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Inequality and Suicide Rates: A Cross-Country Study

by:

Antonio Rodríguez

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INEQUALITY AND SUICIDE MORTALITY RATES: A CROSS-COUNTRY STUDY[1]

Antonio Rodríguez Andrés[2]

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Abstract

This paper tests whether economic inequality is related to suicide mortality. Using an unbalanced panel of 40 countries for the period 1947-2001 allows us to control for the effect of unobserved factors that may have an impact on suicide rates. Our results indicate that there is a statistically insignificant positive effect of inequality on the incidence of suicide. The latter result seems to be robust to a number of specification issues explored in a sensitivity analysis. Our results also suggest that female labour participation has a significant positive effect on the total (males and female) suicide rates, supporting the sociological argument that the role conflict dominates more than the role expansion. Contrary to the total and male suicide rates findings, the fertility rate matters in explaining female suicide rates. Finally, in contrast to previous studies, suicide rates were not sensitive to income levels, divorce rates and alcohol consumption.

Keywords: inequality, suicide, panel data, autocorrelation

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[2] Corresponding author: Departamento de Economía, Facultad de Economía y Administración de Empresas, Av. Angamos 0610, Antofagasta, Chile. Tel: 56 55 355787. Fax: 56 55 355883. E-mail: arodriguez@ucn.cl

1. Introduction

Suicide is not only a personal tragedy but also involves a serious loss of human capital and productive assets to the society. According to the World Health Organization (WHO), in the year 2000, approximately one million people died from suicide (WHO, 1999). Hence, study and understanding the suicidal behaviour is of vital importance to society and policy makers.

The empirical literature on suicide has relied on Hamermesh & Soss's (1974) economic model. In this model, the individual takes his own life when the expected lifetime utility remaining to him reaches some threshold.[3] This model suggests that suicide rates increase with age and decrease with income. Much of the existing literature has focused on the determinants of suicidal behavior using aggregate data. In panel data studies, several risk factors for suicide have been consistently identified. These factors include both economic (GDP per capita, the unemployment rate and female participation in the labor force) and sociological variables (the divorce rate, the fertility rate, alcohol consumption, and religion) (Brainerd, 2001; Chuang & Huang, 1997; Chuang & Huang, 2003; Neumayer, 2003a; Neumayer, 2003b; Ramstedt, 2001). One variable which has been often neglected in the suicide literature by economists is income inequality. To date, no empirical study has analyzed the impact of income inequality on suicide mortality using cross-country data[4].

Based on previous literature, this paper tries to fill this gap by contributing to the literature in three main ways. First, the study includes the Gini index as a measure of income inequality[5]. In contrast to cross-sectional analysis, panel data allows us to control for unobserved heterogeneity across countries, which reduces the likelihood of an omitted variable bias. Second, we deal with the issue of serial correlation in the error term which has been often ignored in panel data studies of suicide. Not accounting for this problem can lead to misleading inference, and thus cast doubt on the results of previous studies. Finally, as well as modeling the total suicide rate we also estimate separate models for men and women, as the determinants of suicide could differ between the sexes. Understanding the gender differences may be important in informing appropriate policy formulations.

[3] Recently, Marcotte (2003) expanded this model to include the possibility that the utility function may be affected by the suicide attempt.

[4] The literature on the economics of crime has found a positive link between income inequality and violent crimes, in particular, homicides. See, Fanjzylber et al, 2002a; Fanjzylber et al, 2002b; and Soares, 1999. In view of these results, it would also be interesting to explore the link between suicide and inequality.

[5] If everyone has the same income, then the Gini coefficient is zero, if the richest person has all the income then its value is the unity. See, Atkinson, 1970 for a detailed discussion of the statistical differences among income inequality measures.

The paper is structured as follows: In Section 2 we review the current studies that have attempted to examine the link between income inequality and suicide using cross-sectional or panel data. Our data, the definitions of the variables and some descriptive statistics are provided in Section 3. In Section 4 we outline our econometric framework. The results of the paper and some sensitivity analysis are presented in Section 5, and conclusions are drawn in Section 6.

