekonomik eşitsizlikleri azaltma, eğitime yatırım yapma, kentsel gelişimi dikkatle yönetme ve sağlık altyapısını genişletme gibi stratejiler, intihar oranlarını azaltmada hayati öneme sahiptir. Bu faktörlere odaklanarak, Türkiye genelinde ruh sağlığı sonuçlarını iyileştirecek daha etkili ve hedefli intihar önleme yaklaşımları geliştirilebilir.

Anahtar Kelimeler: Yoksulluk, Okuryazarlık, Kentleşme, İntihar.

INTRODUCTION

This study approaches the phenomenon of suicide through a sociological and structural lens, primarily grounded in Emile Durkheim's theory of suicide. According to Durkheim (2005), suicide is not merely an individual act but a social fact influenced by the strength of an individual's integration into society. Weak social ties, often caused by economic hardship, rapid urbanization, or social isolation, can increase the risk of suicide. In this context, poverty may lead to feelings of hopelessness and exclusion, reducing social cohesion and contributing to suicidal behavior. Similarly, urbanization can result in social disintegration and alienation, particularly when it occurs rapidly and without adequate infrastructure or support systems. From a theoretical standpoint, education level and access to health services function as protective factors that influence individuals' coping mechanisms. Higher education can enhance awareness, resilience, and help-seeking behavior, yet it may also increase stress levels due to heightened social and personal expectations (Peen et al., 2010). The availability of healthcare institutions, especially mental health services, plays a key role in preventing suicide by improving access to early diagnosis and treatment. This study adopts Durkheim's framework of social integration to explain the effects of selected socio-economic variables on suicide and underscores the critical influence of structural conditions on individual mental health.

This study takes a unique approach to the significant social problem of suicide rates in Türkiye. It aims to examine the effects of poverty rate, literacy, urbanisation level and the number of institutions affiliated with the Ministry of Health on the number of suicides according to the NUTS-2 Regional Classification.[1] The results of the panel data analysis in Türkiye show that poverty rate and literacy level have a positive effect on suicide cases, while urbanisation causes a strong increase. Additionally, the increase in the number of institutions affiliated with the Ministry of health contributes to the decrease in suicide rates. These findings offer important implications for policymakers and public health officials. Addressing economic inequalities, investing in education, carefully managing urbanization, and expanding healthcare infrastructure stand out as critical strategies for reducing suicide rates. With interventions targeting these identified factors, more effective suicide prevention approaches can be developed across Turkey, and the mental well-being of society can be improved.

