



Municipal-level determinants of suicide rates in South Korea: exploring the role of social capital and local government policies

Juheon Lee

To cite this article: Juheon Lee (2020) Municipal-level determinants of suicide rates in South Korea: exploring the role of social capital and local government policies, Journal of Asian Public Policy, 13:3, 277-294, DOI: [10.1080/17516234.2019.1565336](https://doi.org/10.1080/17516234.2019.1565336)

To link to this article: <https://doi.org/10.1080/17516234.2019.1565336>



Published online: 11 Jan 2019.



Submit your article to this journal [↗](#)



Article views: 149



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 2 View citing articles [↗](#)

RESEARCH ARTICLE



Municipal-level determinants of suicide rates in South Korea: exploring the role of social capital and local government policies

Juheon Lee 

Department of Political Science, Northeastern University, Boston, MA, USA

ABSTRACT

This study investigates social and economic factors influencing suicide rates in 231 South Korean cities, counties, and districts from 2010 to 2015. The results of a panel data analysis indicate that the number of social organizations did not have a significant effect on suicide rates; however, among six types of social organizations, social/recreational organizations showed a strong negative impact on suicide rates, suggesting that not all social organizations equally created social capital that addresses community health problems. Moreover, poverty and income are two strong predictors of municipal-level suicide rates, but municipal governments' welfare spending was only effective in rural areas.

ARTICLE HISTORY

Received 12 June 2018
Accepted 3 January 2019

KEYWORDS

Social capital; suicide rate; mental health; South Korea; municipal governments

Recently, more and more studies have examined suicide in South Korea, as the country's suicide rates have been some of the highest in the world since the early 2000s (e.g., Fu & Chan, 2013; Inoue et al., 2010; Kim, Jung-Choi, Jun, & Kawachi, 2010; Kim, Kim, Kawachi, & Cho, 2011; Lee et al., 2009; Lee, Hong, & Espelage, 2010; Park & Lester, 2006). Despite these burgeoning studies on national-level suicide rates in South Korea, sub-national-level studies, especially levels lower than the province level, remain very rare. Likewise, South Korea's suicide-prevention policies have relied heavily on the central government; therefore, the role of local governments has been limited to managing and administering central policies (Kim, Kim, & Jeong, 2017; Song et al., 2016; Won, 2011). Contrary to this trend, international studies on suicide increasingly have been emphasizing the critical role of local communities and governments in reducing suicide (e.g., Caan, 2013; Kim et al., 2017; World Health Organization [WHO], 2014; Smith & Kawachi, 2014; Torjesen, 2013). They point out that community organizations and locally oriented government policies were effective in reducing suicide rates in countries where these rates were once very high, e.g., Finland, Japan, and the UK (Kim et al., 2017; Lee, 2015; Taylor, Kingdom, & Jenkins, 1997). Therefore, this paper explores municipal-level determinants of suicide, focusing on social organizations as a proxy for social capital, as well as socioeconomic factors, such as welfare spending, poverty rates, and income levels. However, this study's objective was not to diminish the central government's suicide-prevention policies, which have greater capabilities

CONTACT Juheon Lee  lee.juhe@husky.neu.edu  Department of Political Science, Northeastern University, 360 Huntington Ave., Boston, MA 02115-5000, USA

© 2019 Informa UK Limited, trading as Taylor & Francis Group

and resources compared with those of local governments, but rather to uncover policy implications for local governments, as well as contribute to extant literature on multi-level governance that emphasizes the importance of cross-level or inter-governmental cooperation.

Suicide in South Korea

Suicide is a major social and public health concern in South Korea, which reports some of the highest suicide rates in the world. The country has maintained the highest ranking for suicide mortality among Organization for Economic Cooperation and Development (OECD) members since it first surpassed Hungary in 2003 (OECD, 2013; WHO, 2012). According to the Korean Statistical Information Service (KOSIS), South Korea's suicide mortality rate peaked in 2011, at 31.7 per 100,000 residents, then gradually decreased to 26.5 per 100,000 by 2015. Although this recent trend is promising, suicide still remains the leading cause of death for individuals under the age of 40 in South Korea (Won, 2011).

As Table 1 illustrates, suicide rates (per 100,000 people) tend to be higher among individuals aged 65 and older, males, and rural populations compared with younger, female, and urban populations. However, as suicide rates have decreased slightly in recent years, and the gap between age groups has narrowed, gender has become a more important factor than age. Over time, the suicide rate of the female population has dropped slightly more rapidly than the male rate. Since 2013, the suicide rate for males aged 15–64 has surpassed that of females aged 65 and older. Meanwhile, suicide rates are higher in rural counties than in cities or districts of metropolitan areas, even though most suicide mortalities occur in urban areas, as more than 90% of the South Korean population is concentrated in cities and districts.

The South Korean government has launched various campaigns and programs to decrease national suicide rates, as manifested in the first and second five-year plans for suicide prevention in 2004 and 2009, respectively. However, these government policies have not been very effective. The goal of the first five-year plan was simply to lower

Table 1. Number of deaths by suicide (per 100,000 population).

		2010	2011	2012	2013	2014	2015
Total		15,566 (31.2)	15,906 (31.7)	14,160 (28.1)	14,427 (28.5)	13,836 (27.3)	13,513 (26.5)
Male	Under 15	27 (0.6)	30 (0.7)	28 (0.7)	21 (0.5)	22 (0.6)	17 (0.5)
	15–64	7,510 (40.4)	7,940 (42.2)	7,048 (37.4)	7,487 (39.6)	7,408 (39.1)	6,924 (36.4)
	65 and above	2,784 (128.5)	2,896 (128.6)	2,545 (107.7)	2,551 (102.3)	2,305 (87.9)	2,615 (95.2)
Female	Under 15	34 (0.9)	26 (0.7)	20 (0.5)	16 (0.4)	11 (0.3)	14 (0.4)
	15–64	3,609 (20.2)	3,504 (19.5)	3,040 (16.8)	3,031 (16.7)	2,896 (15.9)	2,718 (14.9)
	65 and above	1,594 (50.1)	1,510 (46.1)	1,478 (43.5)	1,320 (37.3)	1,192 (32.4)	1,222 (32.1)
Urban Area* (city/district)	13,450 (29.8)	13,776 (30.38)	12,343 (26.95)	12,736 (27.6)	12,334 (26.6)	12,037 (25.9)	
Rural Area* (county)	2,120 (44.5)	2,136 (44.7)	1,816 (39.9)	1,680 (37.6)	1,485 (34.3)	1,463 (33.6)	

*Approximate numbers calculated by the author.

