Research Article

A Study of Suicide Mortality in Turkey (2002-2011)

Semra Günay Aktaş[1] and Yeliz Mert Kantar[2]

[1]Department of Tour Guiding, Faculty of Tourism, Anadolu University, Turkey

[2]Department of Statistics, Faculty of Science, Anadolu University, Turkey

Correspondence should be addressed to: Yeliz Mert Kantar; ymert@anadolu.edu.tr

Abstract

The objective of this study is to research suicide rates in Turkey for the period 2002-2011 for both males and females by using spatial statistical methods and mapping analysis. The results of the analyses show that the suicide mortality rates in Turkey are higher among men than among women and that the seasons affect suicide rates. Also, it is shown that the highest suicide rate for males and females is observed for the 15-24 and 25-34 age groups, respectively. From mapping analysis and spatial statistics tools, it is concluded that the suicide rates for males and females are high in East Anatolia, South East Anatolia, Southwest Aegean and certain coastal provinces of West and Central Black Sea sub-regions. In addition, there is a moderate level of spatial clustering in both male and female suicide mortality rates in Turkey. It means that neighbouring provinces are more similar than distant ones in terms of suicide mortality

Keywords: Suicide mortality, Mapping analysis, Spatial statistics, Spatial correlation, Spatial clustering, LISA.

Introduction

Suicide, a leading cause of premature death, has negative effects on both the relatives of people who commit suicide, and on society. The World Health Organization (WHO) defines suicide as the act of deliberately killing oneself. Experts agree that a combination of many factors plays a role in the emergence of suicidal behavior. Factors such as depression, psychiatric and neurological disorders, schizophrenia, addiction, cancer, as well as physical diseases and HIV infection can be given as reasons for suicide. Besides, suicide is correlated with hopelessness, psychological disorders, social isolation, biological predisposition, previous suicide attempts, mood disorders, domestic violence, work-related stress, financial difficulties and drugs (Sharma et al., 2007). It is well-known that there is a relationship between suicidal thoughts and the behavior of teenagers or young adults, who are exposed to sexual or physical abuse in their childhoods, having a divorced family,

being separated from parents, or living with people involved in crime (Sharma et al., 2007). Also, it is observed that some people commit suicide for religious purposes on political objectives and wars. (Bosnar vd., 2006; Smith and Frueh, 2013). It is well-known that socio-economic factors play an important role in the distribution of suicide. Durkheim states that the risk of suicide is related to social factors, such as low income, unemployment and educational failure (Agerbo et al., 2011; Bedeian, 1982; Kuroki, 2010).

The results of suicide impact, not only on those who commit suicide, but also on families and society. According to the WHO, the annual global mortality rate of suicide is about 16 per 100,000 people for the year 2000, with one person committing suicide every 40 seconds. Suicide is one of the three major causes of death in the 15-44 age range. According to official data taken from the Turkish Statistical Institute for 2008, deaths due to suicide are the ninth order of 50 causes of death. In the same year, 215,562 people lost their lives due to 50 different reasons. Of these, 0.74% of men and 0.46% of women committed suicide.

Suicide, a preventable public health problem, is listed as an external cause of death. Research on suicide is important because it is a preventable cause of death. Studies help to show which factors can be changed and what kind of intervention can be conducted for certain age groups in order to prevent suicide. Much research has considered mental illness and substance abuse as primary risk factors, and thus most suicide prevention programs emphasize these causes in order to lower the risk of suicide. As a result, suicide prevention strategies generally involve reaching out to preventable factors which would decrease risk factors that stem from mental health problems (NIMH). In a world where discussions based on policies and programs which would address suicidal behavior and where attempts to develop new methods to reach out to higher risk groups and suicide prevention, prevention strategies can only be developed through

better research and an understanding of suicide geography. This is because suicide changes through different regions and cultures. The weight of risk factors associated with suicide differs for each country, due to each country's unique circumstances. Differences in mortality rates stem not only from cultural and religious attitudes, the status of women and family structures in a given society, but can also vary spatially within a country (Cutright and Fernquist, 2000). To develop a national suicide prevention strategy, a thorough understanding of all aspects of suicide, a determination of country-specific risk factors, high risk sub-groups and a clear definition of their geographical distribution are needed.

Suicide is a complex phenomenon in all regions of the world because it varies greatly depending on the time, place, age group, gender, race, culture, religion, social systems and region. In the literature, suicide mortality has been studied from different angles. While some studies focus on the reasons for suicide or ways to prevent suicide, some consider the spatial distribution of suicide mortality (Hintikka et al. 1999; Chang et al. 2010; Chang et al. 2011; Günay and Kantar 2015).

According to research, human biology is substantially affected by the environment (Hjelmeland, 2011). Therefore, the environment or geography plays an important role in a person's motivation to commit suicide (Mann et al., 2009). For these reasons, in order to determine the effect of geographical conditions on suicide rates, many studies have been conducted. According to these studies, climatic conditions, such as sunny or foggy days have affected suicidal behavior, and moreover, depending on these conditions, the methods of suicide can change. On the other hand, some researchers suggest that geographical conditions may be directly related to an increase in suicide rates (Hempstead, 2006; Rehkopf and Buka, 2006).

In studies on the geographical distribution of suicide, it has been identified that suicide prevalence shows geographical

variation (Gunnell et al., 1995; Micciolo et al., 1991; Middleton et al., 2008; Levin and Leyland, 2005; Middleton et al., 2006). For example, the national suicide rates in European counties are considerably different (Levi et al., 2003). Moreover, the prevalence and incidence of the suicide rate in a specified country can be different regionally. In other words, it has emerged that these differences may be due to significant geographical features. The uneven distribution of suicide rates between countries and among the regions of a particular country has led to the emergence of the hypothesis that suicide is associated with location (Rehkopf and Buka, 2006; Ngui et al. 2014). For this reason, understanding the spatial distribution of suicide mortality can provide assistance for the planning of suicide prevention actions.

The announced numbers concerning suicide mortality are generally obtained from official statistics. As in many countries, the act of suicide is considered to be a derogatory action in terms of social and religious views in Turkey (Aktepe et. al., 2005). Therefore, the actual size of the mortality rate due to suicide may be greater than the announced figures for Turkey. It should not be overlooked that a number of deaths are accepted as accidents or natural deaths.

The objective of this study is to evaluate the spatial clustering of suicide of males and females in Turkey between 2002 and 2011 by means of both statistical analyses and mapping analysis. It should be highlighted that this study on the spatial analysis of the suicide mortality rate in Turkey for the period 2002-2011 is being conducted for the first time.

Considering all these issues, the paper is organized as follows. The data used and spatial analysis are described in Section 2. Discussion on the obtained findings is also provided in Section 3. Finally, the last section summarizes the conclusions of the study.