CONCEPTUAL FRAMEWORK

Suicide is defined as an individual's act of ending his/her own life and is usually associated with factors such as severe psychological disorders, hopelessness, social isolation or extreme stress (Li et al., 2011). The phenomenon of suicide is closely related to individuals' socioeconomic
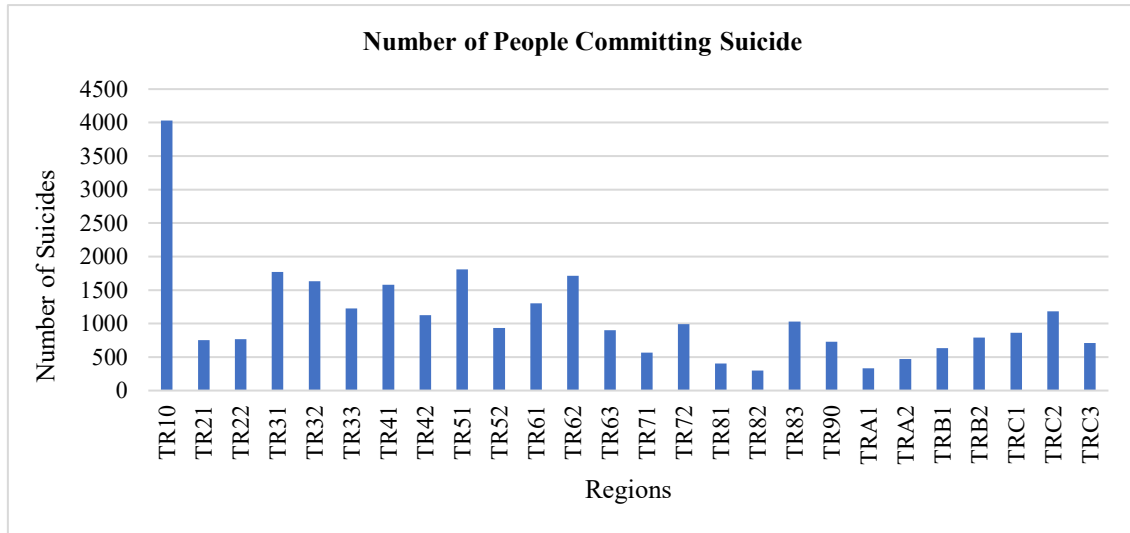
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[1] **TR10** (Istanbul), **TR21** (Tekirdağ, Edirne, Kırklareli), **TR22** (Balıkesir, Çanakkale), **TR31** (Izmir)**, TR32** (Aydın, Denizli, Muğla)**, TR33** (Manisa, Afyonkarahisar, Kütahya, Uşak)**, TR41** (Bursa, Eskişehir, Bilecik)**, TR42** (Kocaeli, Sakarya, Düzce, Bolu, Yalova), **TR51** (Ankara), **TR52** (Konya, Karaman), **TR61** (Antalya, Isparta, Burdur), **TR62** (Adana, Mersin), **TR63** (Hatay, Kahramanmaraş, Osmaniye), **TR71** (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir), **TR72** (Kayseri, Sivas, Yozgat), **TR81** (Zonguldak, Karabük, Bartın), **TR82** (Kastamonu, Çankırı, Sinop), **TR83** (Samsun, Tokat, Çorum, Amasya), **TR90** (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane), **TRA1** (Erzurum, Erzincan, Bayburt), **TRA2** (Ağrı, Kars, Iğdır, Ardahan), **TRB1** (Malatya, Elazığ, Bingöl, Tunceli), **TRB2** (Van, Muş, Bitlis, Hakkari), **TRC1** (Gaziantep, Adıyaman, Kilis), **TRC2** (Şanlıurfa, Diyarbakır), **TRC3** (Mardin, Batman, Şırnak, Siirt)

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conditions, education level, health conditions and environmental factors. Poverty decreases the quality of life in connection with economic difficulties and may increase the risk of suicide by weakening the psychological resilience of individuals (Ferretti and Coluccia, 2009). Literacy rate can affect individuals' socioeconomic expectations and level of integration with society; however, increased literacy level may trigger vulnerability in the face of social expectations and economic difficulties (Hunt, 2015).

Factors such as urbanisation, intense living conditions in cities and isolation may lead to stress and mental problems in individuals and increase the risk of suicide (Lari & Sefiddashti, 2023). On the other hand, the number of institutions affiliated with the Ministry of Health facilitates access to mental health services, enabling individuals to receive psychological support and thus has the potential to reduce suicide cases (Akmedani, 2017). This study, by examining the effects of poverty rate, literacy level, urbanisation and access to health services on suicide in Türkiye, aims to contribute significantly to the development of policies to prevent suicide.

Figure 1 presents the number of people who committed suicide in Türkiye in 2023, based on the NUTS-2 regional classification.

Figure 1: Number of Suicides by Region

Source: Turkish Statistical Institute (TURKSTAT)

As seen in Figure 1, the highest number of suicide cases was recorded in the TR10 Istanbul region (4030). This is followed by TR51 Ankara (1810) and TR31 İzmir (1769) regions. The region with the lowest suicide cases is TR81 Kastamonu, Çankırı, Sinop (298).

LITERATURE SUMMARY

Suicide rates in Türkiye are strongly correlated with socioeconomic factors such as poverty, literacy levels and urbanisation. This literature review compiles research examining the effects of these factors on suicidal behaviour. Ferretti and Coluccia (2009) analysed the socioeconomic factors affecting suicide rates in European Union (EU) countries between 2000 and 2005 using regression analysis. The results of the study indicate that low-income levels and unemployment increase the suicide rate. Andres et al. (2009) analysed the factors affecting the suicide phenomenon in Japan between 1970-2005 using time series analysis. The findings of the study reveal that low-income levels, unemployment rates and economic crises have a positive effect on suicide cases. In contrast, social security expenditures hurt the suicide phenomenon.

