Socioeconomic Determinants of Suicide in Iran: Panel Data Study

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Abstract

Background: A set of experiences that leads to the destruction of individual's self-esteem are the main causes of suicide. Socioeconomic factors can be reasons for this event. Therefore, we aimed to investigate the impact of socioeconomic variables on suicide.

Methods: A panel data model was used to investigate the impact of socioeconomic indexes on the number of suicides in each province of Iran from 2001-2016. The data of socioeconomic variables were obtained from the statistical center of Iran, and data for the number of suicides in each province were obtained from the forensic science department. The analysis was conducted using estimated generalized least squares method by EViews version 8.

Results: The lowest and highest number of suicides was in 2001 (4.97 per 100,000 populations) and 2004 (5.97 per 100,000 populations), respectively and the average rate of suicide from 2001 to 2013 was 1.01 also unemployment, divorce, and industrialization rates have high impact on suicides for both sexes in $P<0.05$.

Conclusion: Living skills training should be provided to the members of the societies as a short-term plan and in the long-term, improving the economic condition of people should be conduct to reduce the number of suicides.

Keywords: Divorce; Iran; Mental health; Socioeconomic factors; Suicide; Panel data regression

Introduction

Every day, all over the world, thousands of people come to life and thousands die. People could have a normal life expectancy if they don't face natural or man-made disasters. However, some people prefer to end their life because of different reasons such as; behavioral, biological, social, psychological, and their interactions (1, 2).

WHO defined suicide as "the act of deliberately killing oneself" (3). According to the WHO report in 2014, over 800,000 people die due to suicide every year. In 2012, suicide was the second leading cause of death among 15-29 yr old and the 15th leading cause of death for all ages. About 75% of global suicides occurred in low and middle-income countries. Suicide accounted for 1.4% of all deaths around the world (4). Due to the increase in the number of suicides, WHO announced on 10th of September each year as the world suicide prevention day (5, 6). The cost of suicide was about 2,000 million euros in economic losses to society (7, 8).

Investigating the causes of suicide is complex; because, many factors contribute to a decision of suicide. The psychological, demographic and socioeconomic factors could affect decisions about suicide (9, 10). Demographic and socioeconomic factors are the main determinants of suicide (11-13).

Emile Durkheim, the French sociologist, was the first to consider suicide as a social phenomenon, and believes that every suicide has a social aspect because societies apply a strong influence on individual's decision. Social forces are the most important causes of suicide that varies in a different society, social groups, religion, etc. Community integration is the main part of Durkheim's theory; as community integration decrease, the individual's relationship with friends and social groups decrease, therefore, they become more vulnerable to end their life (14). Erik Forum also believes that suicide is a social phenomenon. For an effective investigation of suicide determinants; environmental, economic, cultural, educational and family conditions should be considered. Cultural and religious issues of each society are the major parts of its conditions (1).

Using a social perspective, many socioeconomic factors could consider as determinants of suicide. However, suicide leads to a major losses in human resources of societies (15). Currently, the impacts of socioeconomic factors on health are undeniable and their consequent impact on suicide could be investigated separately on both sexes.

During the last decade, Iran has experienced many social, cultural, and economic changes. Due to the economic crisis in 2012, mainly because of international sanctions, unemployment and inflation rate have been increased. Cultural norms have vanished, which leads to a reduction in community integration. Social capital had decreased in Iran (16, 17). Besides, more than 40% of the population is less than 40 yr old, one of the youngest nations in the Middle East region (18). All of these factors could lead to increase the vulnerability of Iran's society to suicide.

Thus, investigating the role of socioeconomic variables on suicide can provide useful infor-

mation to policy-makers in order to prevent the incidence of suicide. Subsequently, we aimed to investigate the impact of socioeconomic variables on suicide on both sexes during the period of 2001-2016.

Methods

Urbanization, divorce, and literacy rates are the main social variables, and unemployment rate, the household income per capita and industrialization index are the main economic variables which determine for a number of suicides. Data about deaths due to suicide in each province during the study time period were obtained from the forensic science department of Iran and mental health department of Ministry of Health and Medical Education. Data about divorce, urbanization, unemployment, industrialization, and literacy rates for each province were obtained from the statistical center of Iran.

