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Suicide, unemployment and other socioeconomic factors: evidence from the economic crisis in Greece

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ABSTRACT – *Background and Objectives:* Economic adverse conditions are acknowledged as having a major impact on the exacerbation of mental disorders and suicides. The severity of current European crisis and the local unrelenting spending is affecting largely the economy of Greece.

Methods: The aim of this study was to explore changes in suicides and their possible association with macroeconomic and behavioural factors. Data for the period 1990-2011 were drawn mainly from the Hellenic Statistical Authority and Eurostat. Suicide mortality rates were correlated with economic and behavioural factors.

Results: Suicide mortality rates were increased by 55.8% between 2007 and 2011 while the total mortality was increased by 1.1% only. Significantly increasing trends in public debt, unemployment rates, consumption of daily units of antidepressants as well as divorces per 1000, homicides per 100,000 and persons with HIV per 100,000 were also observed. Suicides have been found to bear strong correlation with unemployment (r. 0.64). Significant associations were also found between suicide mortality and the percentage of public debt as percentage of GDP, the incidence of infections from HIV and homicides.

Conclusions: People suffering from income and job losses, living in a demoralized social state caused by severe austerity measures and restrictive health policies, are exposed to risks for developing depression or commit suicide.

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Introduction

It has long been established the association between macroeconomic instability and the exacerbation of mental disorders and suicides[1-4]. Adverse economic phenomena e.g. great public debt, exercised austerity measures causing less social state, as well as, the loss of million of jobs are likely to be linked with increased incidence of suicides[5-11]. A recent study in 26 European countries reported that every 1% increase in unemployment was associated with 0.79% risk in suicides for age groups <65 years old[12].

After 13 years of economic expansion, Greece's Gross Domestic Product (GDP) started showing zero growth rates since the end of 2007 and negative growth rates from the fourth quarter of 2008[13,14]. Although in 2007 Greece ranked 27th globally in terms of GDP per capita (32.100 USD), as a corollary of the international financial crisis and the local unrelenting spending, the national debt rose from 105.1% of GDP in 2007 to 170.30% in 2011[13,14]. The impact of crisis reached its peak in 2011[15]. The proportion of the population in Greece living under the poverty threshold reached the number of 2.6 million (about 33% of the population) in 2011[16].

Unemployment rate of total labour force soared to 25.6% during the first quarter of 2012 (1.3 million people)[17]. Approximately 40% of households have at least one unemployed member. The most striking development is that among young adults, 19-29 years old, unemployment exceeds 60%. In 2010 a memorandum of economic policies was signed in order to avert Greece's default. Greek government agreed to borrow 110 billion euros in 2010 and an additional 130 billion euros in 2012 from IMF and the Eurozone, to finance the country's debt[18]. As a result of these economic conditions several austerity measures were adopted, taxes were increased, public sector services were cut back, markets and professional services were deregulated, salaries, pensions and disability benefits were reduced, cost of basic commodities such as electricity, heat, food expenses, were increased as well as dramatic budget cuts in the public health sector were induced[19]. Health and mental health implications of the economic crisis in Greece have attracted increasing attention especially in the investigation of the prevalence of major depressive disorders and the related suicidal behaviour with general population samples nationwide in Greece[20-27].

The hypothesis on whether there is an impact of the current economic crisis on suicides in the country needed to be verified. This is of great importance given the fact that Greece presented the lowest suicide rates in Europe in all previous studies[28,29].

Consistent with the above assumption, this is a study on the incidence of suicides (1990-2011) in Greece. Suicide rates are correlated with several macroeconomic indicators such as public debt, percentage of public debt in GDP, unemployment as well as, some behavioural factors such as divorces, homicides, alcohol and antidepressant medication consumption, and rates of persons with HIV, covering the same period. To our knowledge this is the first study to explore the association between suicide and economic and others factors in Greece.