Data and Spatial Analysis

Turkey is divided into seven regions: Marmara, Aegean, Black Sea, Central Anatolia, Eastern Anatolia, South East Anatolia and the Mediterranean Region, and also divided into 81 provinces administratively. It is clear that narrow geographical area units are more suitable than the provincial level in order to characterize the socio-economic environment (Middleton, et. al. 2008). However, suicide mortality data can only be reached at only the provincial level in Turkey. Thus, this study is limited due to the provincial level. The suicide mortality rate data are taken from the Turkish Statistical Institute.

Using the adjusted total number of suicide cases is more useful in determining a seasonal distribution of deaths. In this study, the monthly adjusted total number of suicide cases is used for deaths resulting from suicide. The adjusted total of suicide cases is calculated by standardizing a 30-day distribution of cases for each month (Sun et al., 2011).

Firstly, the spatial pattern of suicides in Turkey is analyzed via suicide maps. Standardized data were used in these suicide mortality rate maps. Since the mortality variable depends on population structure and size, spatial pattern and time, the misleading nature of demographic variables, such as population size and age groups should be eliminated in order to compare different communities in terms of death rate (Günay, 2010; Anderson and Rosenberg, 1998). In this study, we have calculated the rate of suicides per 100,000 of the population. By using a direct age adjusted method and the results of the Turkey 2000 Census, suicide data are standardized. In this study, we use average province-level suicide rate data by sex covering the 2002-2011 period. In this study, a district level map of Turkey is used and maps were prepared using MapInfo. For mortality rate maps, a double-ended scheme is generally accepted as a better representation of rates above and below the mean (Pickle et al., 1996:8). As a result of this, variations in suicide rates are

_____

presented in double ended colored grid maps for the years between 2002 and 2011, for suicide average maps. In these maps, the highest and lowest values for deaths are represented in red and blue, respectively. Values in between the highest and lowest values are calculated using the interpolation method. To do this, Inverse Distance Weighted algorithm is used. These maps are effective where variations in disease and mortality rates cannot be represented by definite (or drawn) borders, and where clustering of closer values need to be presented.

On the other hand, another way of researching spatial patterns is to use spatial statistic methods. The Moran's I statistic is a general measure to represent the degree of clustering of feature locations (i.e., cities in this study). Negative/positive Moran's I values indicate negative/positive spatial autocorrelation. A zero Moran's I value indicates a random spatial pattern. The formula of Moran's I is given as follows:

$$I = \frac{n}{\sum\limits_{i=1}^{n}(x_i - \overline{x})^2} \times \frac{\sum\limits_{i=1}^{n}\sum\limits_{j=1}^{n} w_{ij}(x_i - \overline{x})(x_j - \overline{x})}{\sum\limits_{i=1}^{n}\sum\limits_{j=1}^{n} w_{ij}}$$

where n is the total number of spatial observations (i.e. districts), x_i is the value measured in region i, x_j is the value for another region j. $\overline{x}$ is the mean value of all regions and w_{ij} is the spatial weight between regions i and j.

As seen from formula I, in order to calculate Moran's I for spatial autocorrelation, the spatial weights matrix should be calculated. There are three kinds of weight matrices; contiguity, based on distance, and k-nearest neighbor. In this study, a spatial weights matrix based on 4-nearest neighbors is used.

The Moran scatter plot of the male suicide mortality rate is demonstrated in Fig. 6. It can be seen that the X- axis shows male suicide mortality rates and the Y- axis shows lagged- male suicide mortality rates defined by the weights matrix.

Global Moran's I statistic only provides an overall measure whether data are clustered or not. Specifically, it does not indicate local clusters or local levels of spatial autocorrelation. In order to identify local clustering geographically, Luc Anselin's LISA (Local Indicators of Spatial Association) is used as a local statistic (Anselin, 1995). This local statistic provides LISA map to quantify spatial autocorrelation and clustering within the small areas. (See Kantar and Aktas, 2016)

Findings

Variations in Suicide Related Mortality over the Years

Figure 1 shows the changes in the suicide mortality in Turkey over time. It can be seen that while the male suicide has increased up to 2009 and decreased between 2009 and 2011, the total rate suicide has been generally stable for the period 2002-2010. The female suicide rate has tended to decrease after 2003. In 2002, 2301 people committed suicide in Turkey. This number sharply increased to 2705 in 2003 and up to 2006 the number of suicide cases remained roughly at this level. In 2006, this number increased to 2829 suicides and then decreased to 2793 in 2007. Starting from 2008, the trend started to increase, and in 2010 this number reached 2933, its highest level. In 2011, 2677 people committed suicide.
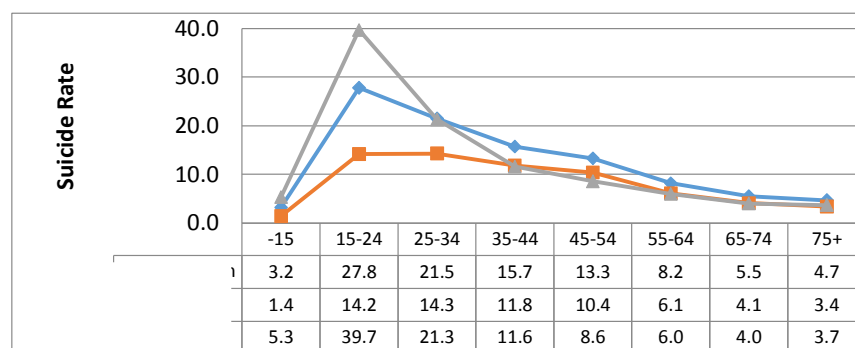
_____

Figure 1: Suicide mortality for males and females for the period 2002-2011, Turkey

Also, it can be seen from Figure 1 that suicide mortality rates in Turkey are higher among men than among women, as it is worldwide. Compared to suicide among men, factors such as strong family ties, children and sense of responsibility can protect women against suicide. It is known that one of the five main reasons for suicide is illness for both males and females (Günay, 2014).