Dependent variable: Number of suicide ($S_{i,t}$)
Independent variables:
Unemployment rate, Rate of urbanization, Divorce rate, Literacy rate

Industrialization index: This variable is the combination of several major indexes, including number of industrial firms per 10,000 population; total number of industrial sector workers per 10,000 population, industrial added value per 10,000 population, number of establishment license of industrial firms, proportion of industry employment to total population, proportion of added values of industry sector of each province to total added value of country, added values per each industrial unit, the average of labors of each firm, proportion of industrial firms in each province to total number of industrial firms in the country and added value per worker. The industrialization index was calculated for each province Using Taxonomy technique.

Model
The estimated model is as follows:

$$S_{i,t} = \propto_i + \beta_1 L_{i,t} + \beta_2 UE_{i,t} + \beta_3 Urban_{i,t} \\ + \beta_4 D_{i,t} + \beta_5 HPI_{i,t} + \beta_6 I_{i,t} \\ + \varepsilon_{i,t}$$

Where, S_{it}: Number of suicides
UE: Unemployment rate
Urban: Urbanization
D: Divorce rate
I: Industrialization index
HPI: household per capita income
L: Literacy

$\varepsilon_{i,t}$ is the value of an unobserved error term, u, and unknown parameters are constant, ceteris paribus.

Because data contain observations on 30 provinces over 12 yr, for the same units (in our case, provinces), panel data model was employed. Before conducting panel data analysis, to avoid false results, a pre-test was implemented on one province. Variance heteroscedasticity was investigated using chi-square test. According to the chi-square results, if the data has variance heteroscedasticity problem, Generalized Least Square (GLS) is used to solve the problem (19).

In the panel data analysis, if the number of individual units is more than the time period (N> T), heteroscedasticity test should be conducted. Thus, Likelihood Ratio (LR) was employed to examine the heteroscedasticity. According to the results (LR chi2 = 359.64 and Prob> chi2=0.000), the zero hypothesis, homogeneity of variance, was rejected, for both sexes, and data were heteroscedastic.

In the next step, to determine whether a fixed model or random model is better, Hausman test applied (20). Zero hypothesis is that there is no correlation between the two models. Table 1 shows the results of Hausman test. Based on the results fixed effect was chosen.

Table 1: Results of Hausman test

Correlated Random Effects - Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob
Cross-section random	28.08	11	0.0031

Fixed effect test

In this model, each component has its own fixed value, because for each fixed value there is a dummy variable, sometimes it's called least squares dummy variable.

The F-Limer test was used to determine whether data are pooled or panel. Based on the results Panel model was chosen (Table 2).

Table 2: Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	42.5	(26,302)	0.0000
Cross-section Chi-square	537.03	26	0.0000
Period F	2.623	(12,302)	0.0024
Period Chi-square	34.6	12	0.0005
Cross-Section/Period F	30.01	(32,308)	0.0000
Cross-Section/Period Chi-square	545.7	38	0.0000

Suicide is the dependent variable. Unemployment rate, added value, the household income per capita, the rate of urbanization, industrialization index, literacy, and divorce rates were independent variables.

Data Analysis: Generalized Least Squares (GLS) model was used to analyze the data. Data were analyzed using EViews version 8. *P*-value less than 0.05 is considered as significant.

Results

Zero hypothesis is that there is no correlation between the two models. Based on the results fixed effect was chosen (Table 1).

The F-Limer test was used to determine whether data are pooled or panel. Table 2 shows the results. Based on the results Panel model was chosen.

The lowest and highest number of suicides was in 2001 (4.97 per 100,000 populations) and 2004 (5.97 per 100,000 populations), respectively (Fig. 1). The average rate of suicide from 2001 to 2013 was 1.01.

Sistan-and-Baluchestan (2.1 per 100,000 populations) and Ilam (18.3 per 100,000 populations) had the lowest and highest number of suicides, respectively (Fig.2).
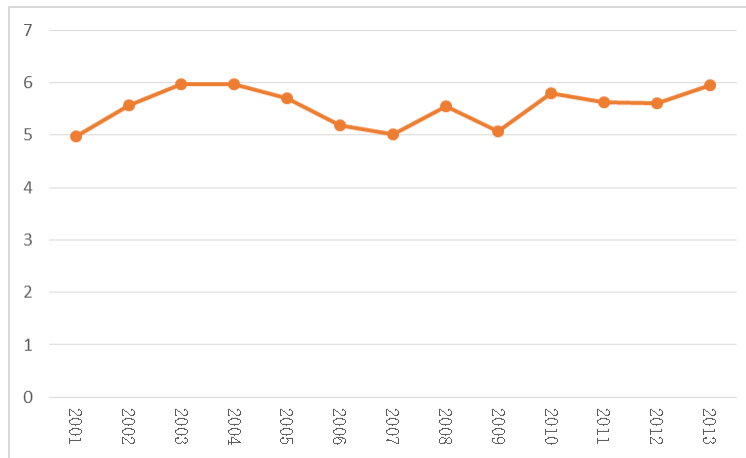