Methods

All suicide cases recorded in Greece during the period 1990-2011 were included in this study. Population data and crude data in suicides were obtained from the Vital Statistics Bureau of the Hellenic Statistical Authority (HELSTAT). Three population cen-

suses were performed during the period studied in 1991 and 2001 and 2011 and population data from the remaining years correspond to the official mid-year estimates of HELSTAT. The total de facto population of Greece was 10,387,000 in the 1991 census, 10,964,000 in the 2001 census and 10,939,000 in the last census of 2011. There were no changes in suicide certification procedures during the period studied. Yearly and mean age and sex specific suicide rates were computed per 100,000 population. The total suicide rates for males and females were age standardized on the Greek population of censuses 1991, 2001 and 2011. In Table 1 additional suicide rates of 1981 were included drawn from our previous work[28].

A control analysis was also undertaken using mortality from falls and poisoning to distinguish any association with the financial crisis from other co-occurring events, due to the fact that this kind of mortality has similarities with that of suicides requiring judicial procedure.

The economic factors included public debt in billion euros, percentage of the public debt in GDP and unemployment as percentage of labour force for the years 1990-2011. The information was drawn from HELSTAT and EUROSTAT. The behavioral factors comprised per capita consumption of alcohol, daily consumption of units of antidepressants, new HIV cases, divorces and homicides for the same period 1991-2011.

All these factors are related to exhibited population behaviour e.g. use of alcoholic beverages and antidepressant medication, disruption of conjugal life, or expression of violence (homicides). All the above correlates are likely to be influenced by the economic downturns. Moreover, possible increase in the incidence of HIV cases the recent years implies weakening of preventive social policy programs related to austerity measures.

Data on consumption of alcohol were collected from the annual commerce statistics of HELSTAT and OECD data sources. The use of antidepressants was provided by the International Marketing System. The yearly new diagnosed cases of persons with HIV were recorded by the Center for Control of Communicable Diseases. Finally the rates of divorces per 1000 and homicides per 100,000 were provided by the HELSTAT annual statistics. The rates of divorces and homicides included both sexes and they were standardized with the same procedure to that of the suicides.

Statistical analysis

The gender effect of suicides was tested by the Man-Whitney U test. In order to test the possible association between suicides and the economic and behavioural factors product moment correlation coefficients r were completed. Furthemore seven different linear regression models were used to investigate whether particular individual predictor variables are able to predict suicides. Multiple regression analysis was avoided due to the limited number of observations. Preliminary analyses were conducted to ensure no violation of the assumptions of normality and linearity. All analyses were performed with the aid of the SPSS version 18.

Results

The incidence of suicide mortality (1981-2011)

In Table 1, the age adjusted suicide rates per 100,000 in Greece for the years 1981, 1991, 2001 and 2011 are presented by gender. In all these years there is a statistically significant increase in both male and female suicide

rates reaching 54% for the total suicide rates. It should be mentioned that for the years 2007, before economic crisis, 2008, 2009, 2010 and 2011 the suicide rates were 3.58, 4.36, 4.57, 4.50, and 5.58 respectively. Between 2007 and 2011 the percentage increase was found to be 55.8%.

With respect to males/females ratio in suicides, there is a strong effect of gender all these years. With the application of Man Whitney U test we found z values ranging from -5.62 for 1991 to -6.92 for 2011, all statistically significant at $p<0.01$ implying that males disproportionately (3:1) commit suicide in Greece than females (data not shown).

The control analysis showed no evidence of an increase in mortality from accidental fall and poisoning. In fact between 2007-2011 mortality from fall and poisoning decreased by 21.5% and 28.0% respectively (data not shown).

Suicide, mortality, economic and behavioural factors

As shown in Table 2, significant increasing trends are observed between 1990 and 2011 in suicide, public debt in billion euros, percentage of public debt in GDP, unemployment rates, daily use of antidepressants, rates of persons with HIV, divorces per 1000 and homicides per 100,000. The lowest increase is that of the per capita consumption of alcoholic beverages (17.02%) and the highest is the public debt (900.95%) which shows the magnitude of economic crisis. It should be mentioned that between 2007 and 2011 the per capita consumption of alcohol decreased by 2.3%.