Suicide Rates by Age Group

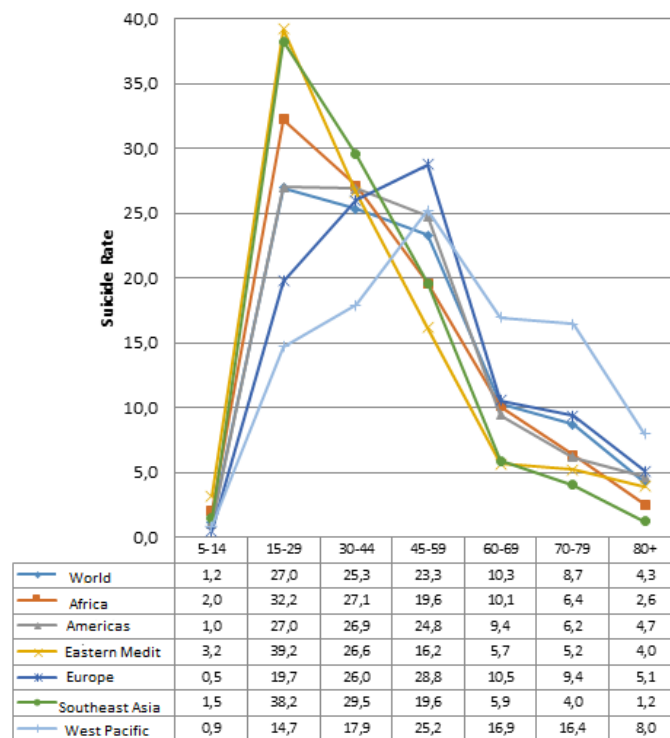Age group distribution is important in determining the scope and commonly observed risk groups of suicide. According to 10 year averages in Turkey, suicide among males is mostly observed in the 15-24 and 25-34 (14.2% and 14.3%) age groups. The male suicide rate decreases by 2% for the age groups 35-44 and 45-54. After the age of 55 this rate decreases. According to 10 year averages in Turkey, suicide among females is mostly observed in the 15-24 group (39.7%). This age group is followed by the 25-34 age group (21.3%). The highest female suicide rate is observed for the 15-34 age group (61%) (See Figure 2).

	-15	15-24	25-34	35-44	45-54	55-64	65-74	75+
	3.2	27.8	21.5	15.7	13.3	8.2	5.5	4.7
	1.4	14.2	14.3	11.8	10.4	6.1	4.1	3.4
	5.3	39.7	21.3	11.6	8.6	6.0	4.0	3.7

Figure 2: Distribution of suicide mortality in Turkey by age groups and gender (2002-2011) Grey line for Total, Blue line for Male, Red line for Female

_____

The age group distribution for male suicide in Turkey is similar to those of the Americas and the world average. The 15-29 age group has the highest male suicide rate in Turkey, as well as in the Americas, Southeast Asia, Africa and Eastern Mediterranean. In these regions, the suicide rates decrease after the age of 30.

However, this rate continues at the same level in Turkey. Even though suicide rates decrease for the 30-59 age group throughout the world and the Americas, the rates are still high, which is also the case for Turkey. The lowest suicide rate in Turkey is observed among young males at a rate of 1.4% (Figure 2).

	5-14	15-29	30-44	45-59	60-69	70-79	80+
World	1,2	27,0	25,3	23,3	10,3	8,7	4,3
Africa	2,0	32,2	27,1	19,6	10,1	6,4	2,6
Americas	1,0	27,0	26,9	24,8	9,4	6,2	4,7
Eastern Medit	3,2	39,2	26,6	16,2	5,7	5,2	4,0
Europe	0,5	19,7	26,0	28,8	10,5	9,4	5,1
Southeast Asia	1,5	38,2	29,5	19,6	5,9	4,0	1,2
West Pacific	0,9	14,7	17,9	25,2	16,9	16,4	8,0

Figure 3: Global distribution of male suicide rates for different age groups

The age group distribution for female suicide in Turkey is similar to those of Southeast Asia and the eastern Mediterranean regions. Female suicide rates for the 15-34 age group are higher than other age groups. This indicates the severity of suicide for young women. In recent years, a variation in suicide mortality rates within different age groups has been observed in industrialized countries. Negative trends are mostly observed among young people (Middleton et al., 2008)

Turkey differs from the world regarding suicide among the elderly. In Turkey, for both males and females, the number of suicide cases decreases, whereas this number remains high for those who are above 60 worldwide. Similarly, suicide cases for elderly males are much higher throughout the world, but in Turkey, there is not much difference across genders for elderly people. The number of female suicide cases is lowest for those above 75 and above. This situation also differs from the world average. Increasing health problems, loss of ability due to chronic

diseases such as heart problems and cancer, incurable depression and isolation from the social environment increase the risk of suicide. On the other hand, it is possible that, due to physical disabilities and a higher probability of accidents occurring due to aging, these suicide cases might not have been determined or recorded.

The suicide rate for females below the age of 15 is 5.3%. This rate shows the problem of pre-adolescent suicide in Turkey, as the world average for females in this age group is much lower (Worldwide 2.1%; eastern Mediterranean 3.7%). This figure is much lower for males for the same age group in Turkey. This situation suggests that further attention should be paid to pre-adolescent female suicides in Turkey. Studies show that the number of pre-adolescent or teen suicide attempts in Turkey is higher (Akın and Berkem, 2012). Preventive measures need to be taken for pre-adolescent suicide attempts and suicides. As a result, this area requires further investigation.

Causes of Suicide

Among the 6283 suicide cases in Turkey, between 2002 and 2011, the cause of suicide is unknown for most (37%). For suicide cases where the causes are known, 23% took place because of diseases. Family (14%) and economic problems (10%) are among other causes (See Figure 4).
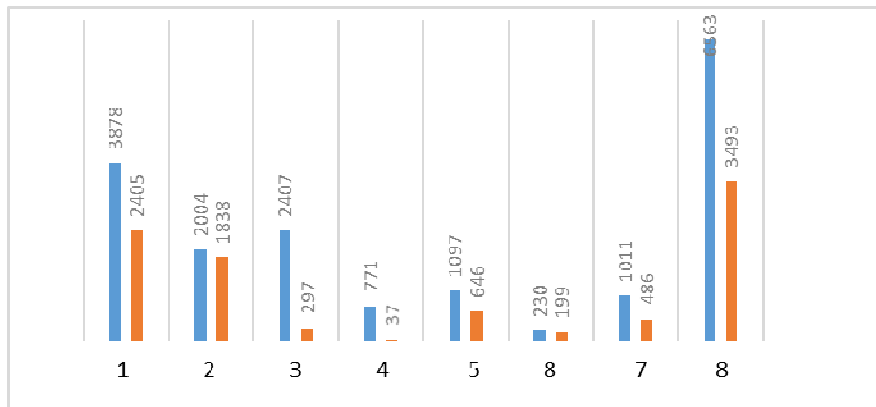
Figure 4: Gender Differences in Causes of Suicide in Turkey (2002-2011): 1. Disease, 2. Family Problems, 3. Economic Reasons, 4. Work Problems, 5. Emotional Problems, 6. Educational Failure, 7. Other, 8. Unknown

When the causes of suicide are analyzed by gender, unknown causes (34%) and diseases (21%; 27%) for males and females have the highest rates. Family problems (12%; 20%), educational problems (1.7%; 2.4%), emotional problems and unwanted marriages (6%; 7%) are higher for females than males as causes of suicide. Economic problems (%14; %4) and business failures (4.4%; 0.4%) are higher for males than females as causes of suicide. Another study which covers the period 1990-2000, also yields similar results. Accordingly, relationship problems for females and diseases for males have the highest rates as causes of suicide (Oner et al., 2007).