2. A Review of the Literature on the Effect of Inequality on Suicide

While there is a fairly large body of empirical literature using cross-sectional or panel data to examine the effects of income inequality on the health of a population[6], there have been a few attempts to demonstrate that the link between income inequality and suicide exists in more than a single year's cross-section. In general terms, inequality is viewed to reduce social integration and increase psychosocial stress (Wilkinson, 1996; Kawachi & Kennedy, 1997). Suicide is therefore expected to have a positive relationship with economic inequality.

Cross-sectional analysis

Lynch et al. (2001) test the correlation between the Gini index and suicide rates across 16 OECD countries using inequality data from the Luxembourg Income Study (LIS). Like other researchers using cross-country data (for instance, Lester, 1987), they failed to find a significant association between inequality and suicide. All of the above results were true for the simple correlation coefficients, but they were not confirmed when inequality was placed into a multiple regression analysis with other variables such as GDP, divorce and fertility rates. Based on data from 3,108 US counties, Kowalski et al. (1987) examined the effect of urbanism and a number of other variables on suicide. In contrast to previous results, they found that high income inequality levels did have a positive significant effect on suicide.

Panel data

One of the main weaknesses of initial empirical analysis of the relationship between income inequality and suicide mortality is the failure to control for unobserved country specific effects.

[6]One of the earliest studies is Rodgers (1979) who found a negative correlation between income inequality and health expectancy across fifty six countries in the mid 1970s after controlling for average income. Wilkinson (1996) demonstrated a strong correlation between inequality and mortality across countries in the 1970s and 1980s. For evidence in the US, see Kennedy et al. (1996), and Kaplan et al. (1996). More recently, Gravelle, Wildman & Sutton (2002) extended earlier analysis by Rodgers and found no connection between inequality and population health using income inequality data from the Deininger & Squire dataset (1996).

One way to overcome the problems is to use panel data. Panel fixed effects corrects some of the bias present in cross-sectional and time series analysis associated with the unobserved characteristics that influence suicide rates. Recently, researchers have turned to study this issue using variation in suicide rates across units (in cross-sectional analysis) and over time (in time series analysis).

Previous estimates of the association between income inequality and suicide use data on states in the United States. Two studies, using a fixed effects approach, document the effect of income inequality on suicide in the United States. Mellor & Mylio (2001) find a negative statistically significant effect of the Gini coefficient on suicide mortality across 48 US states with no controls. But when they include additional controls the relationship becomes statistically insignificant. This result is particularly surprising and contradicts the argument that inequality leads to reduced social integration and increased mortality. Ruhm (2000) investigates the relationship between economic conditions and health by estimating a fixed effects model for a panel of 50 US states and the District of Columbia over the period 1972-1991. He uses alternative measures of income inequality such as the state poverty ratio, and the ratio of incomes of the ninetieth versus the tenth percentile and finds essentially the same results regardless of the inequality measure that was used. The inequality variables had either a positive or a negative but statistically insignificant effect on suicide rates.

More recently, Neumayer (2004), using a panel of 11-16 German states over the period 1980 - 2000, finds that a state's Gini coefficient has a positive but statistically insignificant effect on suicide rates. This finding is in line with cross-sectional studies examining the relationship between income inequality and population health (Gravelle, Wildman & Sutton, 2002).

In summary, this research does not offer conclusive results regarding the effect of income inequality on suicide[7]. However, these studies have been largely confined to total suicide rates, ignoring the possibility of gender differences in the inequality-suicide link[8]. If there are important differences, then pooling the data across the sexes is inappropriate and may cause misleading results.

[7] Recently, Gravelle, Wildman & Sutton (2002) have pointed out the quality of aggregate data as an explanation for the inconsistent findings of the Gini index in population health regressions.