Table 3 presents the Pearson r correlations coefficients matrix between suicide rates, economic and behavioural factors. Suicide rates are positively and significantly correlated with percentage of public debt in GDP, unemployment (as percentage of labour for-

Table 1
Change in age adjusted suicide rates in Greece (1981-2011) per 100,000 by gender: Results of the linear regression (test for significant trend)

Gender	Rate per 100,000 1981 (95% CI)	Rate per 100,000 1991 (95% CI)	Rate per 100,000 2001 (95% CI)	Rate per 100,000 2011 (95% CI)	Change ± %	Estimated slope parameter b (95% CI)	p value
Males	4.98 (4.4-5.21)	5.85 (5.4-6.1)	5.56 (5.1-6.3)	7.24 (6.9-7.7)	+45.38	0.7 (0.3-1.1)	<0.001
Females	2.26 (2.1-2.9)	1.65 (1.2-2.0)	2.30 (1.2-2.7)	3.25 (2.8-3.9)	+43.80	0.6 (0.3-1.0)	<0.001
Total	3.63 (3.3-4.0)	3.78 (3.3-4.0)	3.93 (3.5-4.4)	5.59 (5.0-6.0)	+54.0	0.3 (0.1-0.6)	<0.001

Table 2
Changes in suicides, public debt, % of public debt in Gross Domestic Product (GDP), unemployment rates, per capita consumption of alcohol, daily units of antidepressants consumption, HIV, divorce and homicide rates between 1991 and 2011 in Greece

	1991	1995	2000	2005	2011	+% change
1. Age adjusted suicide rates per 100,000	4.21	4.46	4.60	4.68	5.58	+32.50
2. Public debt in billion euros	35.53	95.01	139.23	195.44	355.20	+900.95
3. % of public debt in GDP	79.61	108.78	114.21	110.52	170.30	+113.91
4. Unemployment percentage of labour force	6.40	11.14	11.17	9.81	22.00	+243.75
5. Alcohol per capita consumption in liters	7.52	8.25	8.58	9.24	8.80	+17.02
6. Daily units consumption of antidepressants	98.86	120.00	139.41	215.40	284.85	+188.13
7. HIV rates per 100,000	3.03	3.45	5.71	5.14	11.25	+271.28
8. Divorces per 1000	0.74	1.32	1.36	1.63	1.90	+156.75
9. Homicides per 100,000	1.29	1.43	1.51	1.43	2.41	+86.82

Table 3
Pearson moment product correlations matrix: Age specific suicide rates x public debt (in billion euros) x % of public debt in GDP x unemployment (%) x alcohol per capita consumption (lit) x daily units of antidepressants consumption x HIV rates/100,000 x divorce rates/1000 x homicide rates/100,000

	1	2	3	4	5	6	7	8	9
1. Suicides/100,000	1.0								
2. Public debt in billion euros	0.12	1.0							
3. % of public debt in GDP	0.47*	0.84***	1.0						
4. Unemployment (%)	0.64***	0.63***	0.73***	1.0					
5. Per capita alcohol consumption in lit	0.22	0.58**	0.34	0.16	1.0				
6. Antidepressants consumption	0.11	0.20	0.22	0.45*	0.20	1.0			
7. HIV rates/100,000	0.64***	0.65***	0.64***	0.73***	0.30	0.24	1.0		
8. Divorces/1000	0.10	0.78***	0.82***	0.56***	0.65***	0.90***	0.82***	1.0	
9. Homicides/100,000	0.68***	0.14	0.15	0.59**	0.16	0.39	0.78***	0.30	1.0

* $p<0.05$
** $p<0.01$
*** $p<0.001$

ce), the incidence of HIV cases and the homicide rates. Public debt is correlated significantly with its percentage in GDP, the per capita consumption of alcohol, the incidence rates of HIV cases and the rates of divorces.

Unemployment rates are significantly correlated with the use of antidepressant medication, HIV and divorce rates as well. Consumption of antidepressant medication is significantly correlated with divorce rates.

After having studied the correlations, six models were developed using linear regression analysis. Suicide rates in each model were considered as dependent variables. Values of regression analysis coefficient b represent the change in the outcome resulting from a unit change in the predictor only if the predictor is having a significant impact on our ability to predict the outcome. From Table 4 we can conclude that the public debt as percentage of GDP, unemployment, HIV and homicide rates, each one separately, makes a significant contribution in predicting suicides (Table 4).