_____

Table 1: Gender Differences in Causes of Suicide

Causes		Gender		
		Male	Female	Total
Diseases	N	4123	2788	6911
	%	21.4	27.0	23.3
Family Problems	N	2319	2082	4401
	%	12.0	20.2	14.9
Economic Problems	N	2657	357	3014
	%	13.8	3.5	10.2
Business Failures	N	844	46	890
	%	4.4	0.4	3.0
Emotional Problems	N	1267	740	2007
	%	6.6	7.2	6.8
Educational Problems	N	325	246	571
	%	1.7	2.4	1.9
Other	N	1125	558	1683
	%	5.8	5.4	5.7
Unknown	N	6639	3493	10132
	%	34.4	33.9	34.2
Total	N	19299	10310	29609
	%	100.0	100.0	100.0

$X^2_{(7)}=1,464$, p=.000. Gender differences in the causes of suicide between 2002-2011, indicate a statistically significant difference ($X^2_{(7)}=1,464$, p=.000).

Seasonality of Suicide

Even though weather conditions are not a major cause of suicide, studies show that in both hemispheres suicide cases reach a maximum during spring and the initial phases of summer, and reach a minimum during winter. (Kevan, 1980; Jessen et al., 1999; Oravecz et al., 2006; Masterton, 199). For females, the second most commonly observed season for high suicide rates is autumn. Studies did not show any relationship between suicide and seasonality in the equatorial region (Parker et al., 2001). In European countries, a significant distribution of seasonality of suicide cases has decreased towards the end of the 20th century (Ajdacic-Gross, 2005), whereas in Australia, the seasonality of these cases has increased (Rock et al., 2003). Seasonal pattern of suicide differs in accordance with certain population subgroups. A number of studies show no difference by gender in terms of seasonality of suicide mortality (Oravecz et al., 2006; Lee et al., 2006). Masterton (1991) suggests that the seasonality effect on female suicide is higher (1991). On the other hand, other studies indicate that seasonal effects are much higher for males than for females (Oravecz et al 2006; Rock et al., 2003).

The distribution of total suicide rates by gender and month in Turkey, which is a northern hemisphere country with a subtropical climate, for the period 2002-2011, is shown at Figure 5. Suicide rates are adjusted by a 30 day distribution.

_____

_____
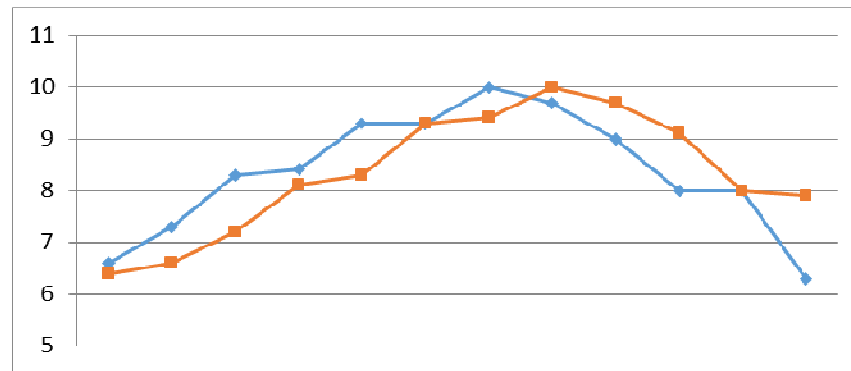
Figure 5: Suicide rate by month (December to November) according to gender in Turkey (2002-2011) (Blue line for male and red line for female)

Males in Turkey mostly commit suicide in the summer and spring months. The lowest suicide rate is observed in November (6.3%). This rate increases until June (%10) and then starting from July, it decreases (9.7%). Male suicide is mostly observed between the months of February and October. The lowest period is between the months of November and January.

Females mostly commit suicide in the summer and spring months. The monthly distribution of the female suicide rate falls one month behind male suicide rates. The lowest female suicide rate is observed in December (6.4%). After December, this rate increases and reaches a maximum in July (10%) and, starting from August, it starts to decrease (9.7%). Since no significant period of increase is observed for female suicide, the most commonly observed period for female suicide starts in March and extends to October. The lowest

female suicide rates are observed in winter, between December and February. There is no second period of increase in autumn for female suicide (Günay, 2014).

Spatial Pattern of Suicide

Suicide prevention strategies can be correctly diagnosed with a better analysis of spatial differences, processes and interactions. As a result of this, a spatial pattern of suicide by gender is presented with a city-level distribution. Firstly, we research whether there is spatial clustering of suicide mortality rates for males and females in Turkey between 2002 and 2011. Therefore, firstly, the calculated age adjusted mortality rate is mapped for both females and males.

_____

_____
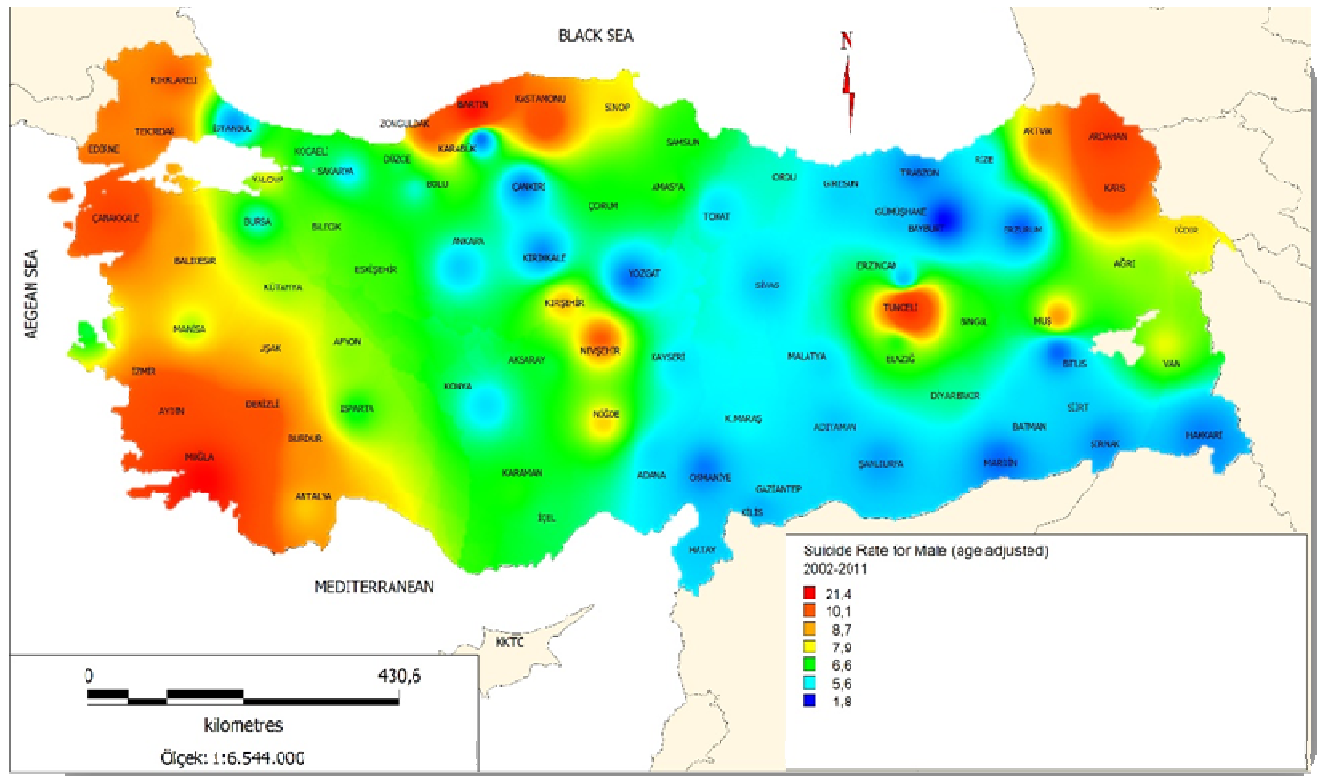
Figure 6: Spatial distribution of the age-adjusted male suicide mortality rates for 2002-2011