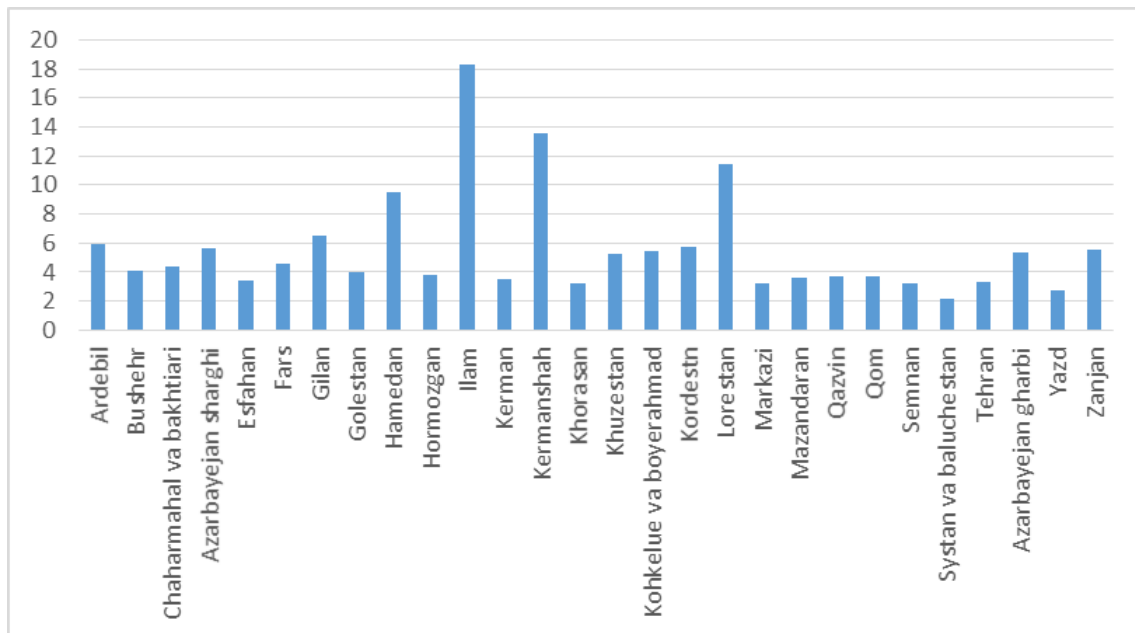**Fig. 1:** Average number of suicides per 100,000 populations in the period of 2001-2016

Fig. 2: Average number of suicide

Urbanization (*P*=0.00) and the divorce rate (*P*=0.00) have a direct and significant impact on suicide in women while the association between households' income per capita (*P*=0.00) and literacy (*P*=0.00) with suicide in women was inverse and significant. The association between industrialization index (*P*=0.37) and suicide in women was insignificant. The literacy rate has the highest reductive impact on women suicide, while divorce rate has a highest positive relationship with suicide. The unemployment (*P*=0.00) and divorce rates (*P*=0.00) of men had a direct and significant impact on suicide numbers. The household income per capita (*P*=0.00), urbanization (*P*=0.00), industrialization index (*P*=0.00), and literacy rate (*P*=0.00) had an inverse and significant association with suicide. The industrialization index has the highest reductive impact while the divorce rate has the highest positive association with suicide in men (Table 3).