Table 4
Linear regression models with dependent variable «age adjusted suicide rates»

Model	Independent variable	B	P value	95.0% C.I.
Model 1.	Public Debt as percentage of GDP	0.01	<0.05	0.01-0.02
Model 2.	Unemployment	0.07	<0.01	0.03-0.12
Model 3.	Alcohol consumption per capita	0.03	>0.05	-0.37-0.43
Model 4.	Daily Units of antidepressants	0.00	>0.05	0.00-0.00
Model 5.	HIV (per 100,000)	0.10	<0.05	0.02-0.19
Model 6.	Divorces (per 1000)	0.12	>0.05	-0.42-0.65
Model 7.	Homicides (per 100,000)	0.86	<0.01	0.40-1.32

Discussion

The findings of this study provide evidence that the onset of the economic crisis in Greece in 2008 is associated with a significant increase in the incidence of suicides. The total percentage change in suicides between 1981 and 2011 reached 54.0%. Particularly between 2007, the year before crisis, and 2011, the year when several austerity measures were exercised including the public health sector, an increase in suicide mortality was also observed by 55.8%. This increase was found to be almost equal in both sexes. However the percentage increase of total mortality rates in Greece between 2007 and 2011 was only 1.1%. These results coincide with the findings drawn from recent general population surveys in Greece nationwide, related to an increase in the reported suicidal ideation by 184.9% and suicidal attempts by 161.5% between 2008 and 2011[23-27]. The trends in suicides are also parallel with the increased use of antidepressants between 1990 and 2011 (+188.1%).

Apparently the recent significant increase in suicides in Greece portrays a serious psychosocial problem in the country exhibiting the lowest suicide rates in Europe all the previous years[28,29]. It should be mentioned that a similar increase in suicides is observed in Italy and Spain, countries also facing severe

financial crisis[31,11]. Increasing trends in suicide were also recorded in several countries in other geopolitical areas during past economic downturns[11,34-36].

The lack of any association between economic factors influenced by the current economic crisis and mortality from accidental falls and poisoning helps to exclude any residual confounders (events) such as unrecognized changes in the registration system of classification of mortality, a finding also reported by others[32].

The strong correlation between unemployment and suicide in Greece is a consistent finding in several empirical studies[4-7,9,10,35-37]. Milner *et al.*[38] in their systematic review and meta-analysis on decades of studies, reported that long-term unemployment within five years of job loss is associated with greater risk of suicide (RR = 2.50, 95% CI 1.93-3.17). In our study we were unable to differentiate the chronicity of unemployment. Anecdotal evidence from media outlets, suggests that several long term hopeless unemployed individuals commit suicide in Greece. The possible psychological mechanism underlying the rational choice of person to commit a suicide has been described by Hamermesh and Neal[39]. They consider suicide as an action when a person chooses to put an end to his/her life when his/her expected usefulness fall, below his/her personal threshold of well-being. Based on such hypothesis, a high unemployment rate causing deterioration of living standards and decline of income is expected to increase the incidence of suicide in Greece[40].

Nevertheless it is imperative to have in mind the attributable risk of psychiatric factors for suicide[41]. It seems that individuals vulnerable to develop a mood disorder and being out of the labour force are exposed to a greater risk to commit suicide[42]. In the case of Greece, the introduction of serious austerity measures, hit the less economically advantaged people, and they have a profound and detrimental influence on their mental health profile exhibiting high prevalence of major depression and suicidal behaviour[23,24].

Help seeking from a mental health professional could prevent acts of self destruction. However austerity measures on health care impose restrictions in the accessibility of health services by uninsured persons due to their long-term unemployment status[21]. In Greece long-term unemployed persons are deprived of their social insurance and therefore are not covered by the National Health System.

The correlation of suicides with the public debt as percentage of GDP could be explained through the mechanism of the serious socioeconomic instability and the increasing millions of people living under the poverty line facing serious psychosocial problems[42].