A province distribution of the male suicide mortality rate is examined for the 2002-2011 period (see Figure 4). It can be seen from Figure 6 that it is noteworthy that provinces with high mortality rates are located in the east and west of Turkey and North Anatolia. It should also be noted that a new group has emerged with Kırşehir, Nevsehir, Nigde and Karaman in Central Anatolia. The lowest mortality rates are seen here in Erzurum, Bitlis, Yozgat, Mardin, Bayburt, Karabük and Çankırı. Most of the provinces with the highest male suicide rates are located in the west of Turkey.

_____
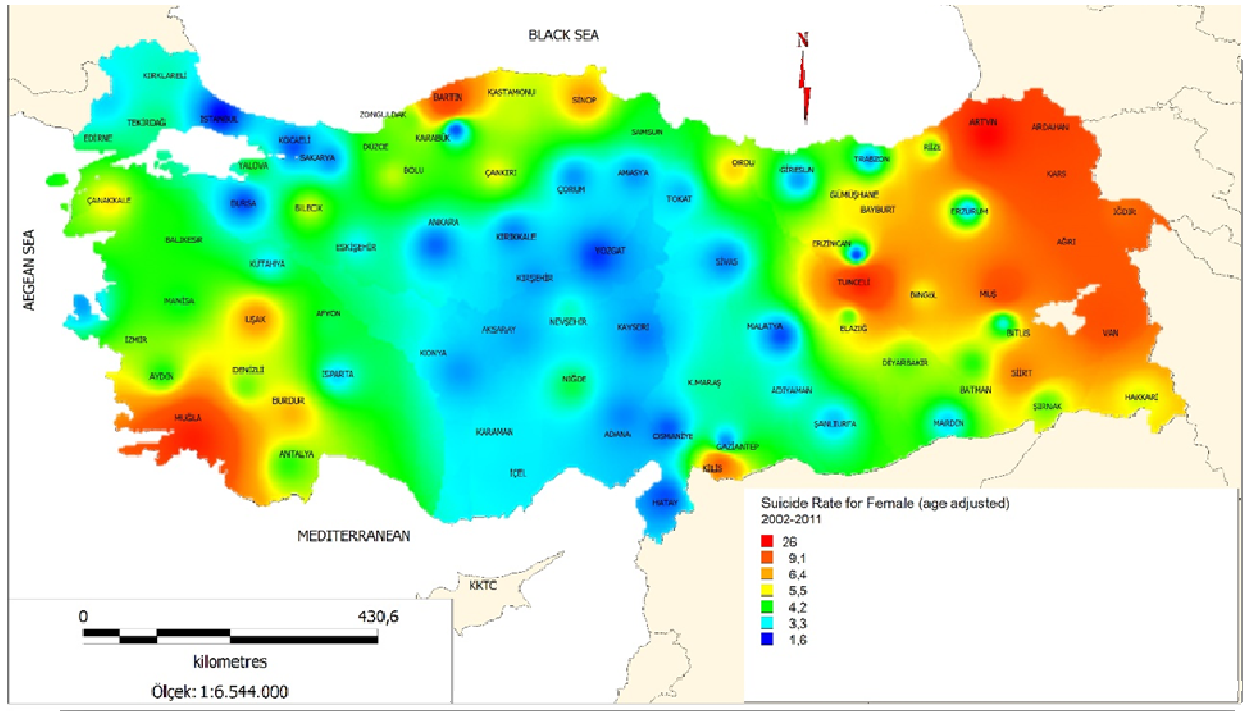
**Figure 7: Spatial distribution of the age-adjusted female suicide mortality
rates for 2002-2011**

The distribution of the mortality rates of female suicide examined for the period of 2002-2011 is given in Figure 7. From this figure, it is found that the suicide rate is high for East Anatolia, SouthEast Anatolia, Southwest Aegean and a number of coastal provinces of the west and central Black Sea sub-regions, and east part of eastern Black Sea sub-region. The highest suicide rates can be seen in Turkey's east and south west regions. The highest mortality rate is recorded in the province of Artvin. The mortality rates, because of suicide, are lower in Central Anatolia and the Thrace Peninsula, west part of south Eastern Anatolia region than other regions. Similarly, the suicide mortality rates of Çankırı, Malatya, Kocaeli, İstanbul, Bursa, Yozgat and Erzincan are fairly low. By using mapping analysis, we have found that there is spatial clustering in terms of the suicide mortality rate in Turkey.

Taking into account the provinces with high-male suicide rates, it can be seen that the migration rate, the number of single-person households, population density and the level of socioeconomic development rates are fairly high. Therefore, social change is rapid in these provinces. The protective effects of family on suicide have changed rapidly in developing societies, because social structures do not change simultaneously and family structure is undermined (Günay, 2014).

The spatial pattern of female suicide is related with socio-dynamic elements, such as the characteristics of geographical location, gender roles and the social status of women. Most provinces with high female suicide rates are located in eastern Turkey. These provinces have lower levels of women's education and employment and a high level of social pressure on women.