suicide rates, which surged during and after the Asian Financial Crisis (from the late 1990s to the early 2000s). This first plan failed to achieve its goal, as suicide rates continued to increase during this period (Won, 2011). The first five-year plan focused mainly on implementing hospital-based psychiatric programs, campaigns to address depression and drug use, and some emergency measures; therefore, socioeconomic perspectives were relatively neglected (Lee, 2015). Moreover, the Ministry of Health and Welfare was the sole implementer of this plan; thus, its impacts were very limited. Compared with the first plan, the second five-year plan (2009–2013) was relatively comprehensive, involving multiple governmental departments with more specific groups targeted, such as youths, seniors, and military members (see Won, 2011). Governmental budgets allocated specifically for suicide prevention increased from approximately 500 million Won per year during the first plan's implementation to 7 billion Won per year during the second plan (Won, 2011). The goal of the second plan was to bring suicide rates below 20 per 100,000 people by 2013. Although the gradual decrease beginning in 2011 indicates that the second plan was more effective than the first, it still failed to reach its goal. Moreover, the slight decrease in suicide rates in South Korea may be a result of an enhanced emergency-response system. According to the National Emergency Medical Center (NEMC), the number of suicide *attempts* did not decrease during this period despite the decrease in suicide mortality; emergency department visits for suicide attempts continued to surge, increasing from 19,373 in 2010 to 25,472 in 2014 (NEMC, 2014). Moreover, as Park (2012) found, South Korean females' suicide rates are more closely related to depression than males' rates; therefore, the South Korean government's increased attention to treating depression may have contributed to the recent decrease in female suicide rates. Overall, the South Korean government's comprehensive approach in the second plan has yielded some positive results, but the effects of such central-government-led strategies have not been enough to lower the country's suicide mortality rates further, as has been the case in other countries such as Japan (Coppens et al., 2014; Kral et al., 2009; Nakanishi, Yamauchi, & Takeshima, 2015; Shiraishi, 2012). Active local governments that engage community entities in their efforts are critical in reducing suicides (e.g., Kim et al., 2017; Song et al., 2016; Won, 2011). An OECD report also noted that South Korea's central-government-led mental health policies contradict the general trend in most OECD countries toward focusing on the increasing role of local communities in suicide prevention (OECD, 2013).

Despite the important role of local communities and local governments in suicide prevention, few empirical studies have focused on regional variations in suicide across South Korea. Extant studies on South Korea's suicide rate either have looked at individual-level data, focusing on survey respondents' suicidal ideation as being dependent on socioeconomic status (e.g., Kim, Chung, Perry, Kawachi, & Subramanian, 2012; Kim et al., 2010), or have taken the form of national-level studies on socioeconomic determinants of suicide (e.g., Park & Lester, 2006; Inoue et al., 2010; Kim et al., 2011). Other studies have searched for idiosyncratic characteristics, such as pesticide poisoning (Lee et al., 2009), youth suicide (Lee et al., 2010), or imitation effects after celebrity suicides (Fu & Chan, 2013). Unaddressed in such studies are regional differences in suicide rates. For example, in 2010, the municipality with the lowest suicide rates had 11.7 suicides per 100,000 people, and the municipality with the highest suicide rates had 82.4 suicides per 100,000 people (see Table 2). In South Korea, municipal



Table 2. Descriptive statistics.

Variable	2010			2011			2012			2013			2014			2015								
	Min	Max	Ave	SD	Min	Max	Ave	SD	Min	Max	Ave	SD	Min	Max	Ave	SD	Min	Max	Ave	SD				
Suicide rate (Total)	11.7	82.4	37.7	12.8	14.9	75.5	37.9	12.4	7.1	72.2	33.3	10.9	12.8	76.6	32.8	9.9	10.5	75.0	30.6	9.5	15.2	60.2	30.2	8.4
Suicide rate (Male)	14.2	128.7	50.6	18.8	17.2	106.0	52.3	18.8	4.8	106.0	46.0	16.9	17.6	113.3	46.5	15.3	17.0	112.4	44.2	15.3	15.1	95.3	43.4	13.7
Suicide rate (Female)	7.7	63.5	24.7	10.6	6.1	79.7	23.4	9.7	4.2	65.8	20.6	8.6	4.3	50.8	19.2	8.6	5.6	62.5	17.4	7.3	2.2	43.5	17.1	6.8
Social organizations (per capita)	8.8	63.6	24.6	11.2	8.8	61.4	24.9	11.4	8.6	64.5	26.3	12.3	8.6	65.7	26.6	12.5	8.2	67.2	26.3	12.7	8.2	77.0	26.3	13.4
Professional	0.0	8.0	0.9	0.9	0.0	9.1	0.9	1.0	0.0	13.1	1.3	1.4	0.0	12.8	1.3	1.3	0.0	14.1	1.3	1.5	0.0	14.2	1.3	1.5
Labor	0.0	3.2	0.2	0.3	0.0	3.1	0.2	0.3	0.0	3.3	0.3	0.4	0.0	4.0	0.3	0.4	0.0	4.3	0.3	0.4	0.0	4.6	0.3	0.4
Religious	5.8	48.1	20.4	9.8	6.1	48.0	20.4	9.8	6.3	48.8	20.6	9.8	6.4	48.7	20.5	9.8	6.0	48.0	20.3	9.9	5.7	47.6	20.0	10.0
Political	0.0	0.6	0.1	0.1	0.0	1.0	0.1	0.1	0.0	1.0	0.1	0.1	0.0	0.8	0.1	0.1	0.0	0.5	0.1	0.1	0.0	0.5	0.1	0.1
Social movements	0.0	3.0	0.4	0.4	0.0	3.2	0.4	0.4	0.0	5.2	0.6	0.6	0.0	5.7	0.6	0.6	0.0	5.8	0.6	0.6	0.0	6.4	0.6	0.7
Social/recreational	0.0	22.9	2.6	3.0	0.0	23.0	2.8	3.1	0.2	28.1	3.5	3.6	0.5	28.7	3.7	3.7	0.2	28.9	3.7	3.7	0.2	28.2	4.0	4.5
Welfare budget (%)	4.6	59.5	26.2	12.9	4.6	58.9	26.4	13.2	5.2	61.2	26.9	14.0	6.0	149.8	29.5	16.7	6.8	62.7	30.7	15.0	7.7	64.7	31.8	14.8
Income tax per capita (1,000 Won)	0.2	44.0	1.5	3.3	0.2	53.6	1.7	3.9	0.3	63.4	1.9	4.6	0.3	59.0	1.9	4.3	0.3	41.7	1.7	3.2	0.4	61.1	2.2	4.6
Poverty rate (per 100,000)	0.6	10.4	4.0	1.9	0.6	9.7	3.7	1.7	0.5	9.1	3.4	1.6	0.5	8.5	3.2	1.5	0.5	8.0	3.1	1.4	0.7	8.8	3.7	1.5
Divorce rate (per 1,000)	1.1	3.5	2.3	0.4	1.3	3.5	2.2	0.4	1.2	3.4	2.2	0.4	1.1	3.9	2.2	0.4	1.1	3.7	2.2	0.4	1.3	3.5	2.1	0.4
Unemployment (%)	0.0	6.2	2.8	1.3	0.0	5.2	2.4	1.4	0.0	4.5	2.2	1.4	0.0	5.1	2.2	1.4	0.0	4.9	2.5	1.5	0.0	5.3	2.5	1.5
Alcohol use (%)	3.1	27.0	15.8	4.3	7.6	30.6	19.3	3.8	7.3	31.3	16.7	4.0	9.3	32.1	19.0	3.6	10.7	35.4	19.4	3.5	9.2	28.4	19.5	3.3
Depression (%)	0.4	11.2	5.3	2.2	0.6	11.2	4.9	2.2	0.6	13.3	5.0	2.1	0.5	13.1	5.5	2.1	0.4	13.8	6.7	2.5	0.7	16.8	6.3	2.4

divisions are subdivisions of provinces and metropolitan areas, but are larger regional divisions than neighborhoods, villages, and towns. The present meso-level analysis will provide policy implications for local public-health policies.