Machado et al. (2015) analysed the relationship between income inequality, unemployment, education and suicide rates in Brazil between 2000 and 2010 using regression analysis. The results of the analysis reveal that as unemployment and income inequality increase, suicide cases increase, while education level hurts suicide cases. Ahmedani et al. (2017) analysed the relationship between health conditions and the number of people who committed suicide in the United States between 2000 and 2010 using regression analysis. The results of the analysis show that physical health problems increase suicide cases. Dilber and Uysal (2020) investigated the relationship between unemployment rates and suicides caused by financial distress and commercial problems in Türkiye from 2005 to 2018 through time series analysis. The findings show a unidirectional causality from unemployment to suicide, indicating that joblessness weakens individuals' life satisfaction and psychological resilience, potentially leading to suicide. Atila and Çelikkaya (2020) analyzed the impact of economic crises on unemployment, crime, and suicide in Türkiye using the Granger causality test. The results reveal that economic crises significantly increase unemployment, and in turn, rising unemployment has a causal effect on suicide rates. This study highlights the psychological and social consequences of economic instability. Kızılkaya and Kuzucu (2022) examined the effects of unemployment, inflation, and female labor force participation on male and female suicide rates across 44 countries between 2000 and 2019 using panel data analysis. The results of the study indicate that a 1% increase in unemployment leads to a 4% increase in male suicides and a 2% increase in female suicides. Furthermore, a 1% increase in female labor force participation results in a 16% rise in male suicides and a 10% rise in female suicides. These findings emphasize the influence of economic vulnerability and gender dynamics on suicidal behavior. Lari and Sefiddashti (2023) analysed the effect of economic, health and environmental variables on the number of suicides in Eastern Mediterranean countries by using data between 1990-2019 with panel data analysis. The results of the analysis show that unemployment, psychological problems, and urbanisation increase suicide rates.

DATA SET, ECONOMETRIC METHODOLOGY AND MODEL

Data Set

This study analyses the effects of the poverty rate, the total population of provinces and districts, the number of literate people and the number of institutions affiliated with the Ministry of Health on the number of suicides at the NUTS-2 regional level in Türkiye by using the annual data between 2015 and 2022. The data used in the study were obtained from the Turkish Statistical Institute (TurkStat) website. Descriptive statistics and explanations of the variables are presented in Table 1. In the estimation models, all variables natural logarithms were taken to normalise the distribution of variables and minimise problems such as changing variance.

Variables	Variable Description	Eye Number	Average	Stan Deviation	Min.	Max.	Wait. Impact
Dependent Variables							
Suicide	Number of people who committed suicide	208	4.740	0.596	3.295	6.357	
Independent Variables							
Poverty	Poverty rate %	208	2.830	0.165	2.128	3.178	Positive
Education	Total number of literate people)	208	9.797	0.734	8.092	12.209	Negative
Health	Number of institutions affiliated to the Ministry of Health	208	3.480	0.325	2.772	4.248	Negative
Urbanisation	Total population of the province and district	208	14.613	0.730	13.056	16.582	Positive

Table 1: Descriptive Statistics

Source: Turkish Statistical Institute (TurkStat)

According to the table data, urbanisation (14.613) as the mean and education (0.734) as the standard deviation have higher variance than the other independent variables.

Econometric Method

Driscoll-Kraay analysis of standard errors is developed to obtain reliable estimation results in the presence of cross-sectional dependence, autocorrelation and heteroskedasticity problems in panel data analysis. This method aims to improve the robustness of parameter estimates by correcting the deviations of classical standard errors. The Driscoll-Kraay method, which is particularly effective in panel data sets containing large cross-sectional units (N) and short time series (T), provides high accuracy in the presence of cross-dependence in the data set (Tatoğlu, 2021).

Model

The empirical model for the econometric analyses conducted in the study is mathematically shown in the equation below.

$$lnsuicide_{i,t} = \alpha + \beta_1 lneducation_{i,t} + \beta_2 lnurbanization_{i,t} + \beta_3\ lnpoverty_{i,t} + \beta_1 lnhealth_{i,t} + \varepsilon_{i,t}$$

In the above equation, $lnsuicide_{i,t}$ refers to the total number of people who committed suicide $lneducation_{i,t}$ the number of people who can read and write, $lnurbanization_{i,t}$ total population of the province and district, $lnpoverty_{i,t}$ poverty rate and $lnhealth_{i,t}$ It refers to the number of institutions affiliated to the Ministry of Health. In the equation i and t, *subscripts* denote region and year, respectively. Also, β elasticity coefficients of variables, α the model constant, *ln* the natural logarithm and ε symbolises the error terms.