_____

_____

There are various factors that influence suicidal behavior. Slight alternation in any one of these factors can trigger consequences. Generational conflict and gender conflict are considered to be the explanatory reasons in the high suicide rates in countries which return rapidly from traditional agricultural society to industrial society (Sharma et. al, 2007; Chuang and Huang, 1996). On the other hand, migration is one of the most important socio-environmental factors associated with suicide (Voracek, et. al., 2009). It is well-known that Turkey has been experiencing rapid urbanization and a rapid migration process since 1950.

Accordingly, the share of the population living in cities is increasing. While 25% of the population lived in cities in 1950, this rate reached 75% in 2012. While the number of cities exceeding one million population was sixteen 2012, this number was only one in 1950 (Bekdemir, et. al., 2015). In Turkey, the proportion of people living in the cities and the number of cities and metropolitan have increased. These are features of Turkey's urbanization (Doğanay 1997: 427). This urbanization of Turkey has not developed in parallel with the industrialization. Therefore, certain problems like squatters, the accumulation

of the rural population, unemployment, environmental pollution, social, economic, political and planning have been experienced. 86% of those who commit suicide throughout the world is composed of citizens in low and middle-income countries (WHO). Turkey, which is a developing country and thus has rapid migration movement, and has a rapidly changing socio-cultural and socio economic structure, has suicide rates less than countries on the European continent (Günay 2014: 10-22). The effect of religious structures on suicide should not be overlooked. While suicide is considered as an honorable choice in some religions and cultures, this action is definitely an unforgiven act in Islam.

A similar design is formed for female suicide as shown in Figure 8. It can be seen from Figure 8 that Moran's I is 0.274829 for the male suicide mortality rate, which indicates that there is a moderate level spatial clustering in male suicide mortality in Turkey. Also, the *p*-value of Moran's I is less than 0.05 and thus, Moran's I is statistically meaningful. On the other hand, for the female suicide mortality rate, Moran's I value is approximately 0.20025 (See Figure 9). This means that there is a global spatial correlation.
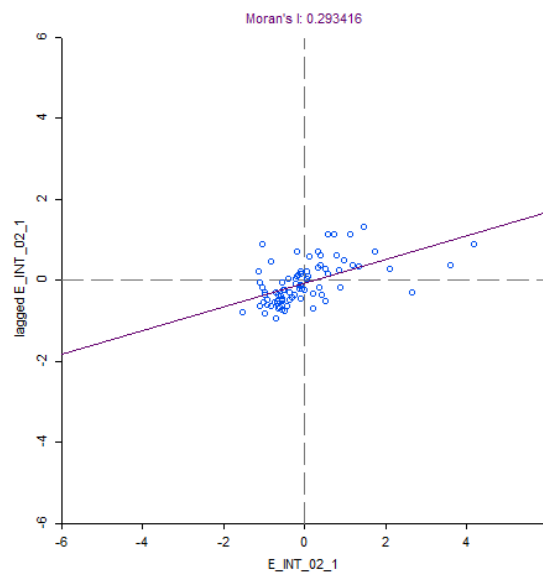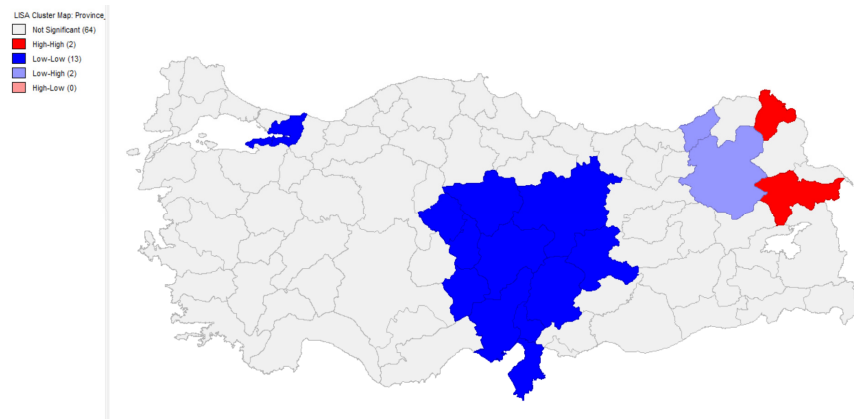

Figure 8: Moran's I for male suicide rates

_____

_____
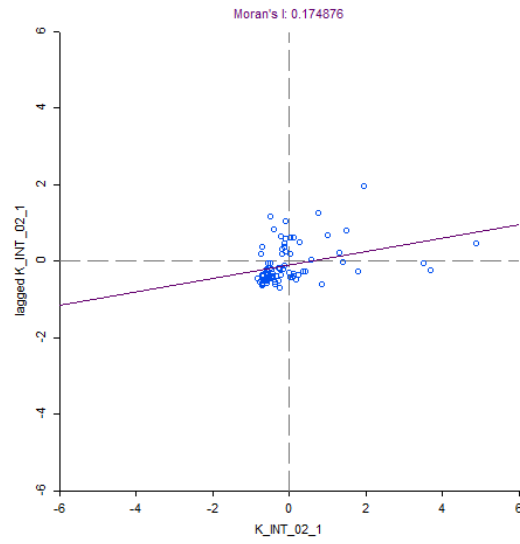
Figure 9: Moran's I for female suicide rates
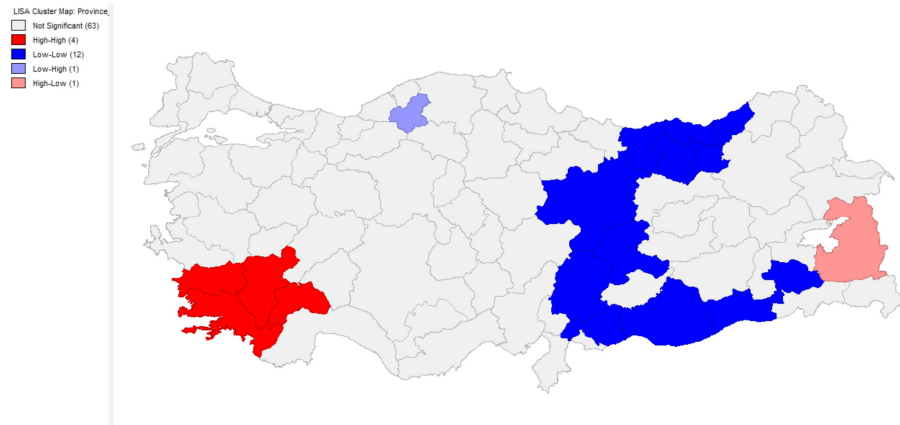
Figure 10: LISA map for male suicide mortality rates for 2002-2011
(5% pseudo-significance level)

_____

**Figure 11: LISA map for female suicide mortality rates for 2002-2011
(5% pseudo-significance level)**

According to Fig. 10, provinces in the southern west part of Turkey such as Mugla, Aydin, Denizli and Burdur replaced in High-High (HH). It means that indicates higher values surrounded by neighboring units with higher values, and that there is positive spatial autocorrelation and neighborhood effect. According to Fig. 11, the H-H cluster with the high female suicide rate is still located in the Ardahan and Agri.