Social determinants of suicide and governments' role

Historically, two theories have been used to explain the phenomenon of suicide. One attributes it to individuals' physical/mental conditions, whereas the other connects suicidal behavior to social conditions in which individuals live. The former is an individualist approach that investigates the psychological and biomedical factors that influence suicidal behavior (e.g., Wray, Colen, & Pescosolido, 2011). For example, psychiatric researchers often conduct retrospective studies of psychological processes among those who commit suicide – a research method known as psychological autopsy (Cavanagh, Carson, Sharpe, & Lawrie, 2003; Cox, 1996). Relying on police reports and in-depth interviews with family members and friends, they investigate the medical and social histories of those who commit suicide, considering such factors as mental illness (Conwell, Duberstein, Cox, & Herrmann, 1996) and alcohol abuse (Wilcox, Conner, & Caine, 2004). Biomedical studies look at biological and genetic causes of suicide, such as primary stress response, aggression regulation, and genetic factors identifiable through family studies (Arango & Mann, 1992; Brunner et al., 2001; Statham et al., 1998).

These individualist explanations are paralleled by the sociological approach, which assumes that social conditions that individuals experience affect suicidal behavior. Durkheim studied suicidal behavior in several countries and determined that suicide is a cultural phenomenon that can be attributed to national characteristics. He found that suicide rates were higher among Protestants than other religious groups, male populations than female populations, soldiers than civilians, and single people than married people (Durkheim, 1951). Following Durkheim, various sociological investigations of suicide emerged (e.g., Wray et al., 2011). Prominent among this research wave was a study by Henry and Short (1954), who hypothesized that suicide was a social behavior that was as aggressive as homicide, but that low-status groups tended to blame others (homicide), whereas high-status groups blamed themselves (suicide). Another research wave, initiated by Gibbs and Martine's study (1964), highlighted potential conflicts between social roles, such as age, gender, occupation, and marital status. The third group examined the social and cultural meanings of suicide, such as imitating suicidal behavior (Douglas, 1967; Phillips, 1979).

More recent studies have shifted their attention toward using empirical data and statistical techniques to help guide public-policy measures. One of the classic themes of suicide is the impact of social determinants such as race, class, religion, and gender (e.g., Almgren et al., 1998; Burr, Hartman, & Matteson, 1999; Campbell & Troyer, 2007; Ellison, Burr, & McCall, 1997; Girard, 1993; Krull & Trovato, 1994; Kubrin, Wadsworth, & DiPietro, 2006; Lehmann, 1995; Pampel, 1998). For example, Wadsworth and Kubrin (2007) studied suicide rates in the United States (US) and found that Hispanics born in the US tended to have higher suicide rates than Hispanics born outside the US because the former used a different racial group for comparison. Other studies related suicidal behavior to levels of social integration achieved through marriage, employment, or community building (Gibbs, 2000; Kposowa, Breault, & Singh, 1995; Maimon & Kuhl,

2008). Related research has identified a correlation between unemployment and suicide rates (Andres, 2005; Blakely, Collings, & Atkinson, 2003; Morrell, Taylor, Quine, & Kerr, 1993). Poverty is also addressed often in studies on suicide, with a demonstrated relationship between suicide and increases in poverty rates (Rehkopf & Buka, 2006). The Gini coefficient, a measure of income inequality, has been used widely to assess economic inequality, but its relationship to suicide is inconsistent (e.g., Sapag et al., 2008; Lester, 1992; Andres, 2005). The characteristics of a given geographical area are also linked to suicide rates (see Rehkopf & Buka, 2006). Barkan's study (2013) identified a positive relationship between population stability – the rate at which people enter or leave an area – and the suicide rate of a given area. Singh and Siahpush (2002) focused on the differences between urban and rural areas and found that suicide rates in rural areas consistently were higher.

Related to location-specific characteristics, a growing number of studies have focused on the relationship between community social capital and suicide (Congdon, 2012; Fujiwara & Kawachi, 2008; Kelly, Davoren, Mhaoláin, Breen, & Casey, 2009; Kim et al., 2011; Okamoto, Kawakami, Kido, & Sakurai, 2013; Szreter & Woolcock, 2004). Smith and Kawachi (2014) conducted a notable state-level study on social capital and suicide rates in the US that identified a link between social capital and suicide mortality. Recker and Moore (2016) conducted a similar meso-level study and determined that social capital had a significant impact on the suicide rates of US counties.

While these sociological studies have provided policy implications by finding social determinants of suicide, other studies have evaluated the direct impacts of central and local governmental policies on suicide rates. Zimmerman (2002) found that state-level spending on public welfare significantly affected suicide rates in the US from 1960–1995, controlling for divorce rates, population changes, population density, unemployment, gender ratio, and racial composition. Flavin and Radcliff (2009) also found that state governments' welfare spending in the US decreased suicide rates. Burgess, Pirkis, Jolley, Whiteford, and Saxena (2004) tested European central governments' mental-health initiatives against their suicide rates and found that these initiatives were not as effective as policy makers assumed. Although the efficacy of centralized vs. decentralized systems and of multi-level governance remains an ongoing debate in the areas of welfare, education, and fiscal policies (e.g., Bache & Flinders, 2004; Boockmann, Thomsen, Walter, Göbel, & Huber, 2015; Cha, 2016; Martinez-Vaquez et al., 2017), suicide research commonly has called for local governments and communities to take more active roles in prevention (Coppens et al., 2014; Kral et al., 2009; Nakanishi et al., 2015; Shiraishi, 2012). However, local governments and communities' role in the context of South Korea remains understudied.

The present study appeals to both extant sociological literature that has investigated social capital's role in reducing suicide rates, as well as extant public policy literature that tests the impact of local governments' policies on suicide rates. Among various cognitive and behavioral indicators of social capital (e.g., Aldrich & Meyer, 2015), this study focuses on people's participation in social organizations or voluntary associations, which are an important indicator of social capital (Brehm & Rahn, 1997; Curtis, Baer, & Grabb, 2001; Delhey & Newton, 2003; Lee & Fraser, 2018; Liu & Stolle, 2017; Putnam, 2001). Moreover, the present study tests some socioeconomic factors that are intertwined closely with municipal-level suicide rates, such as, welfare spending, poverty, and income.

Data, variables, and methods

This study used municipal-level data obtained from KOSIS, a South Korean governmental organization that manages national census information. KOSIS publishes municipal-level data collected from various governmental departments, such as the National Tax Service, Statistics Korea, and the Ministry of Health and Welfare. The dependent variable of this study was the suicide rate (per 100,000 people) in 231 South Korean cities, counties, and districts. To address the gap between male and female suicidal behavior and mortality rates, the study analyzed three types of suicide rates separately: total suicide rate, male suicide rate, and female suicide rate. The independent variables included various social and economic indicators. First, as an indicator of social capital, the number of social organizations, as determined by Statistics Korea, was included. The number of social organizations was measured per 10,000 inhabitants. However, some recent studies have shown that different social organizations serve as sources of social capital in different ways (Knack & Keefer, 1997; Lee & Cho, 2018; Lee & Fraser, 2018; Moore & Recker, 2017; Rupasingha, Goetz, & Freshwater, 2006); therefore, these organizations were also coded separately based on six types: professional, labor, religious, political, social movement, and social/recreational organizations.

For an indicator of residents' average income level, data on local income tax per capita (paid to municipal governments) were obtained. The best practice may be to obtain data on municipal residents' average income, but such data are not published at the municipal level in South Korea. However, income tax paid to local governments is paid at the same rate across municipalities, with higher local income tax per capita indicating higher average incomes in a municipality. The South Korean National Tax Service provided the data, which KOSIS published. The poverty rate, another economic indicator, has been calculated based on the number of people per 100,000 who are eligible to receive 'basic living security' from local governments. A higher poverty rate indicated that a larger portion of the municipal population was living below the poverty line. The study also used municipal governments' welfare spending as a percentage of total budgets to evaluate these governments' role in reducing income inequality. This variable tested the impact of local governments' welfare policy on their suicide rates (Flavin & Radcliff, 2009; Zimmerman, 2002).