3. Data and Definitions

Dependent variable

Completed suicide figures are obtained from the World Health Organization (WHO) Mortality database (WHO, 2003)[9]. As in most previous studies, undetermined deaths are excluded from the analysis. The United Kingdom, including England & Wales, Scotland and Northern Ireland is chosen as a single unit and the analysis for Germany covers only Western Germany. Crude suicide rates per 100,000 inhabitants are computed as the number of suicides in any particular country over the mid-year population of that country. Mid-year population is also taken from the WHO mortality database. This variable is logged to correct for its skewed distribution.

Table A.1 (see, appendix A) displays the average overall, male and female suicide rates for countries studied here. There is a huge variation in average crude suicide rates across countries. For instance, overall suicide rates range from 29.9 in Slovenia to 0.1 in Egypt. These variations may partially be explained due to underreporting or suicide death certification accuracy[10], though some may reflect different attitudes towards suicide within different countries. Men also appear to be more prone to commit suicide than women. The average male suicide rate was 17.7 while that for females was 7.3.

The independent variables

As mentioned above, all of the explanatory variables are assumed to be exogenous in our empirical model. Based on previous research into suicide, five socioeconomic variables were chosen as predictors of suicide: the gross domestic product (GDP) per capita, the divorce rate, the fertility rate, the alcohol consumption and the participation of females in the labor force[11]. An extensive review of the suicide literature can be found in Lester & Yang (1997).

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[8] The only exception is the study by Neumayer (2004).

[9] The relevant codes for suicide used in this study were: E950-E959 (ICD-8 and ICD-9) and X60-X84, Y87.0 (ICD-10).

[10] Although criticisms of the official statistics have arisen due to cultural and religious factors that might affect the reliability of suicide between countries and over time and because of under-reporting bias, several studies demonstrate that suicide rates are enough accurate to allow for comparisons across countries and over time (Sainsbury, 1982).

[11] Research has indicated that unemployment is associated with suicide not only in studies of individuals but also in studies of aggregate data (see, Platt, 1984). Due to differences in unemployment definitions, figures for different countries and periods are not completely comparable and therefore excluded them from the empirical models.

The measure of income used in this paper is the GDP per capita, measured in constant US dollar prices and adjusted via purchasing power parity. Data on GDP per capita are extracted from the Penn World Tables (PWT) 6.1 (Heston, Summers & Atten, 2002)[12]. Coverage extends from 1950 to 2000, except for Germany, where coverage starts in 1970. Also, income data from the PWT for Bahamas, China, India and Yugoslavia are missing.

The degree of income inequality is measured by the Gini index. This variable is available from the Deininger & Squire (DS) (1996) dataset[13]. Recent empirical contributions that find no evidence that economic inequality impacts on health population rely on data from the DS dataset (Gravelle, Wildman & Sutton, 2002). The DS dataset also includes data for years prior to 1960. The DS dataset differentiates "reliable" data and "less reliable" data. We selected only countries with Gini coefficients from the "reliable" observations in the DS dataset[14]. This is the most widely accepted practice of data choice. This resulted in a total of 704 observations.

Alcohol data comes from the WHO global alcohol database (WHO, 2001)[15]. As a proxy variable of alcohol consumption we use the adult pure alcohol consumption in liters per capita (>15 years old). Coverage extends from 1950 to 2000 for all countries in the sample. The national figures are exclusively based on recorded levels of alcohol consumption. This may lead to underestimation or overestimation of alcohol consumption. To get a more reliable picture on alcohol in one country, not only recorded but also unrecorded consumption should be considered. Alcohol consumption data is not available for men and women separately.

Fertility rates are measured as the child-women ratio per 1,000 women aged 15-49 with children under age five. Female labor force participation is measured as the proportion of women aged 16-65 in the total civilian labor force. Data on fertility rates and on female labor participation were extracted from the World Bank's WDI database (World Bank, 2003). Divorce rates, measured as the number of divorces per 1,000 inhabitants were taken from the Demographic Statistics of the United Nations (UN) (UN, 1950-1997). These data have been supplemented by statistical publications from individual countries. Table 2 reports descriptive statistics of the sample. As can be seen, the average total (males and female) suicide rates for all countries during the studying period are, respectively, 12.40, 17.70 and 7.31 per 100,000 persons. Men also appear to have