It is of note that higher income was found to be associated with higher suicide rates for the years 1980-2002 in the 24 OECD countries[38]. In the case of Greece, a member state of OECD, the abrupt change of living standards involving significant loss of per capita income due to unemployment and dramatic cuts in salaries /pensions, as well as, the weakening of social networks, is the possible cause for the exacerbation of depression and the related suicides[26,27].

Suicides were also found to bear strong association with the HIV rates and homicide. The correlation of HIV rates with suicides could be explained by the fact of their parallel increasing trends attributed to social disintegration and the lack of social protection policy as a consequence of current financial turmoil. During the last four years, an HIV epidemic outbreak was noticed among injecting heroin drug addicts due to the cessation of preventive programmes e.g. exchange

needles[43,44]. Increased criminality (homicides) is also resulted by the adverse social cohesion phenomena within the framework of the economic recession[7,45]. On the contrary, the consumption of antidepressants was not found to be associated with suicides, a finding not in line with others[46]. As far as the relationship of the per capita alcohol consumption with suicides is concerned, no correlation was also found. It seems that the Mediterranean meal related drinking compared to the Northern European countries weekend binge drinking is preventing the uncontrolled drinking behavior[31].

The variable 'unemployment' in the correlation matrix, was found to be linked with public debt as well as with consumption of antidepressants, HIV rates and divorces. All these findings reflect the current financial crisis effects on social structure and institutions causing long-term social demoralization phenomena e.g. increased family disruption, violent mortality and uncontrolled drug abuse as well.

The results of linear regression models with dependent variable the suicide rates confirm the previously discussed correlations. Public debt as a percentage of GDP, unemployment, HIV and homicide rates, each one separately, make up a significant contribution in predicting suicides in Greece. It becomes clear that the exploration of the economic and other behavioural factors and suicide revealed causal associations.

The correlation between suicides and unemployment is likely to represent only the peak of the iceberg of a possible impact of the current crisis on public mental health and social disintegration related phenomena (divorces, homicides, drug abuse) under the reality of the extensive budget cuts in public health and social care spending in the country. It should be mentioned that two previous studies have shown: the first the strong association between low regional socioeconomic development and the non existence of mental health care services in Greece, for the years 1984 and 1994 and, the second the reverse regional correlations between suicide rates (2002-2008) the health-mental health infrastructures and the number of psychiatrists, nurses and psychologists, meaning that people commit suicide when there is no place to seek help[47,48]. The development of psychosocial protection programs should be of primary importance such as expansion of subsidized employment programs, development of extensive psychosocial support systems, accessibility to health and mental health care services and provision of health insurance. All these measures might mitigate the effects of economic crisis and the collateral phenomena[49,50]. In the case of Greece, family and kinship considered as the foundation of social institutions, are needed to be supported within the framework of the local communities' psychosocial resources[51].

Although this study has provided evidence of the deteriorative effects of economic crisis on various psychosocial domains, there remains a need for further research. Firstly, the study of the dimensions of traffic and other accidents in terms of possible parasuicidal tendencies[52]. Further investigation should focus on cohorts of persons at risk for exhibiting symptoms of depression e.g. former high income executives currently unemployed, in order to prevent their mental health impairment and suicidal behaviour.

Limitations

The present study was not without certain limitations. The cases of suicides were reported by the Hellenic Statistical Authority with no relevant information on the underly-

ing causes. In that way the specific contribution of economic factors on the causation of their incidence in not clear. Monthly and regional suicide and unemployment data were not available. Additionally, the contribution of possible mental illness was not feasible to be taken into account. The design of this study does not provide evidence on the effect of the duration of adverse economic factors eg long-term unemployment as risk factor for suicide. However our study showed a temporal and parallel increase of public debt, unemployment and suicides mainly the last five years (2007-2011).

Conclusion

In summary, Greek data on suicides, unemployment and other macroeconomic and behavioural factors show significant yearly increase after 2008, the year of the onset of the financial crisis, providing evidence for a strong association between unemployment and suicides. If this association is causal, a further increase in suicides will continue to occur, unless systematic interventions are going to be undertaken to mitigate the pervasive influence of economic recession on mental health of the Greek population.

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