Other social factors also were included. Divorce rates for each municipal division were collected from annual Statistics Korea census data, presented as the number of divorces per 1,000 inhabitants. Unemployment rates also were obtained from Statistics Korea. As indicators of mental health, alcohol use and depression rates were included as well. The data were based on the national Community Health Survey that the Ministry of Health and Welfare conducted. In its published data, KOSIS included the percentage of people who used alcohol during the previous month and the percentage of those suffering from depression lasting more than two weeks over the previous year. Finally, to examine difference between urban and rural areas, a variable for rural areas was coded (1/0). Table 2 summarizes the identified variables. Due to concerns about multicollinearity, variance-influence factors for all variables were tested and found to be less than 3.5, which generally is considered acceptable in most social-science research.

Results

A panel data analysis was conducted due to the nature of the data covering 231 municipalities from 2010–2015. To decide between fixed-effects or random-effects models, a Hausman test was run for each model. Models were fitted with both municipality fixed effects and year fixed effects to control for both vertical and horizontal variations. Dummy variables were included in Tables 3 and 4 but were not reported in the text. Finally, standard errors were clustered by municipality and year.

First, Table 3 illustrates the regression results of total suicide rates (both male and female) in South Korean municipalities. Four models were structured for this analysis. Model 1 included number of social organizations (all six types), as well as other socioeconomic factors. The results showed that the number of social organizations is not significantly associated with total suicide rates, but that poverty rates and income levels are. Poverty rates had a strong positive effect on suicide rates ($b = 3.182, p < 0.01$), and average income levels, measured through income tax amounts paid to municipal governments per capita, showed a negative effect on suicide rates ($b = -0.258, p < 0.10$). Other factors did not indicate significant effects on suicide rates. Since the negative coefficient of social organization was not significant enough, in Model 2, six different types of organizations were included separately to see whether any types of social organizations elicited a strong effect on suicide rates. Model 2 showed that among the six types of social organizations, only social/recreational organizations significantly reduced suicide rates ($b = -0.618, p < 0.01$). Other types of organizations either did not indicate a significant effect on suicide rates or showed an unexpected effect. The number of religious organizations showed a positive effect on suicide rates ($b = 0.506, p < 0.10$). Other than social organizations, poverty rates increased total suicide rates ($b = 2.762, p < 0.01$), and income levels decreased total suicide rates ($b = -0.330, p < 0.05$). Other factors did not indicate a significant effect on total suicide rates.

Because only the social/recreational organization type showed a strong negative effect on total suicide rates in Model 2, Model 3 excluded other types of social organizations from the model. Model 3's results showed that social/recreational organizations ($b = -0.468, p < 0.05$) decreased, poverty rates ($b = 2.957, p < 0.01$) showed a positive effect, and income levels ($b = -0.251, p < 0.05$) showed a negative effect on total suicide rates. Again, other factors did not show statistically significant effects. Model 4 went deeper into government welfare spending, considering that South Korean rural areas have higher populations of elderly citizens and that the portion of the welfare budget spent there is relatively higher than that of urban areas. Therefore, Model 4 added an interaction variable that multiplied two predictor variables: welfare spending and rural area. Model 4 showed that the number of social/recreational organizations showed a negative effect on total suicide rates ($b = -0.331, p < 0.10$). Poverty rates had a positive effect ($b = 2.233, p < 0.05$), but income levels ($b = -0.308, p < 0.01$) had a negative effect on total suicide rates, which resembled previous models' results. Although the welfare spending variable itself did not indicate a significant effect on total suicide rates, the interaction term indicated that welfare spending showed a strong negative effect on suicide rates

Table 3. Panel data analysis of social determinants of suicide rates.

Suicide rates (total)	Model 1	Model 2	Model 3	Model 4
Social organizations	-0.113 (0.134)			
Professional		0.536 (0.869)		
Labor		-0.634 (2.149)		
Religious		0.506* (0.303)		
Political		2.612 (4.019)		
Social movements		0.467 (1.140)		
Social/recreational		-0.618*** (0.233)	-0.468** (0.208)	-0.331* (0.211)
Welfare budget	0.056 (0.043)	0.059 (0.046)	0.055 (0.042)	0.085 (0.05)
Poverty rate	3.182*** (0.915)	2.762*** (0.939)	2.957*** (0.925)	2.233** (0.918)
Income tax per capita	-0.258* (0.140)	-0.330** (0.140)	-0.261** (0.124)	-0.308*** (0.116)
Divorce rate	1.507 (1.580)	1.360 (1.590)	1.445 (1.575)	1.883 (1.538)
Unemployment	-0.063 (0.388)	-0.094 (0.385)	-0.098 (0.387)	-0.007 (0.378)
Alcohol use	0.017 (0.087)	0.026 (0.088)	0.026 (0.087)	0.054 (0.089)
Depression	0.072 (0.119)	0.067 (0.119)	0.076 (0.119)	0.098 (0.121)
Rural area	1.809 (2.722)	-0.212 (2.72)	1.702 (2.589)	24.452*** (6.789)
Welfare budget x Rural area				-1.136*** (0.253)
Year dummies				
2011	1.216 (0.803)	1.051 (0.814)	1.058 (0.800)	0.813 (0.781)
2012	-2.320*** (0.813)	-2.576*** (0.807)	-2.266*** (0.808)	-3.059*** (0.823)
2013	-2.525*** (0.900)	-2.725*** (0.921)	-2.446*** (0.892)	-3.160*** (0.922)
2014	-4.524*** (0.952)	-4.633*** (0.977)	-4.474*** (0.942)	-4.815*** (0.989)
2015	-6.597*** (0.891)	-6.019*** (0.967)	-6.256*** (0.967)	-5.540*** (0.935)
Intercept	22.220*** (6.187)	12.538* (6.986)	21.684*** (5.760)	19.779*** (5.812)
No. of observations	1,378	1,378	1,378	1,378
No. of groups	230	230	230	230
Within group r^2	0.201	0.209	0.205	0.224
Between group r^2	0.207	0.451	0.256	0.373
Overall r^2	0.203	0.344	0.233	0.310
F-statistic	17.56***	15.73***	18.03***	17.98***
(d.f.)	(14, 229)	(19, 229)	(14, 229)	(15, 229)
Hausman test	FE	FE	FE	FE

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ FE: Hausman test indicates that fixed effects model should be chosen over random effects model
Standard errors were clustered by municipality and year

among rural residents compared with urban residents ($b = -1.136$, $p < 0.01$). Finally, residents of rural areas showed a significantly higher rate of suicide than those of urban areas ($b = 24.452$, $p < 0.01$).

Table 4. Panel data analysis of social determinants of suicide rates by gender.