Conclusions

Research on suicide is important since suicide is a preventable cause of death. Such studies help to show which factors can be changed and what kind of intervention can be conducted for certain age groups in order to prevent suicide. Differences in suicide mortality rates arise not only from cultural and religious attitudes, the status of women and family structures in a given society, but can also vary spatially within a country. To develop a national suicide prevention strategy, a thorough understanding of all aspects of suicide, a determination of country-specific risk factors, high risk sub-groups and a clear definition of their geographical distribution are needed. In Turkey, suicide mortality rates are higher among men than among women, as it is worldwide. Compared to suicide among men, factors such as strong family ties, children and sense of responsibility can protect women

against suicide. It is known that one of the five main reasons for suicide is illness for both males and females. If the age groups are taken into account, the 15-29 age group has the highest male suicide rate in Turkey as in the Americas, Southeast Asia, Africa, Eastern Mediterranean. The lowest suicide rate in Turkey is observed among young males at a rate of 1.4%. Female suicide rates for the 15-34 are higher than the other age groups. This indicates the severity of suicide for young women. Turkey differs from the world regarding suicide among the elderly. In Turkey, for both males and females, the number of suicide cases decreases, whereas this number remains high for those who are above 60 worldwide. Similarly, suicide cases for elderly males are much higher throughout the world, but in Turkey, there is not much difference across genders for elderly people. When the causes of suicide are taken into account by gender, unknown causes and diseases for males and females have the highest rates. Family problems, educational problems, emotional problems and unwanted marriages are higher for females than males as causes of suicide. Economic problems and business failures are higher for males than females as causes of suicide. If suicide in Turkey is analyzed seasonally and spatially, it is found that males in Turkey mostly commit suicide in the summer and spring months. The lowest suicide rate is observed in November. Male suicide is mostly observed between the

_____

months of February and October. The lowest period is between the months of November and January. It is found that the suicide rates for males and females are high for East Anatolia, South East Anatolia, the South West Aegean region and some coastal provinces of the west and central Black Sea sub-regions. The obtained Moran's I values for male and female suicide mortality rates indicate that there is a moderate level of spatial clustering of male and female suicide mortality in Turkey.

Acknowledgments

References

1. Agerbo, E., Stack, S., Petersen, L. (2011) 'Social integration and suicide: Denmark, 1906–2006.'. *The Social Science Journal* 48, 630-640.

2. Ajdacic-Gross, V. (2005) 'Historical Change of Suicide Seasonality in the Canton of Zurich,' Switzerland. *Suicide and Life-Threatening Behavior*, 35 (2): 217-226.

3. Ajdacic-Gross V., Wang, J., Bopp, M., Eich, D., Rössler, W., Gutzwiller, F. (2003) 'Are seasonalities in suicide dependent on suicide methods? A reappraisal,' *Social Science and Medicine* 57, 1173-1181.

4. Aktepe, E., Kandil, S. and Topbaş M. (2005) 'Çocuk ve ergenlerde intihar davranışı,' *TSK Koruyucu Hekimlik Bülteni* 4 (2): 88-97.

5. Aktas S.G. and Kantar Y.M. (2015) 'Spatial Analysis of Suicide Mortality in Turkey for the period of 2002-2011,' Proceedings of the 25th IBIMA Conference, Amsterdam, Netherlands

6. Anderson, RN., Rosenberg HM. (1998) 'Age standardization of death rates: implementation of the year 2000 standard,' *National Vital Statistics Reports* 47(3): 1-17.

7. Anselin L. (2005) 'Exploring Spatial Data with GeoDa: A Workbook Spatial Analysis Laboratory, Department of Geography University of Illinois and Center for Spatially Integrated Social Science,' IL, USA.

8. Bekdemir, Ü., Kocaman, S. and Polat, S. (2014) 'Yeni büyükşehir yasası sonrasında Türkiye'de şehir nüfusu ve şehir yerleşmeleri,' *Doğu Coğrafya Dergisi* 19 (32): 277-297.

9. Bedeian, A. G. (1982) 'Suicide and occupation: A review,' *Journal of Vocational Behavior,* 21 (2): 206-223.

10. Bosnar, A., Stemberga, V., Coklo, M., Grgurevic, E., Zamolo, G., Cucic, T. and Nunno, N. (2006) 'War and Suicidal Deaths by Explosives in Southwestern Croatia,' *Archives of Medical Research* 37, 392-394.

11. Chang, S-S., Sterne, J.A.C., Wheeler, B.W., Lu, T-H., Lin, J-J. and Gunnell D. (2011) 'Geography of suicide in Taiwan: Spatial patterning and socioeconomic correlates,' *Health and Place* 17, 641–650.

12. Chuang, HL. and Huang W.C. (1996) 'A Reexamination of sociological and economic theories of suicide: a comparison of the U.S.A. and Taiwan,' *Social Science and Medicine* 43 (3), 421-423.

13. Cutright, P. and Fernquist, R. M. (2000). 'Effects of Societal Integration, Period, Region, and Culture of Suicide on Male Age-Specific Suicide Rates: 20 Developed Countries, 1955–1989,' *Social Science Research* 29, 148-172.

14. Doğanay, H. (1997). *Türkiye Beşeri Coğrafyası*, MEB, İstanbul.

15. Gunnell, D., Peters, T., Kammerling, M. and Brooks, J. (1995) 'The relation between para-suicide, suicide, psychiatric admissions, and socioeconomic deprivation,' *BMJ* 311, 226-30

16. Günay, S. (2010) 'Normalization for the disparity indicative variables according to age on the health geography: Direct age adjustment example,' *VI. Ulusal Coğrafya*

_____

_____

Sempozyum, Ankara: University of Ankara Press.

17.   Günay, S. (2014) 'Türkiye'de İntihar (2000-2011)'*,* Anadolu University Press: 3095, Eskişehir: Türkiye.

18.   Hempstead K., (2006) 'The geography of self-injury: Spatial patterns in attempted and completed suicide,' *Social Science and Medicine*s, 62, 3186-3196.

19.   Hintikka J., Saarinen PI. and Viinamaki H. (1999) 'Suicide mortality in Finland during an economic cycle, 1985 ± 1995', *Scand J Public Health* 27(2):85-8.