[12] The PWT has been widely used in international macroeconomic studies.
[13]The data set can be downloaded from the World Bank's server at http://www.worldbank.org/research/growth/dddeisqu.htm.
[14] A critical viewpoint of the income inequality measures used in empirical works can be found in Atkinson & Brandolini, 2001.

higher suicide rates than women. Gini coefficients vary greatly across countries. For instance, the gini idex ranges from 0.18 in Bulgaria to 0.62 in Honduras. The average income inequality was 0.36. Pearson's correlation coefficients for all variables appear in Table A.2 (see, appendix A). Results indicate that multicollinearity does not appear to be a problem. The correlation signs are as expected, with the exception of GDP per capita. GDP p.c was positively associated with suicide rates. Alcohol consumption was not highly correlated with males and female suicide rates.

Table 2: Descriptive statistics

	Number of observations	Mean	Std. dev.	Minimum	Maximum
Total suicide rates	466	12.40	7.25	0.11	45.06
Male suicide rates	466	17.70	11.06	0	67.64
Female suicide rates	466	7.31	4.62	0	26.10
GDP pc.	627	9.15	6.77	0.48	30.19
Fertility rate	487	2.56	1.31	1.17	7.29
Female labor force participation	619	37.21	7.79	14.7	50.92
Divorce rate	469	1.64	1.18	0.02	5.3
Gini index	704	36.03	9.08	17.83	61.88
Alcohol consumption	596	7.26	4.89	0	24.69

Sample

The final sample size is restricted by the availability of income inequality data. When putting the "high quality" Gini index and available regressors together, a total of 323 observations are obtained. The final sample covers 40 countries. Table 1 lists the countries used in the analysis (see, appendix A).

4. Econometric Framework

Using the subscripts *i* and *t* to index the country and the year, the baseline specification to estimate is:

[15] The data set can be obtained from the WHO's website at http://www3.who.int/whosis/menu.cfm?path=whosis,alcohol&language=english.

$$SR_{it} = \alpha_i + X'_{it}\beta + \varepsilon_{it}$$
$$\varepsilon_{it} = \rho\varepsilon_{it-1} + u_{it} \qquad (1)$$

where SR_{it} is the logarithm of suicide rate (per 100,000 thousand), X_{it} is the vector of explanatory variables constructed following previous empirical studies and that includes economic and socio-demographic variables. The vector X includes GDP per capita, adult alcohol consumption per capita, fertility rate, divorce rate, the proportion of female in the labor force, and the Gini coefficient. The model assumes away any reverse causation or endogeneity of the explanatory variables. The β are unknown parameters to be estimated and ε_{it} is the usual stochastic regression error term that varies across countries and over time. The parameter α_i represents unobserved country specific effects. This parameter controls for unobserved factors that vary across countries but are time invariant within countries. It is very likely that there are important country specific effects that are related to suicide mortality rates. The list of effects may include climate, religion, lifestyles, geography, and preferences for suicide in a given country that may not be captured by the set of observed covariates included in our baseline specification. Fixed effects models have generally been used in previous suicide research (Brainerd, 2001; Kunce & Anderson, 2002; Neumayer 2003a, Neumayer, 2003b).

An important methodological concern is the possibility of serial correlation in the error term. If serial correlation is present, then estimation of (1) will generate incorrect OLS standard errors, and false findings on the significance of β (see, Davidson & Mackinnon, chapter 10, 1993). In the results, we test for serial correlation using the test developed by Bhagarva, Franzini & Narendranathan (1982) for linear panel data models (BFN-DW statistic).

The model in eq. (1) is estimated by using non-linear techniques (Davidson & MacKinnon, 1993, pp. 331-341). Interestingly, several recent studies have found evidence that the effect of a number of socioeconomic variables on suicide rates depends on sex (Kposowa, 2000; Neumayer, 2003a; Neumayer, 2003b; Chuang and Huang, 2004; Minoiu and Rodríguez, 2006). In light of this, we run separate models for males and females[16].

[16] Estimation was carried out using the xtregar command in STATA V.8 (2003).