	Male				Female			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Social organizations	-0.402* (0.225)				0.162 (0.136)			
Professional		0.111 (1.358)				1.036 (0.949)		
Labor		2.346 (3.210)				-4.672 (2.860)		
Religious		0.419 (0.510)				0.525 (0.334)		
Political		7.305 (7.103)				-1.458 (4.309)		
Social movements		1.523 (2.534)				0.544 (1.430)		
Social/recreational		-1.272*** (0.399)	-1.074*** (0.342)	-0.844** (0.347)		-0.028 (0.209)	0.101 (0.196)	0.133 (0.204)
Welfare budget	-0.036 (0.047)	-0.028 (0.048)	-0.035 (0.047)	0.013 (0.066)	0.136*** (0.051)	0.131** (0.053)	0.134*** (0.050)	0.140*** (0.052)
Poverty rate	3.665*** (1.399)	3.034** (1.448)	3.198** (1.423)	1.980 (1.390)	2.572** (1.009)	2.411** (1.008)	2.575** (1.029)	2.412** (1.044)
Income tax per capita	-0.246 (0.187)	-0.443** (0.203)	-0.290* (0.170)	-0.371** (0.171)	-0.268* (0.166)	-0.231 (0.146)	-0.231 (0.169)	-0.242 (0.166)
Divorce rate	2.266 (2.370)	2.256 (2.390)	2.161 (2.343)	2.893 (0.417)	0.467 (1.473)	0.127 (1.512)	0.451 (1.482)	0.544 (1.490)
Unemployment	0.154 (0.656)	0.068 (0.145)	0.093 (0.652)	0.246 (0.645)	-0.326 (0.432)	-0.288 (0.422)	-0.339 (0.431)	-0.321 (0.434)
Alcohol use	-0.083 (0.142)	-0.068 (0.145)	-0.067 (0.142)	-0.207 (0.142)	0.118 (0.082)	0.130* (0.080)	0.122 (0.082)	0.129 (0.084)
Depression	0.238 (0.174)	0.216 (0.174)	0.241 (0.174)	0.278* (0.174)	-0.116 (0.122)	-0.111 (0.122)	-0.111 (0.122)	-0.106 (0.123)
Rural area	9.113* (4.742)	6.655 (4.443)	8.262* (4.318)	46.531*** (11.343)	-5.193** (2.157)	-5.832** (2.476)	-4.589** (1.922)	0.569 (5.796)
Welfare budget x Rural area				-1.910*** (0.417)				-0.257 (0.268)
Year dummies								
2011	3.431*** (1.281)	3.106** (1.294)	3.305*** (1.274)	2.725** (1.231)	-1.099 (0.783)	-1.135 (0.776)	-1.096 (0.786)	-1.175 (0.795)
2012	-1.338 (1.355)	-1.908 (1.374)	-1.408 (1.354)	-2.742** (1.375)	-3.249*** (0.870)	-3.237*** (0.865)	-3.074*** (0.886)	-3.256*** (0.872)
2013	0.007 (1.396)	-0.531 (1.448)	-0.020 (1.381)	-1.222 (1.433)	-4.700*** (0.939)	-4.596*** (0.915)	-4.516*** (0.945)	-4.681*** (0.939)
2014	-2.315 (1.412)	-2.687* (1.476)	-2.367* (1.400)	-2.940** (1.430)	-6.138*** (0.986)	-5.974*** (0.985)	-5.991*** (0.996)	-6.076*** (1.011)
2015	-4.837*** (1.378)	-3.990*** (1.476)	-4.233*** (1.430)	-3.027** (1.408)	-8.208*** (0.865)	-7.925*** (0.960)	-8.113*** (0.883)	-7.956*** (0.914)
Intercept	-38.423*** (10.453)	25.063** (12.684)	33.706*** (9.061)	30.501*** (9.368)	7.771 (6.766)	2.450 (7.77)	11.220* (5.864)	10.816* (5.892)
No. of observations	1,378	1,378	1,378	1,378	1,367	1,367	1,367	1,367
No. of groups	230	230	230	230	230	230	230	230
Within group r ²	0.108	0.119	0.114	0.136	0.162	0.168	0.161	0.162
Between group r ²	0.250	0.470	0.364	0.418	0.038	0.218	0.005	0.007
Overall r ²	0.191	0.322	0.260	0.299	0.071	0.147	0.038	0.051
F-statistic (d.f.)	10.19*** (14, 229)	9.10*** (19, 229)	10.81*** (14, 229)	10.22*** (15, 229)	16.03*** (14, 229)	14.86*** (19, 229)	15.30*** (14, 229)	14.51*** (15, 229)
Hausman test	FE	FE	FE	FE	FE	FE	FE	FE

*p < 0.10, **p < 0.05, ***p < 0.01

FE: Hausman test indicates that fixed effects model should be chosen over random effects model
Standard errors were clustered by municipality and year

As shown in Table 1, a huge gap exists between suicide rates among male and female populations. Luckily, KOSIS provides municipal-level suicide rates by gender; therefore, additional models were structured to determine whether factors associated with suicide rates are different according to gender. Table 4 illustrates the results.

Models 1 through 4 regressed on male suicide rates. Model 1 showed that social organizations (all types) had a strong negative effect on male suicide rates ($b = -0.402$, $p < 0.10$). Poverty rates also negatively affected male suicide rates ($b = 3,665$, $p < 0.01$). Living in rural areas meant significantly higher suicide rates among male populations ($b = 0.113$, $p < 0.01$). Model 2 separately included six types of social organizations, and the results indicated that only social/recreational organizations showed a strong negative effect on male suicide rates ($b = -1.272$, $p < 0.01$). Poverty rates positively affected male suicide rates ($b = 3.034$, $p < 0.05$), but income levels negatively affected ($b = -0.443$, $p < 0.05$) male suicide rates. Model 3 excluded other types of organizations except social/recreational organizations, indicating that these organizations are negatively associated with male suicide rates ($b = 1.074$, $p < 0.01$). Also, poverty rates ($b = 3.198$, $p < 0.05$) positively affected, but income levels ($b = -0.290$, $p < 0.10$) negatively affected male suicide rates. Living in rural areas meant higher suicide rates among males ($b = 8.262$, $p < 0.10$). Finally, in Model 4, the number of social/recreational organizations ($b = -0.844$, $p < 0.05$) and income levels ($b = -0.371$, $p < 0.05$) had a negative effect on male suicide rates, but depression rates showed a positive effect on male suicide rates ($b = 0.278$, $p < 0.10$). Living in rural areas ($b = 46.531$, $p < 0.01$) meant higher suicide rates among males. Interaction variables between welfare spending and rural areas indicated that welfare spending decreases male suicide rates in rural areas ($b = -1.910$, $p < 0.01$).

Models 5 through 8 regressed on female suicide rates. Model 5 showed that social organizations did not exert a significant effect on female suicide rates. However, poverty rates ($b = 2.572$, $p < 0.05$) positively affected, but income levels ($b = -0.268$, $p < 0.10$) negatively affected female suicide rates. Contrary to male suicide rates, living in rural areas ($b = -5.193$, $p < 0.05$) meant lower suicide rates among females. Unexpectedly, welfare spending showed a positive effect on female suicide rates ($b = 0.136$, $p < 0.01$). Model 6 indicates that no type of social organizations significantly affected female suicide rates, meaning that social organizations are only significantly associated with suicide rates among male populations. Poverty rates ($b = 2.411$, $p < 0.05$) negatively affected female suicide rates. The effect of welfare spending ($b = 0.131$, $p < 0.05$) was also positive on female suicide rates. One interesting finding is that alcohol use in municipalities had a positive effect on female suicide rates ($b = 0.130$, $p < 0.10$), which means that regions with larger (proportionate) populations of people using alcohol saw higher rates of female suicide. Finally, living in rural areas meant lower female suicide rates ($b = -5.832$, $p < 0.05$), meaning that female suicide rates are higher in urban areas. Model 7 showed that social/recreational organizations did not exert a significant effect. Poverty rates ($b = 2.575$, $p < 0.05$) positively affected female suicide rates. Again, welfare spending positively affected female suicide rates ($b = 0.134$, $p < 0.01$). Living in rural areas meant lower female suicide rates ($b = -4.589$, $p < 0.05$). Finally, in Model 8, poverty rates ($b = 2.412$, $p < 0.05$) positively affected female suicides. Welfare spending also showed a positive effect on female suicide rates ($b = 0.140$, $p < 0.01$).