20.   Hjelmeland, H. (2011) 'Cultural Context is Crucial in Suicide Research and Prevention,' *Crisis, 32 (2)*: 61-64.

21.   Jessen, G., Andersen, K., Arensman, E., Bille-brahe, U., Crepet, P., De Leo, D., Hawton, K., Haring, C., Helmeland, H., Michel, K.Ostamo, A., Salander-renberg, E., Schmidtke, A., Temesvary, B., Wasserman, D. (1999) 'Temporal fluctuations and seasonality in attempted suicide in Europe: Findings from the who/euro multicentre study on parasuicide,' *Archives of Suicide Research* 5, 57-69.

22.   Kantar YM. and Aktas G. (2016) 'Spatial Correlation Analysis of Unemployment Rates in Turkey,' *IBIMA Publishing Journal of Eastern Europe Research in Business and Economics*, 1-9.

23.   Kapusta, ND. and Sonneck, G. (2004) 'Suicides of men in Austria: an epidemiological analysis over a 30-year period,' *JMGH* 1 (2-3) , 197-202.

24.   Kevan, M.S. (1980), Perspectives on season of suicide: A review, Social Science and Medicine. Part D: Medical Geography, 14 (4), 369-378.

25.   Kuroki, M. (2010) 'Suicide and unemployment in Japan: Evidence from municipal level suicide rates and age-specific suicide rates,' *Journal of Socio-Economics*, 39, 683-691.

26.   Lee, H.-C., Lin, H.-C., Tsai, S.-Y., Li, C.-Y., Chen, C.C. and Huang, C.-C. (2006) 'Suicide rates and the association with climate: A population-based study,' *Journal of Affective Disorders* 92, 221-226.

27.   Levin, KA and Leyland, AH. (2005) 'Urban/rural inequalities in suicide in Scotland, 1981–1999,' *Social Science and Medicine 60*, 2877-2890.

28.   Levi, F., Vecchia CL. and Saraceno, B. (2003) 'Global suicide rates,' *European Journal of Public Health* 13*,* 97-98.

29.   Masterton, G. (1991) 'Monthly and seasonal variation in parasuicide. A sex difference,' *The British Journal of Psychiatry*, 158, 155-157.

30.   Mann, JJ., Arango, VA., Avenevoli, S., Brent, DA., Champagne, FA., Clayton, P. and Wenzel, A. (2009) 'Candidate endophenotypes for genetic studies of suicidal behavior,' *Biological Psychiatry, 65,* 556-563.

31.   Massing, W. and Angermeyer, MC. (1985) 'The monthly and weekly distribution of suicide,' *Social Science and Medicine* 21(4), 433-441.

32.   Micciolo, R., Williams, P., Zimmermann-Tansella Ch., Tansella M. (1991) 'Geographical and urban-rural variation in the seasonality of suicide: Some further evidence,' *Journal of Affective Disorders*, 21(1), 39-43.

33.   Middleton, N., Sterne, J.A., Gunnell and DJ. (2006) 'The geography of despair among 15-44-year-old men in England and Wales: Putting suicide on the map,' *Journal of Epidemiol Community Health* 60(12), 1040-1047.

34.   Middleton, N., Sterne, JA. and Gunnell, DJ. (2008) 'An atlas of suicide mortality: England and Wales, 1988-1994,' *Health & Place* 14, 492-506.

35.   Ngui AN., Apparicio P., Moltchanova E. and Vasiliadis HM. (2014), 'Spatial analysis of suicide mortality in Québec: Spatial clustering and area factor correlates,' *Psychiatry Research* 15; 220(1-2), 20-30.

_____

_____

36. Oravecz, R., Rocchi, M.B.L., Sisti, D., Zorko, M., Marusic and A., Preti, A. (2006) 'Changes in the seasonality of suicides over time in Slovenia, 1971 to 2002,' *Journal of Affective Disorders* 95, 135-140.

37. Parker, G., Gao, F. and Machin, D. (2001) 'Seasonality of suicide in Singapore: data from the equator,' *Psychological Medicine* 31, 549-553.

38. Rehkopf DH. and Buka SL. (2006) 'The association between suicide and the socio-economic characteristics of geographical areas: a systematic review,' *Psychol Med.* 36 (2), 145-57.

39. Rock, D., Greenberg, D. M. and Hallmayer, J. F. (2003), 'Increasing seasonality of suicide in Australia 1970–1999,' *Psychiatry Research* 120, 43-51.

40. Sharma, BR., Gupta, M., Sharma, AK., Sharma, S., Gupta, N., Relhan, N. and Singh H. (2007). 'Suicides in Northern India: Comparison of trends and review of literature,' *Journal of Forensic and Legal Medicine* 14, 318-326.

41. Smith, J. A. and Frueh, B. C. (2013), 'Further considerations on suicides among union forces during the U.S. Civil War' *Journal of Anxiety Disorders* 27(5), 544-546.

42. Sonneck, G., Goll, H., Herzog, H., Klejna, M., Kuess, S., Pröbsting, E., Rossiwall, O., Till, W. and Ziegelbauer, B. (2000). "Krize Müdahale ve İntiharı Önleme. Translator: Yasemin Sözer. Ankara: Türkiye Sosyal Psikiyatri Derneği.

43. Sun, J. Guo, X., Ma, J., Zhang, J., Jia, C. and Xu, A. (2011) 'Seasonality of suicide in Shandong China, 1991–2009: Associations with gender, age, area and methods of suicide,' *Journal of Affective Disorders* 135, 258-266.

44. Tietjen, GH. and Kripke, D. F. (1994) 'Suicides in California (1968–1977): Absence of seasonality in Los Angeles and Sacramento counties,' *Psychiatry Research* 53 (2), 161-172.

45. Voracek, M., Loibl, L.M., Dervic, K., Kapusta, N.D., Niederkrotenthaler, T. and Sonneck, G. (2009) 'Consistency of immigrant suicide rates in Austria with country-of-birth suicide rates: A role for genetic risk factors for suicide?,' *Psychiatry Research 170*: 286-289.

46. Vyssoki, B., Praschak-Rieder, N., Sonneck, G., Blüml, V., Willeit, M., Kasper, S. and Kapusta, N.D. (2012), 'Effects of sunshine on suicide rates,' *Comprehensive Psychiatry* 53, 535-539.

47. http://www.emro.who.int/health-topics/suicide/ (WHO Suicide)

Notes

Monthly Adjusted Suicide Cases :
(Number of deaths due to suicide per month x 30) / number of days each month)

Direct Age Adjusted Method = R= 100,000* SUM (wiri) = 100,000* SUM (widi/ni)

- R= Mortality Rates
- i= Age groups 0-4, 5-9,..., 85+
- wi= Standard population rate in i age group
- ri= Special age rage di/ni
- di= Number of deaths in i age group
- ni= Number of people in i age group

_____