5. Results

A. Baseline results

We begin by discussing the parameter estimates from the basic models with individuals effects (**Table 2**). The three models use different dependent variables: the total suicide rate, the male and female suicide rates[17]. Estimates for the pooled model with country specific effects are reported in columns (1), (2) and (3) of Table 2. Columns (4), (5), and (6) of Table 2 present the fixed effects models with AR (1) adjustment. As can be seen from the low BFN-DW statistic, serial correlation is a serious concern in the one-way fixed effects model. Thus, inference based on t-ratios is misleading. As Table 2 shows, fertility rates always enter negatively at standard significance levels. Alcohol consumption always enters negatively, meaning that higher alcohol consumption lowers suicide rates, which is at odds with the positive effect one would expect. The divorce variable is negatively associated with suicide rates, although its coefficient is insignificant, which is inconsistent with the view that a lack of social integration raises suicide rates. The coefficient on female labor participation rate variable is positive and significant, although not for females. The absence of country fixed effects is rejected in all regressions at the 1 % level ($p < 0.000$).

In the previous section, we argued that estimating the model without accounting for serial correlation of the residuals would yield inappropriate t-values. We have re-estimated models assuming a first order autocorrelation term. As a result, the sample drops to 33 countries. It can be seen that the null of no serial (first order) correlation is clearly rejected. As it is apparent, the results are changed to an important degree and are more in line with those reported in previous empirical studies. Overall, the models fit the data well. The R^2 shows a better fit for males than females. We were able to reject the hypothesis that all coefficients are jointly zero in all regressions. Similarly, we tested the significance of the country fixed effects; and they were significantly different from zero in all regression models ($p < 0.000$).

[17] Breusch & Pagan (1979) tests detected the presence of heteroskedasticity in the three regression equations. Results are available from the author upon request.

Table 2. Panel regression models in levels.

	Fixed effects			Fixed effects with AR (1) adjustment		
Dependent Variable (in logs)	Total suicide rates	Male suicide rates	Female suicide rates	Total suicide rates	Male suicide rates	Female suicide rates
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Real GDP p.c.	-0.0005	0.006	-0.014**	-0.012	-0.013	-0.008
	(0.13)	(1.64)	(2.51)	(1.41)	(1.62)	(0.59)
Gini index	-0.002	0.005*	-0.019***	0.004	0.004	0.006
	(0.82)	(1.70)	(4.82)	(1.47)	(1.51)	(1.51)
Fertility rate	-0.118***	-0.099***	-0.224***	-0.064	-0.025	-0.270***
	(5.73)	(4.75)	(7.33)	(1.10)	(0.46)	(3.17)
Divorce rate	-0.037*	-0.021	-0.079***	0.022	0.036	-0.01
	(1.98)	(1.10)	(2.86)	(1.04)	(1.67)	(0.34)
Female labor force participation	0.011**	0.014***	-0.001	0.058***	0.068***	0.042***
	(2.84)	(3.45)	(0.24)	(9.60)	(11.75)	(3.91)
Alcohol consumption	-0.015**	-0.018***	-0.005	0.019*	0.013	0.032*
	(2.23)	(2.68)	(0.53)	(1.67)	(1.21)	(1.78)
Indiv. Dummies	122.69	119.14	75.91	9.87	13.46	2.38
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2 (within)	0.2906	0.3909	0.2821	0.6288	0.7658	0.173
R^2 (overall)	0.4185	0.3424	0.3091	0.4529	0.4956	0.3197
BFN-DW statistic				0.67	0.68	0.65
Number of countries	40	40	40	33	33	33
Number of observations	296	296	296	256	256	256

Note: Absolute t statistics in parentheses. Significant at *.10, **.05, ***.01. The regressions include a constant term plus country specific dummies.

The estimate of the effect of GDP per capita on suicide rates is negative and statistically insignificant. The direction of the effect is consistent with other studies (Brainerd, 2001; Neumayer, 2003a; Neumayer, 2003b; Chuang & Huang, 1997; Chuang & Huang, 2003; Tapia, 2002) as well as the Hamermesh & Soss theory of suicide. The higher future expected income, the higher the expected utility; thus living is more attractive relative to committing suicide and income should lower the suicide rate.