In summary, based on the results in [Table 4](#), the number of social/recreational organizations, poverty rates, income levels, depression, and living in rural areas strongly affected suicide rates among male populations, but poverty rates, income levels, alcohol use, and living in urban areas affected suicide rates among female populations.

Discussion

This study set out to examine the social determinants of suicide rates across 231 South Korean municipal-level regions from 2010–2015 to examine the role of social capital and local policies. Although centralization vs. decentralization has been a long-debated topic in public policy, suicide studies have shown that central-local cooperation is important in preventing suicide. From such a perspective, this study's objective was not to diminish the central government's suicide prevention policies, but rather to search for some policy implications for local governments, in addition to central policies.

The first goal of this study was to test social capital theory by examining social organizations' role in reducing suicide rates. The effect of locally based numbers of social organizations was not statistically significant, but when social organizations were broken down into six types, availability of social/recreational organizations showed a significant negative effect on suicide rates. This finding partially supports relatively recent trends in social capital studies that distinguish different types of social organizations (e.g., Lee & Cho, 2018; Lee & Fraser, 2018; Moore & Recker, 2017; Rupasingha et al., 2006). According to these studies, reward-based organizations (such as political organizations and labor unions) or organizations without civic goals (such as sports clubs, social gatherings, or hobby associations) may not be as closely associated with social capital at the community level as organizations with clear civic goals (such as volunteer groups, residential associations, and customer-movement groups). Although this study confirmed that not all social organizations play the same role in generating social capital, this study's contribution is that social/recreational organizations, despite their informal and personal activities without clear civic causes, may be more closely associated with people's suicide behavior than other types of social organizations. Municipalities with better access to social and recreational activities may better serve residents with suicide ideation. Although these data concern self-organized organizations, local governments also can support these organizations in their municipalities. However, social/recreational organizations' effect is limited due to their weak effect on female populations, inviting further studies. Moreover, the insignificant results on other types of organizations may be due to the short period of time that this study covers because the data may not have captured long-term changes in availability of social organizations thoroughly. Therefore, further studies with broader time frames can determine whether this is a temporary phenomenon. Likewise, the unexplained results on religious organizations, which increased suicide rates, should be examined further in future studies.

Another objective of this study was to test some municipal-level socioeconomic factors to determine any policy implications for municipal governments. The strongest effects shown consistently across models were poverty rates and average income levels, measured by income tax amounts per capita paid to municipal governments. Municipal regions with higher incomes and lower poverty rates saw significantly lower suicide rates among their residents, which is consistent with national-level studies that used

gross domestic product (GDP) per capita (Kim et al., 2011). However, municipal-level welfare spending showed that such spending was more closely associated with lower suicide rates in rural populations than in urban populations, and in male populations than in female populations. Welfare spending in urban areas did not exert significant effects on suicide. The relationship between local governments' welfare spending and suicide rates has been studied in the context of the US (Zimmerman, 2002), but this study suggests that, in South Korea, welfare is more closely associated with rural areas, where a higher percentage of senior citizens live. This indicates that rural municipal governments' efforts to reduce suicide rates should be oriented toward giving residents access to social welfare programs, along with measures that increase income, such as bringing in new industries and development. In urban areas, where people had relatively better access to social welfare programs, income levels and inequality seemed to be a bigger problem. Higher rates of poverty, as measured by the number of residents below the poverty line, increased suicide rates despite local government provisions of 'basic living security' for residents living in poverty. However, the effect from welfare spending on female suicide rates was unexpected and requires further studies as to why increases in welfare spending increased female suicide rates.

Other than key independent variables, other results also were noteworthy. Male suicide rates are higher in rural regions, whereas female suicide rates are higher in urban regions. Together with the aforementioned results on social organizations and welfare spending, it seems that male suicide rates are associated closely with access to social welfare and social activities. The positive effect of depression on male suicide rates also supports the idea that male suicide rates are closely associated with connectedness and accessibility. Furthermore, female suicide is higher in urban areas, where a higher percentage of people live in poverty and use alcohol. This means that females living in an impoverished urban area with high rates of alcohol use among residents may be exposed more often to situations that increase their suicidal ideation. Further studies should be conducted on suicide behavior among urban females.

Some national-level studies showed that divorce was an important indicator of suicide rates (e.g., Park & Lester, 2006), but the present study indicates that divorce rates were not a very strong indicator at the municipal level, although their coefficients indicated a positive relationship. Unemployment rates also were not a significant predictor, which is inconsistent with previous national-level studies (e.g., Kim et al., 2011). National-level unemployment fluctuations may be relevant only to some heavily populated or very influential municipalities, rather than to all municipalities. This gap between national-level studies and current municipal-level studies not only indicates that national-level policy-making may not be effective in local social contexts, but also implies that local governments must take a more active role in creating and implementing suicide-prevention policies.

Conclusion

In sum, the results from this panel data analysis showed that the number of available social organizations as a whole did not reduce suicide rates significantly, but the social/recreational organization type exerted a strong negative impact on suicide rates, indicating that not all social organizations create social capital that influences public health equally. Moreover, both poverty and income are two strong predictors of municipal-

level suicide rates, but municipal governments' welfare spending significantly reduced suicide rates only in rural areas. Finally, the number of available social/recreational organizations, poverty rates, income levels, and living in rural areas strongly affected suicide rates among male populations, but poverty rates, income levels, alcohol use, and living in urban areas affected suicide rates among female populations.

A noteworthy point from this study is that the results easily can be interpreted as individual-level causes of suicide. For example, the results do not indicate necessarily that socially disconnected, low-income populations are more likely to commit suicide. This study's implications are that municipalities with smaller numbers of social/recreational organizations, lower average income, more impoverished residents, and less welfare spending tend to have higher suicide rates. Thus, variables in the analysis are characteristics of municipal regions rather than direct causes of individual suicidal behavior. In particular, some insignificant effects from the factors in this study may be due to the short period of time that this study covers, which is a limitation of this research. Future studies with more available data accumulated over a longer period of time may investigate whether the insignificance of these relationships is attributable to method or to validity of findings. More meso-level studies should be conducted as well.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

Juheon Lee is a Ph.D. candidate in political science at Northeastern University, Boston, USA. His research interests include social capital, community resilience, environmental politics, identity politics, and East Asian politics.

ORCID

Juheon Lee  <http://orcid.org/0000-0003-4516-8766>

References

- Aldrich, D. P., & Meyer, M. A. (2015). Social capital and community resilience. *American Behavioral Scientist*, 59(2), 254–269.
- Almgren, G., Guest, A., Immerwahr, G., & Spittel, M. (1998). Joblessness, family disruption, and violent death in Chicago, 1970–90. *Social Forces*, 76, 1465–1493.
- Andres, A. R. (2005). Income inequality, unemployment, and suicide: A panel data analysis of 15 European countries. *Applied Economics*, 37(4), 439–451.
- Arango, V., & Mann, J. J. (1992). Relevance of serotonergic postmortem studies to suicidal behavior. *International Review of Psychiatry*, 4(2), 131–140.
- Bache, I., & Flinders, M. (2004). Multi-level governance and the study of the British state. *Public Policy and Administration*, 19(1), 31–51.
- Barkan, S. E., Rocque, M., & Houle, J. (2013). State and regional suicide rates: A new look at an old puzzle. *Sociological Perspectives*, 56(2), 287–297.
- Blakely, T. A., Collings, S. C., & Atkinson, J. (2003). Unemployment and suicide. Evidence for a causal association? *Journal of Epidemiology & Community Health*, 57(8), 594–600.