Findings

Model selection is significant in panel data analysis. In this study, random and fixed effects models are first estimated. The Hausman test was applied between the two models to determine the most appropriate model. Hausman test is used to evaluate the random effects model against the fixed effects model, and the hypotheses are formulated as follows:

H_0: The random effects model is appropriate.   **(1)**

H_A: The fixed effects model is appropriate.   **(2)**

Suicide	Probability Value)
Model	40.67 (0.0000)

Table 2: Hausman test results

Table 2 shows the Hausman test statistics and probability values for the model used in the study. The probability values of the Hausman test are less than 0.05, H_A: This shows that the fixed-effects model is appropriate. In the next important step of the analysis, the presence of possible problems such as autocorrelation, heteroskedasticity (changing variance), and horizontal cross-section dependence in the data was tested.

Injury	DWT (probability value)	Durbin-Watson	Pesaran CD
Model	109.60 (0.0000)	1.583 (0.000)	7.096 (0.000)

Table 3: Modified Wald Test - Durbin-Watson Test - Pesaran CD Test results

As seen in Table 3, since the probability value of the modified Wald test result is ($p < 0.05$), it is understood that there is a heteroskedasticity problem in the model. The Durbin-Watson test value is 1.583, i.e. less than 2, and the probability value ($p < 0.05$) indicates autocorrelation in the model. Finally, the probability value of the Pesaran CD test result ($p < 0.05$) indicates that there is horizontal cross-section dependence between units in the model. Since the presence of such problems may reduce the reliability of the forecasts, it is recommended to use robust standard error estimation methods such as Driscoll-Kraay in the analysis. This approach will make the estimation results more consistent and reliable.

Variables	Probability Value
Poverty	0.128*
	(0.056)
Reading and Writing	0.114*
	(0.059)
Urbanisation	3.139***
	(0.001)
Number of Institutions Affiliated to the Ministry of Health	-0.456***
	(0.002)
Fixed Term	-41.039***
	(0.002)

Table 4: Driscoll-Kraay analysis results

As seen in Table 4, a 1% increase in the poverty rate increases the number of people who commit suicide by 0.128% on average, with other variables held constant. A 1% increase in the literacy rate increases the number of people who commit suicide by 0.114% on average, with other variables held constant. A 1% increase in the rate of urbanisation increases the number of people committing suicide by 3.139% on average, with other variables held constant. This shows that urbanisation strongly affects injury crimes at a 1% significance level. The last variable, a 1% increase in the number of institutions affiliated to the Ministry of Health, decreases the number of people committing suicide by 0.456% on average when other variables are constant. This shows that health infrastructure strongly negatively affects crime rates at the 1% significance level.

CONCLUSION AND EVALUATION

In this study, various socio-economic factors affecting suicide rates are analysed. According to the results of the analyses, there is a positive relationship between the poverty rate and the number of people who commit suicide. A 1% increase in the poverty rate increases the number of people who commit suicide by 0.128% on average when other variables are constant. This finding suggests that poverty may increase suicide rates by negatively affecting the mental health of individuals.

Another critical finding was observed between literacy rate and suicide. A 1% increase in literacy rate increases the suicide rate by 0.114%. This result shows that literacy level significantly impacts the quality of life and psychological well-being of individuals. Education can help individuals to manage their lives better, cope with problems and deal with emotional difficulties. However, although individuals' access to information and their ability to express themselves improve as the literacy rate increases, it should be considered that this does not always have a positive effect, and some socio-economic conditions and environmental factors may also affect this relationship.

The effect of the urbanisation rate on suicide is more significant. A 1% increase in the rate of urbanisation increases the number of suicides by 3.139%. This result shows that urbanisation may

be associated with factors such as social isolation, stress and psychological health problems, especially in big cities, and this may increase suicide rates.

Finally, when the effect of the number of institutions affiliated with the Ministry of Health is analysed, it is observed that this variable has a negative effect on suicide rates. A 1% increase in the number of institutions affiliated with the Ministry of Health decreases the number of suicides by 0.456%. This finding shows that strengthening the health infrastructure can play an essential role in solving social problems such as suicide. Making health services more accessible may reduce suicide rates by making it easier for individuals to receive psychological support.

In conclusion, factors such as poverty, literacy rate and urbanisation have significant effects on suicide rates. In particular, urbanisation and strengthening health infrastructure are critical for reducing suicide rates. These findings suggest that policymakers should develop strategies to reduce suicide rates by taking socioeconomic factors into consideration.

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