Income inequality measured by the Gini coefficient is positively associated with either kind of suicide rates, although its coefficient is close to zero for both males and females (0.004-0.006).

This confirms the notion that inequality causes psychosocial stress that in turn drives to self-destructive behavior (Wilkinson, 1996). The insignificant positive effect is in accordance with the results of Neumayer (2004) for Germany. The most noteworthy feature is that fertility rates had a statistically significant influence only for females. Following Durkheimian arguments of social integration, fertility rates increase family integration and promote socials ties and are expected to lower societal suicide rates. This result is consistent with panel data studies at regional and cross-country level (Neumayer, 2003a; Neumayer, 2003b; Chuang & Huang, 1997).

Divorce enters positively but is not significant in the regressions for the overall and male suicide rates, as opposed to other panel data studies (Brainerd, 2001; Chuang & Huang, 1997; Chuang & Huang, 2003; Neumayer 2003b; and Kunce & Anderson, 2003). The positive effect of divorce on suicide is in accordance with the sociological theory of suicide (Durkheim, 1966). Divorce lowers social integration and entails a rupture of family ties. From this perspective, a society characterized with a high divorce rate is expected to have a higher suicide rate. The negative impact of divorce on female suicide rates is surprising. Nevertheless, Table 2 shows that the model for females reveals a poor fit (R^2=0.17), suggesting that the negative sign found for the divorce might result from omitted bias variable or miss-specification.

Alcohol consumption is positively correlated with suicide rates but is statistically insignificant. This finding is consistent with the argument that alcohol related problems may lead individuals to take their own lives. It should be noticed that this correlation may be caused by other third factors which may increase both alcohol consumption and suicide rates such as stress, family integration, and psychological problems. Others, such as Brainerd (2001); and Neumayer (2003a, 2003b), find a positive significant effect of alcohol consumption on male and female suicide rates.

The female labor participation variable becomes significant with a positive sign. One possible explanation for this finding could be the “role conflict” (Stack, 1998). The more woman participate in the labor force the lower the social integration due to the role conflict between men and women caused by participation. It also appears empirically that dominates more the role conflict than the role expansion, raising suicide mortality (Neumayer, 2003a; Neumayer, 2003b; Chuang & Huang, 1997).

Comparing the results for female suicide rates with those obtained for male and total suicide rates, reveals three similarities: (1) the participation of female in the labor market is consistently positive and significant, (2) the divorce rate, the GDP per capita and the alcohol consumption are

not significantly associated with either kind of suicide rate, (3) the gini index has no impact on either kind of suicide rate. In addition, the effect of fertility rates on suicide depends on sex. Female suicide rates are significantly associated with fertility rates and with the expected negative sign.

(B) Sensitivity analysis

In Table B.1 (see, appendix B), the results are tested for their robustness to the exclusion of any given particular country. The pattern of the results is similar to that reported in columns (2), (4) and (6) of Table 2. The coefficient on inequality is positive though not significant. When Costa Rica is omitted from the regressions, the economic inequality coefficient turns negative, although its t-ratio is always smaller than one. In general, we do not find that inequality is significantly associated with suicide except for Mexico. We have also re-estimated the models including a squared economic inequality term to test for a non-linear relationship of inequality on suicide rates. We find no evidence that the suicide inequality relationship is non-linear[18]. Another alternative we have explored is the use of log-income instead of income. As with previous estimates, the Gini index maintains its positive sign, although the income variable switched to a positive sign, implying that countries with a higher GDP per capita would appear to have higher suicide rates. It may be that healthier countries may count suicide more accurately than poorer countries do (Hamermesh, 1974). Another possible explanation is that in modern societies, family structures are weaker than in traditional ones, thus reducing the costs of committing suicide (Jungeilges & Kirchgassner, 2002). We have also included a quadratic term for alcohol consumption as well as a main effect as we might expect that while a little drinking may reduce suicide risk, a lot of drinking may increase it. The coefficients on the squared alcohol consumption term become insignificant in all regressions. In sum, these findings do not appear to be driven by a specific country. This is an important observation given the lack of a theoretical framework for interpreting the results of models estimated at a macro (rather than micro) level.