- Boockmann, B., Thomsen, S. L., Walter, T., Göbel, C., & Huber, M. (2015). Should welfare administration be centralized or decentralized? Evidence from a policy experiment. *German Economic Review*, 16(1), 13–42.
- Brehm, J., & Rahn, W. (1997). Individual-level evidence for the causes and consequences of social capital. *American Journal of Political Science*, 41(3), 999–1023.
- Brunner, J., Stalla, G. K., Stalla, J., Uhr, M., Grabner, A., Wetter, T. C., & Bronisch, T. (2001). Decreased corticotropin-releasing hormone (CRH) concentrations in the cerebrospinal fluid of eucortisolemic suicide attempters. *Journal of Psychiatric Research*, 35(1), 1–9.
- Burgess, P., Pirkis, J., Jolley, D., Whiteford, H., & Saxena, S. (2004). Do nations' mental health policies, programs and legislation influence their suicide rates? An ecological study of 100 countries. *Australian and New Zealand Journal of Psychiatry*, 38(11–12), 933–939.
- Burr, J. A., Hartman, J. T., & Matteson, D. W. (1999). Black suicide in U.S. metropolitan areas: An examination of the racial inequality and social integration-regulation hypotheses. *Social Forces*, 77, 1049–1080.
- Caan, W. (2013). Urgent need for proactive leadership in local suicide prevention plans. *Bmj*, 346, f1529.
- Campbell, M. E., & Troyer, L. (2007). The implications of racial misclassification by observers. *American Sociological Association*, 72, 750–765.
- Cavanagh, J., Carson, A., Sharpe, M., & Lawrie, S. (2003). Psychological autopsy studies of suicide: A systematic review. *Psychological Medicine*, 33, 395–405.
- Cha, S. H. (2016). Decentralization in educational governance and its challenges in Korea: Focused on policy conflicts between central and local government in education. *Asia Pacific Education Review*, 17(3), 479–487.
- Congdon, P. (2012). Latent variable model for suicide risk in relation to social capital and socio-economic status. *Social Psychiatry and Psychiatric Epidemiology*, 47(8), 1205–1219.
- Conwell, Y., Duberstein, P. R., Cox, C., & Herrmann, J. H. (1996). Relationships of age and axis I diagnoses in victims of completed suicide: A psychological autopsy study. *The American Journal of Psychiatry*, 153(8), 1001.
- Coppens, E., Van Audenhove, C., Iddi, S., Arensman, E., Gottlebe, K., Koburger, N., ... Székely, A. (2014). Effectiveness of community facilitator training in improving knowledge, attitudes, and confidence in relation to depression and suicidal behavior: Results of the OSPI-Europe intervention in four European countries. *Journal of Affective Disorders*, 165, 142–150.
- Cox, C. (1996). Relationship of age and Axis I diagnoses in victims of completed suicide: A psychological autopsy study. *The American Journal of Psychiatry*, 153, 1001–1008.
- Curtis, J. E., Baer, D. E., & Grabb, E. G. (2001). Nations of joiners: Explaining voluntary association membership in democratic societies in democratic societies. *American Sociological Review*, 66 (December), 783–805.
- Delhey, J., & Newton, K. (2003). Who trusts? The origins of social trust in seven societies. *European Societies*, 5(2), 93–137.
- Douglas, J. D. (1967). *The Social Meanings of Suicide*. Princeton, NJ: Princeton Univ. Press.
- Durkheim, E. (1951). *Suicide: A study in sociology*. (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Ellison, C. G., Burr, J. A., & McCall, P. L. (1997). Religious homogeneity and metropolitan suicide rates. *Social Forces*, 76, 273–299.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195–209.
- Fu, K. W., & Chan, C. H. (2013). A study of the impact of thirteen celebrity suicides on subsequent suicide rates in South Korea from 2005 to 2009. *PLoS one*, 8(1), e53870.
- Fujiwara, T., & Kawachi, I. (2008). A prospective study of individual-level social capital and major depression in the United States. *Journal of Epidemiology and Community Health*, 62(7), 627–633.
- Gibbs, J. P. (2000). Status integration and suicide: Occupational, marital, or both? *Social Forces*, 78, 949–970.
- Gibbs, J. P., & Martin, W. T. (1964). *Status integration and suicide: a sociological study*. Eugene: Univ. Or. Press.

- Girard, C. (1993). Age, gender, and suicide: A cross-national analysis. *American Sociological Review*, 58, 553–574.
- Henry, A. F., & Short, J. F. (1954). *Suicide and homicide: Some economic, sociological and psychological aspects of aggression*. New York, NY: Free Press.
- Inoue, K., Nishimura, Y., Nishida, A., Fukunaga, T., Masaki, M., Fujita, Y., ... Ono, Y. (2010). Relationships between suicide and three economic factors in South Korea. *Legal Medicine*, 12(2), 100–101.
- Kelly, B. D., Davoren, M., Mhaoláin, Á. N., Breen, E. G., & Casey, P. (2009). Social capital and suicide in 11 European countries: An ecological analysis. *Social Psychiatry and Psychiatric Epidemiology*, 44(11), 971–977.
- Kim, J. S., Kim, Y. R., & Jeong, A. W. (2017). Current state and future development of local suicide prevention policies: Content analysis of the suicide prevention action plans of local governments nationwide. *Journal of Critical Social Policy*, 55, 257–290.
- Kim, M. H., Jung-Choi, K., Jun, H. J., & Kawachi, I. (2010). Socioeconomic inequalities in suicidal ideation, parasuicides, and completed suicides in South Korea. *Social Science & Medicine*, 70(8), 1254–1261.
- Kim, S. S., Chung, Y., Perry, M. J., Kawachi, I., & Subramanian, S. V. (2012). Association between interpersonal trust, reciprocity, and depression in South Korea: A prospective analysis. *PLoS one*, 7(1), e30602.
- Kim, S. Y., Kim, M. H., Kawachi, I., & Cho, Y. (2011). Comparative epidemiology of suicide in South Korea and Japan: Effects of age, gender and suicide methods. *Crisis*, 32, 5–14.
- Knack, S., & Keefer, P. (1997). Does social capital have an economic payoff? A cross-country investigation. *Quarterly Journal of Economics*, 112, 1251–1288.
- Kposowa, A. J., Breault, K. D., & Singh, G. K. (1995). White male suicide in the United States: A multivariate individual-level analysis. *Social Forces*, 74, 315–325.
- Kral, M. J., Wiebe, P. K., Nisbet, K., Dallas, C., Okalik, L., Enuaraq, N., & Cinotta, J. (2009). Canadian Inuit community engagement in suicide prevention. *International Journal of Circumpolar Health*, 68(3), 292–308.
- Krull, C., & Trovato, F. (1994). The quiet revolution and the sex differential in Quebec's suicide rates: 1931–1986. *Social Forces*, 72, 1121–1147.
- Kubrin, C. E., Wadsworth, T. P., & DiPietro, S. (2006). Deindustrialization, disadvantage and suicide among young Black males. *Social Forces*, 84, 1559–1579.
- Lee, J., & Cho, S. (2018). The impact of crime rate, experience of crime, and fear of crime on residents' participation in association: studying 25 districts in the city of Seoul, South Korea. *Crime Prevention and Community Safety*, 20(3), 189–207.
- Lee, J., & Fraser, T. (2018). How do natural hazards affect participation in voluntary association? The social impacts of disasters in Japanese society. *International Journal of Disaster Risk Reduction*. doi:10.1016/j.ijdrr.2018.11.009
- Lee, S. (2015). Policy options for the improvement of suicide prevention programs. *Health and Welfare Forum (Bogwon Bokji Forum)*, 11, 34–49.
- Lee, S. Y., Hong, J. S., & Espelage, D. L. (2010). An ecological understanding of youth suicide in South Korea. *School Psychology International*, 31(5), 531–546.
- Lee, W. J., Cha, E. S., Park, E. S., Kong, K. A., Yi, J. H., & Son, M. (2009). Deaths from pesticide poisoning in South Korea: Trends over 10 years. *International Archives of Occupational and Environmental Health*, 82(3), 365–371.
- Lehmann, J. M. (1995). Durkheim's theories of deviance and suicide: A feminist reconsideration. *American Journal of Sociology*, 100, 904–930.
- Lester, D. (1992). *Why people kill themselves: A 1990s summary of research findings on suicidal behavior*. Springfield, IL: Charles C Thomas, Publisher.
- Liu, C., & Stolle, D. (2017). Social capital, civic culture and political trust. In I. Zmerli & V. D. Meer (Eds.), *Handbook on political trust* (pp. 338–352). Northampton, MA: Edward Elgar Publishing.
- Maimon, D., & Kuhl, D. C. (2008). Social control and youth suicidality: Situating Durkheim's ideas in a multilevel framework. *American Sociological Association*, 73, 921–943.

