QBS
Vol. 35, No. 2, pp. 41-44 (2016)
https://doi.org/10.22283/qbs.2016.35.2.41
pISSN : 2288-1344 **Original Article**

Quantitative Bio-Science
Official Journal of the Institute of Natural Science at Keimyung University
Available Online at http://qbs.kmu.ac.kr

A Comparative Analysis of Suicide Rate Trends between Korea and Other OECD Countries

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(Received November 1, 2016; Revised November 14, 2016; Accepted November 16, 2016)

ABSTRACT

This study investigates the factors affecting suicide in the member of countries of the Organization for Economic Cooperation and Development (OECD), and examines the factors contributing to the difference in suicide rate trends between Korea and other OECD countries. The decision tree and linear regression analyses were applied for empirical research. There are two major findings from this study. First, the factors affecting suicide were variables related to life expectancy, health resources, birth and divorce, social welfare spending, demographic factors, and weekly hours worked. Second, there are five key factors influencing the difference in suicide rate trends between Korea and other OECD countries: psychiatric care beds, crude divorce rate, social expenditure for family, weekly hours worked for men (20-29 hours), and mobile subscribers.

Key words : Suicide, Korea, OECD, Decision tree, Linear regression analysis

Introduction

Today, suicide has been recognized as a serious problem in many developed countries, and many countries have attempted to implement policies for preventing suicide. The World Health Organization (WHO) reported that suicide is an important issue because it is one of the top three causes of death in the age group of 15-44 [1]. According to data from Statistics Korea, the number of suicide deaths was 13,836. This means that 27.3 per 100,000 people committed suicide in Korea [2]. Furthermore, the suicide rate in Korea has shown an increasing trend unlike other Organization for Economic Cooperation and Development (OECD) countries. Since 1997, the number of deaths caused by suicide per 100,000 people in Korea has been higher than the OECD average, and Korea had the highest suicide rate among the OECD countries from 2003 to 2012. As a result, Korea has promoted various policies to reduce the suicide rate [3-5].

Previous research on suicide mostly focused on how mental health and economic and social factors affect suicide rate. Jin et al. [6] investigated the difference in suicide rate trends between Korea and other countries using data from the OECD and WHO. Lee et al. [7] studied mental illness factors for suicide attempts and Kim [8] examined suicide prevention methods by dividing the factors for adult suicide into personal factors and social environmental factors. Yoo et al. [9] studied the relationship between suicide and stress of college students using a structural equation model. Petrovich et al. [10] studied how the social and economic crisis in the region of Nis (southeastern Serbia) affects suicide.

A review of previous research reveals that while there is a great deal of literature on various factors that affect suicide, there is little work on why Korea has a different trend compared to other OECD countries. In this study, we analyze the social factors that affect suicide in OECD countries and inves-

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tigate why Korea has a different suicide rate trend compared to other OECD countries.

Experimental Setting

1. Data

From 1990 to 2012, 94 variables affecting suicide were considered in this study. The entire dataset was divided into 10 main categories, composed of country and year, suicide, health status, health resources, family indicators, population, work hours, nutrition, smoking and alcohol consumption, and macroeconomics. Data related to suicide is obtained from the OECD and WHO database and nutrition data is extracted from the United Nations Food and Agriculture Organization (FAO).

2. Assumption and hypothesis of the study

Snowdon and Hunt [11] explained that suicide is influenced by past events, such as war or economic crisis. From the previous research, this study established an assumption and hypothesis as follows.

Assumption

The suicide rates of a country at time t would be influenced by social variables at time $t-1$.

Hypothesis

Certain social factors would affect suicide rate differently in Korea and other OECD countries.

3. Analysis steps

In the first step, we created dummy variables using Shapiro-Wilk normality test and ANOVA. In the second step, we performed the variable selection using decision tree analysis. In the final step, we analyzed how independent variables at time $t-1$ affect the fluctuations in suicide rates at time t using a linear regression model with dummy variables.

Method

1. Decision tree

Decision tree is an analysis method for classification and prediction by inference rule. Decision tree is made up of nodes and branches, and it is built by specifying a split criterion, stopping rules, and eliminating nonessential branches through minimizing the risk of classification of prediction error.

Table 1. Importance ranking of input variables

Importance rank	Selected input variable
1	Life expectancy at birth, Men
2	Labor force participation rate, Women
3	Weekly hours worked (1-19 hours), Women
4	Population
5	Labour force participation rate, Men, 15-25
6	Weekly hours worked for men (20-29 hours)
7	Labour force participation rate, Men, 15-64
8	Elderly population (age 65 and over)
9	Labour force participation rate, Men, 35-39
10	Life expectancy, Women at birth
11	Total fertility rate
12	Social expenditure for incapacity
13	Protein supply quantity (g/capita/day)
14	Alcohol consumption
15	Social expenditure for other social policy areas
16	Employment/Population ratio, All 15-24
17	Employment/Population ratio, Men, 55-64
18	Total hospital beds per 1,000 population
19	Social expenditure for old age
20	Labour force participation rate, Women, 15-64
21	Mobile subscribers
22	Social expenditure for family
23	Psychiatric care beds
24	Mean age of women at childbirth
25	Employment/Population ratio, All 55-64
26	Crude divorce rate
27	Employment/Population ratio, Total
28	Employment/Population ratio, Women, 15-64