6. Conclusions

This paper has provided new evidence on the causal effect of income inequality on suicide mortality using a panel data set of countries. The results suggest that the estimates are sensitive to model specification and in particular to serial correlation of the error term which has been frequently ignored in most previous empirical applications of suicide. Once we control for serial

correlation, the results suggest that divorce, fertility and female labor participation rates seem to have a significant impact on societal suicide rates. GDP per capita, and alcohol consumption, although with the expected sign, do not seem to have a significant effect either kind of suicide rates.

The finding in this paper with regard to the effect of inequality on suicide mortality complements that of Neumayer (2004) for 10-17 German states. We find that the estimates on the Gini coefficient are always positive, although they are not statistically significant. The latter result appears to be robust to a number of different specification issues examined in a sensitivity analysis. However this result should be interpreted with some degree of caution as well. The use of aggregate data might be criticized since the economic model at hand is one of individual behavior. Despite of this criticism, such data have been used in circumstances where individual data are not available.

In addition, this study focused on the contemporaneous association between inequality and suicide. Nevertheless, it has been conjectured that the pathway by which inequality is assumed to impact on health involves some delay. It would be interesting to examine whether lagged values of income inequality are associated with suicide mortality rates. In a recent study using individual and state level data, Mellor & Mylio (2003), do not find that lagged values of inequality are significantly associated with suicide rates. Finally, our results also suggest that suicide prevention policies for males and females should be articulated differently.

[18] Results are available from the author upon request.

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APPENDIX A

Table A. 1: Average crude suicide rates (per 100,000 population)

Country	N	Total suicide rates	Male suicide rates	Female suicide rates	Country	N	Total suicide rates	Male suicide rates	Female suicide rates
Australia	10	12	18.1	5.8	Mauritius	3	6.2	9.1	3.6
Belgium	5	20.6	28.8	12.9	Mexico	7	2.2	3.6	0.8
Brazil	7	3.2	4.6	1.8	Netherlands	13	10.4	13.1	7.9
Bulgaria	27	14	19.8	8.2	New. Zeal	13	11.8	17.4	6.2
Canada	24	12.2	18.7	5.8	Norway	10	11.9	17.7	6.2
Chile	5	6.1	10.4	1.9	Panama	3	2.3	3.8	0.7
China	7	16.5	14.7	18.5	Poland	15	13	22.1	4.4
Costa Rica	10	4.4	7.2	1.6	Portugal	5	8.1	12.6	4
Czech. Rep	3	17.3	26.3	8.8	Romania	4	12	19.2	5
Denmark	5	23.9	31.2	16.7	Singapore	7	11.9	13.6	10.1
Egypt	3	0.1	0.2	0.1	Slovenia	3	29.9	47.3	13.5
Estonia	4	35	60.9	14.1	Spain	9	6.3	9.4	3.4
Finland	12	25.4	41.4	10.5	Sri. Lanka	4	19.4	25.6	12.8
France	8	17.5	26	9.4	Sweden	16	18.5	26.2	10.9
Germany	7	21	28.4	14.2	Thailand	5	4.7	5.4	4
Greece	4	3.6	5.3	2.1	Trinidad	5	6.8	10.8	3.1
Hungary	10	37	54.3	20.9	UK	32	8.8	11.3	6.3
Italy	16	7	10.2	4	USA	43	11.4	17.7	5.5
Jamaica	2	1	1.8	0.2	Venezuela	10	4.7	7.4	2
Japan	24	16.6	20	13.2	Average	402	12.4	17.7	7.3
Korea	2	8.1	11.7	4.5					

Source: *Mortality Database*, World Health Organization

APPENDIX A

List of countries

Australia, Belgium, Brazil, Bulgaria, Canada, Chile, China, Costa Rica, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Jamaica, Japan, Korea, Mauritius, Mexico, Netherlands, New Zealand, Norway, Panama, Poland, Portugal, Romania, Singapore, Slovenia, Spain, Sri Lanka, Sweden, Thailand, Trinidad, United Kingdom, USA, Venezuela.