Table 3: Results of GLS regression

Method: Panel EGLS (Cross-section weights)

Variable	Dependent Variable: Female Suicide				Dependent Variable: Male Suicide			
	Coefficient	Std. Error	*t*-Statistic	*P*-value	Coefficient	Std. Error	*t*-Statistic	*P*-value
C	160.12	22.81	7.01	0.0000	349.64	43.547	8.029	0.0000
Unemployment rate	0.73	0.25	2.94	0.0034	2.679	0.424	6.312	0.0000
household income per capita	-0.00000018	0.00000002	-8.91	0.0000	0.000212	0.0000207	-9.095	0.0000
Urbanization	0.35	0.08	4.32	0.0000	-0.864	-0.147	-5.846	0.0000
Industrialization index	-10.94	12.29	-0.89	0.3740	-18.4	14.873	-7.398	0.0000
Literacy	-1.57	0.24	-6.48	0.0000	-1.999	-0.423	-4.72	0.0000
Divorce rate	1.81	0.24	7.36	0.0000	5.258	-0.487	10.77	0.0000
	Weighted Statistics				Weighted Statistics			
R-squared	0.553	F-statistic		62.93	R-squared	0.647	F-statistic	93.6
Adjusted R-squared	0.544	Prob(F-statistic)		0.00	Adjusted R-squared	0.641	Prob (F-statistic)	0.00

Discussion

Unemployment rate is the most affecting factor for suicide in all the provinces of Iran, which leads to poverty, income inequalities, migration, family disputes, etch at least in the long-term (21).

Suicide in both sexes has a positive relationship with the unemployment rate. This result is consistent with the results of Qin in Denmark, Philips in China, Ceccherini-Nelli in the UK, USA, France, and Italy (22-25). In Japan, individuals with a non-professional job had an increased number of suicides (26).

Contrarily, Tsuboi did not find any significant association between suicide and unemployment in Canada. The impact of socioeconomic variables was investigated on suicide in Japan, which shows a direct and significant association between the unemployment rate and suicide (27).

In today's modern societies, poverty can create severe conflicts. Poverty forms a foundation for social deviations and is the most important cause of suicide. Poverty creates the feeling of

inequality, low spirits, isolation, cut ties with friends, and finally leads suicide (28).

Household income per capita has a preventive impact on suicide in both sex (increasing the income per capita lead to decrease in suicides). Financial problems as an important factor had a direct impact on suicide (24, 29-33). Migration to industrial areas to find jobs intensify the population density and other environmental problems. Increasing the number of population who reside in such areas has different negative impacts on the already existing population, such as cultural, social, and economic aspects,which has a direct impact on the mental health of the societies. Besides, men usually are less affected by urbanization effects (and sometimes side effects), and this could be one of the reasons that men have a lower number of suicides relative to women. Men and women have an inverse and direct association, respectively between urbanization and suicide and both of them were significant. This finding is consistent with another results that found a significant and direct association between urbanization and suicide for women (22). Urbanization had a preventive impact on suicide in Chinese men (24).

Industrialization plays a vital role in economic growth and therefore, it decreases the unemployment rate and leads to GDP growth. All of these variables have anegativeimpact on suicidewith some drawbacks.

In this study, industrialization index dosen't show a significant association with a suicidalrate. This result was inconsistent with another study in Ilam province that indicates industrialization has a significant and direct impact on suicide in women (22). The difference between the results could be due to that their study only examined one province (Ilam).

The educational system as a framework for institutionalizing cultural values and as mean to transfer norms and social values to all people of the society can prevent many moral and social anomalies caused by cultural poverty. Literacy rate could prevent suicide. This result was in agreement with other studies (29, 30, 34). The prevalence of social chronic problems, such as marital problems and divorce, is so high among people who attemptedsuicide. Hence, low level of overall life satisfaction could create a depressing perception that may lead to attempt suicide.

Increasing the rate of divorce leads to higher rates of suicide in both sex even though the impact of divorce in men is higher than women. The results of other studies are consistent with this result (31, 32, 35, 36).

The impact of socioeconomic factors affecting suicide be examined more closely. Socio-economic information of deceased individuals should be collected from their families using the interview method.

Conclusion

Suicide leads to the destruction of social capital. With regard to the impact of human resources in development process, investigating the cause of suicide is important. Most studies mentioned economic variables as the most important affecting factorsforsucidies. Thus, trying to reduce unemployment and increasing the literacy rate, facilitating marriage, reducing the divorce rate and increasing houshold's per capita income can have a significant impact on suicide reduction. The association between industrializa-tion index and suicide was negative but industrialization includes some negative aspects.

Provision of training about the living skills to schoolage children, particulary by their parents, could be a suitable solution to prevent suicides in adulthood. Every problems have many solutions and suicide is not a good solution.

Ethical considerations

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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