- Martinez-Vazquez, J., Lago-Peñas, S., & Sacchi, A. (2017). The impact of fiscal decentralization: A survey. *Journal of Economic Surveys*, 31(4), 1095–1129.
- Moore, M. D., & Recker, N. L. (2017). Social capital groups and crime in urban counties. *Deviant Behavior*, 38(6), 655–667.
- Morrell, S., Taylor, R., Quine, S., & Kerr, C. (1993). Suicide and unemployment in Australia 1907e1990. *Social Science & Medicine*, 36(6), 749–756.
- Nakanishi, M., Yamauchi, T., & Takeshima, T. (2015). National strategy for suicide prevention in Japan: Impact of a national fund on progress of developing systems for suicide prevention and implementing initiatives among local authorities. *Psychiatry and Clinical Neurosciences*, 69(1), 55–64.
- National Emergency Medical Center (2014) Emergency Medical Yearbooks, No.1. MEMC. Retrieved from <http://www.nemc.or.kr/egen/inf.emb13.do>
- OECD. (2013). *OECD Health Statistics 2013*. Paris: Author. Retrieved from http://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics_health-data-en
- Okamoto, M., Kawakami, N., Kido, Y., & Sakurai, K. (2013). Social capital and suicide: An ecological study in Tokyo, Japan. *Environmental Health and Preventive Medicine*, 18(4), 306–312.
- World Health Organization (2012). Suicide Rates Data by country. Retrieved from <http://apps.who.int/gho/data/node.main.MHSUICIDE?lang=en>.
- World Health Organization (2014). Preventing suicide: A global imperative, Author. Retrieved from http://apps.who.int/iris/bitstream/handle/10665/131056/9789241564779_eng.pdf;jsessionid=2A7FC7F541CEECD4C89296E2351815DC?sequence=1.
- Pampel, F. C. (1998). National context, social change, and sex differences in suicide rates. *American Sociological Association*, 63, 744–758.
- Park, B. (2012). The path analysis for mutual relationship of stress and depression that affect the suicidality: Comparison of sex and age group. *Health and Social Welfare Review*, 32(3), 485–521.
- Park, B. B., & Lester, D. (2006). Social integration and suicide in South Korea. *Crisis*, 27(1), 48–50.
- Phillips, D. P. (1979). Suicide, motor vehicle fatalities, and the mass media: Evidence toward a theory of suggestion. *American Journal of Sociology*, 84, 1150–1174.
- Putnam, R. D. (2001). *Bowling alone: The collapse and revival of American community*. New York, NY: Simon and Schuster.
- Recker, N. L., & Moore, M. D. (2016). Durkheim, social capital, and suicide rates across US counties. *Health Sociology Review*, 25(1), 78–91.
- Rehkopf, D. H., & Buka, S. L. (2006). The association between suicide and the socio-economic characteristics of geographical areas: A systematic review. *Psychological Medicine*, 36(02), 145–157.
- Rupasingha, A., Goetz, S. J., & Freshwater, D. (2006). The production of social capital in US counties. *The Journal of Socio-Economics*, 35(1), 83–101.
- Sapag, J. C., Aracena, M., Villarroel, L., Poblete, F., Berrocal, C., Hoyos, R., ... Kawachi, I. (2008). Social capital and self-rated health in urban low income neighbourhoods in Chile. *Journal of Epidemiology and Community Health*, 62(9), 790–792.
- Shiraishi, Y. (2012). Impact of 'safe community' model in suicide prevention in Japan. *Injury Prevention*, 18(Suppl 1), A33–A33.
- Singh, G. K., & Siahpush, M. (2002). Ethnic-immigrant differentials in health behaviors, morbidity, and cause-specific mortality in the United States: An analysis of two national data bases. *Human Biology*, 74(1), 83–109.
- Smith, N. D. L., & Kawachi, I. (2014). State-level social capital and suicide mortality in the 50 US states. *Social Science & Medicine*, 120, 269–277.
- Song, I., Kim, J., Kwon, S., Kim, J., Kim, Y., & Jeong, A. (2016). "Development of suicide prevention plan manual in local governments," *Korea Institute for Health and Social Affairs*.
- Statham, D. J., Heath, A. C., Madden, P. A., Bucholz, K. K., Bierut, L., Dinwiddie, S. H., ... Martin, N. G. (1998). Suicidal behaviour: An epidemiological and genetic study. *Psychological Medicine*, 28(04), 839–855.

- Szreter, S., & Woolcock, M. (2004). Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology*, 33(4), 650–667.
- Taylor, S. J., Kingdom, D., & Jenkins, R. (1997). How are nations trying to prevent suicide; An analysis of national suicide prevention strategies. *Acta Psychiatrica Scandinavica*, 95, 457–463.
- Torjesen, I. (2013). Local authorities must have suicide prevention plans, says parliamentary report. *BMJ*, 346. doi:10.1136/bmj.f645
- Wadsworth, T., & Kubrin, C. E. (2007). Hispanic suicide in U.S. metropolitan areas: Examining the effects of immigration, assimilation, affluence, and disadvantage. *American Journal of Sociology*, 112, 1848–1885.
- Wilcox, H. C., Conner, K. R., & Caine, E. D. (2004). Association of alcohol and drug use disorders and completed suicide: An empirical review of cohort studies. *Drug and Alcohol Dependence*, 76 (Suppl. 1), S11eS19.
- Won, S. Y. (2011). Problems and future direction of suicide prevention policies. *National Assembly Research Service*, 117. Retrieved from http://www.nars.go.kr/brdView.do?cmsCd=CM0042&brd_Seq=203
- Wray, M., Colen, C., & Pescosolido, B. (2011). The sociology of suicide. *Annual Review of Sociology*, 37, 505–528.
- Zimmerman, S. L. (2002). States' spending for public welfare and their suicide rates, 1960 TO 1995: What is the problem? *The Journal of Nervous and Mental Disease*, 190(6), 349–360.