2. Linear regression with dummy variable

Linear regression with dummy variables is a regression model that could consider the qualitative variables affecting the dependent variable. In this study, we have the following linear regression model with dummy variables:

$$\begin{aligned} Suicide_{t;i} = {} & (\beta_0 + \beta_{k+1}) + (\beta_1 + \beta_{k+2} D_i) X_{t-1;1i} \\ & + \cdots + (\beta_k + \beta_{2k+1} D_i) X_{t-1;ki} + \varepsilon_i \end{aligned} \quad (1)$$

where t and $t-1$ represent the variable at time t and $t-1$, and D_i represents the dummy variable.

Results

1. Decision tree analysis

In this study, we applied the decision trees with F-statistics as a split criterion to select the independent variables. Table 1

Table 2. The factors influencing differences

Variable	Coefficient	
	Other OECD countries	Korea
Psychiatric care beds	3.3925	−21.7098
Crude divorce rate	2.1291	7.5595
Social expenditure for family	3.1288	24.0666
weekly hours worked for men (20-29 hours)	0.2727	−3.6159
Mobile subscribers	−5.5775	20.245

shows importance ranking of input variables to construct a decision-making model to capture fluctuations in suicide rates.

2. Linear regression analysis

Twenty-eight variables in Table 1 and interactions between dummy variables and 28 variables were considered for the linear regression analysis. That is, 57 variables were used for linear regression as independent variables. For establishing the final optimal model, a step-wise variable selection method was used to eliminate independent variables that have low explanatory power relatively on the dependent variable. Table 2 shows the main result of the linear regression analysis with dummy variables. The table shows the difference between the regression coefficients in accordance with the value of the dummy variables. It also shows how five factors cause differences in suicide rate trends.

Discussion

1. Psychiatric care beds

In the case of other OECD countries, psychiatric care beds would affect the suicide rate positively, while in the case of Korea, it has a negative effect on the suicide rate.

In the last 20 years, the number of psychiatric beds in other OECD countries has decreased, while that in Korea has increased. The trend of psychiatric care beds is very similar to the trend of suicide rate. This suggests that the factors related to mental health and mental illness cause different social phenomena between Korea and other OECD countries.

2. Crude divorce rate

For both Korea and other OECD countries, crude divorce rate has a positive effect on the suicide rate. However, the regression coefficient of crude divorce rate for Korea is larger than other OECD countries by approximately 3.5 times. From these results, we can conclude that divorce is a social factor related more sensitively to suicide in Korea than other OECD countries.

3. Social expenditure for family

Social expenditure for family has a positive effect on the suicide rate in both Korea and other OECD countries. However, the regression coefficient of social expenditure for family for Korea is larger than other OECD countries by approximately 8 times. The increase in social expenditure for family implies that the number of people who need to support their family increases. These results suggest that people in Korea have more burden of family support than those in other OECD countries. Therefore, the burden of family support positively influences the suicide rate.

4. Weekly hours worked for men (20-29 hours)

In OECD, weekly hours worked 20-29 hours was defined as long part-time. In the case of other OECD countries, weekly hours worked, 20-29 hours for men would affect the suicide rate positively, while in the case of Korea, it has a negative effect on the suicide rate. The decrease in long part-time ratio of Korean men implies two cases. First, the proportion of full-time workers, such as contract workers or regular workers, is increasing. Second, the percentage of people who spend time to prepare for exams to find jobs is increasing. In the first case, we could hypothesize that young people who have difficulties in work-related adjustments affect the suicide rate positively in Korea. The second case could suggest that the trouble with getting a job would have an impact on the suicide rate in Korea.

5. Mobile subscribers

In the case of other OECD countries, mobile subscribers would affect the suicide rate negatively, while in the case of Korea, it has a positive effect on the suicide rate. According to the Ministry of Health & Welfare, the number of smart-phone addiction risk groups in Korea has been continuously increasing. Currently, Korea has the highest child deficiency index among the OECD countries because high degree of social media addictions, such as the Internet and smart-phone addiction, deteriorate the quality of life of children in Korea. If these results are applied to all ages, Korean people are often

exposed to negative and pessimistic words from Internet web sites that can be easily accessed by smart-phones. Therefore, high degree of social media addiction makes Koreans more lethargic and melancholic than people in other OECD countries.

Concluding Remarks

The purpose of this study was to investigate the social factors affecting the trend of increasing suicide rates in Korea. From the results of this study, we could conclude that Korea has a different suicide rate trend compared to other OECD countries because of five key factors: psychiatric care beds, crude divorce rate, social expenditure for family, weekly hours worked for men (20-29 hours), and mobile subscribers.

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