Table A2: Pearson Correlations matrix (n =296).

	Total suicide rates	Male suicide rates	Female suicide rates	Divorce rate.	GDP pc	Gini index	Alcohol consumption	Fertility rate	Fem. Labor participation rate
Total suicide rates									
Male suicide rates	0.9792								
Female suicide rates	0.8871	0.7755							
Divorce rate	0.2567	0.2897	0.1422						
GDP pc	0.1503	0.1525	0.1116	0.6171					
Gini index	-0.3810	-0.3573	-0.3765	-0.1973	-0.2374				
Alcohol consumption	0.1538	0.1829	0.0680	0.0492	0.2017	-0.1715			
Fertility rate	-0.4257	-0.4052	-0.4050	-0.3285	-0.5496	0.5378	-0.4011		
Fem. Labor participation rate	0.5811	0.6100	0.4227	0.4577	0.3823	-0.4499	0.1087	-0.5751	

APPENDIX B

Table B1.Sensitivity analysis of the estimated coefficient of the Gini index. Fixed effects model with AR (1).

Countries excluded	Gini index					
	Total suicide rates		Male suicide rates		Female suicide rates	
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
Australia.	.0037	1.39	.0037	1.39	.0052	1.31
Belgium	.0038	1.51	.0038	1.51	.0059	1.54
Brazil	.0037	1.39	.0039	1.51	.0057	1.51
Bulgaria	.0038	1.47	.0038	1.47	.0057	1.52
Canada	.0029	1.07	.0029	1.07	.0051	1.27
Costa Rica	-.0015	0.61	-.0015	0.61	-.0018	0.54
Czech. Rep	.0038	1.47	.0038	1.47	.0057	1.51
Denmark	.0027	1.05	.0027	1.05	.0049	1.29
Egypt	.0037	1.47	.0027	1.47	.0057	1.51
Estonia	.0039	1.55	.0039	1.55	.0057	1.51
Finland	.0043	1.67	.0043	1.67	.0064	1.66
France	.0042	1.61	.0042	1.61	.0062	1.61
Germany	.0038	1.49	.0038	1.49	.0058	1.53
Greece	.0037	1.46	.0037	1.46	.0057	1.51
Hungary	.0047	1.78	.0047	1.78	.0063	1.59
Italy	.0038	1.44	.0038	1.44	.0063	1.60
Japan	.0038	1.38	.0038	1.38	.0055	1.32
Mexico	.0056	2.12	.0056	2.12	.0085	2.18
Netherlands	.0040	1.57	.0040	1.57	.0060	1.57
New Zealand	.0039	1.55	.0039	1.55	.0068	1.77
Norway	.0031	1.17	.0031	1.17	.0057	1.46
Panama	.0036	1.39	.0036	1.39	.0057	1.50
Poland	.0042	1.66	.0042	1.66	.0061	1.57
Portugal	.0038	1.52	.0038	1.52	.0060	1.58
Romania	.0037	1.44	.0037	1.44	.0055	1.45
Singapore	.0039	1.53	.0039	1.53	.0059	1.57
Slovenia	.0038	1.47	.0038	1.47	.0057	1.51
Spain	.0045	1.72	.0045	1.72	.0062	1.56
Sweden	.0045	1.77	.0045	1.77	.0060	1.48
Thailand	.0037	1.46	.0037	1.46	.0057	1.51
UK	.0041	1.50	.0041	1.50	.0063	1.56
USA	.0041	1.51	.0041	1.51	.0060	1.49
Venezuela	.0037	1.46	.0037	1.46	.0057	1.51

Notes: The regressions include a constant term plus country specific dummies. The variables used as explanatory variables were: divorce, female labor participation, fertility rate, GDP per capita and alcohol consumption.