IS HAPPINESS THE MAIN CAUSE OF THE RISING SUICIDE RATE IN THE WORLD?

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing this research project.

(4) The word count of this research report is 11,764.

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ABSTRACT

This study investigates the impact of happiness on suicide rate. Beside the impact of happiness, employment, gross domestic product, education, health expenditure and population on the suicide rate is also studied. The study divides the data into three sets including 31 developed and developing countries, 26 developed countries, and 5 developing countries. A significant relationship between happiness and the suicide rate is found in developing countries. Hence, it is suggested that the government should look into the life satisfaction of the people because this may help reducing the probability of committing suicide. To raise the awareness and prevent the suicide rate from continuing increase, the policy makers should pay attention to the significant factors that may impact the suicide rate and propose the solutions based on these factors.

CHAPTER 1 : INTRODUCTION

1.0 Introduction

According to World Health Organization (2018), the suicide has caused death of approximately 800,000 people per year, meaning that there will be one person committing suicide in every 40 seconds. The World Health Organization (2018) also shows that 1.4% of the global death rate is caused by suicide. Based on the report of Tavernise (2016), United States experienced the highest suicide levels in 30 years and claimed that there will be 13 people die of suicide in every 100,000 people in the United States. The increase of suicide rate did not just happen in the middle-age group but almost all groups in the United States except the older adults. In addition, Newman (2017) claimed that the suicide rate of teenage girls in the United States hit all-time high in the recent 40 years. VanOrman and Jarosz (2016) stated that suicides had taken over the place of homicide as the second largest cause of death in the teenager group. In a nutshell, the rising suicide rate has caused great economic loss for the world.

Organisation for Economic Co-operation and Development (2018) defines suicide rate as the deaths performed by a person who is in full knowledge and expectation of its fatal outcome. Moreover, Kanwal, Perveen and Sumbla (2017) defined suicides as the end of one's life purposely and it has been recognised as one of the source of mortality or fatal as it is a tragedy that will happen everywhere around the world. According to Jang, Bae, Shin, Jang, Hong, Han and Park (2016), they state that suicide refer to one of the leading cause of death globally and is one of the most exigent health problems. In fact, suicide behaviour have become the largest issue and major concern in both developing countries and developed countries as there is roughly 800,000 people in the world who commit suicide every year (World Health Organization, 2018). The pattern of suicide rate is different across different countries. Suicide rate may have different characteristics in the countries. Therefore, this research is carried out by separating into developed and developing countries respectively. Besides, this study is also conducted on the impact of happiness, employment, gross domestic product, education, health

expenditure and population on suicide rate in developed and developing countries together.

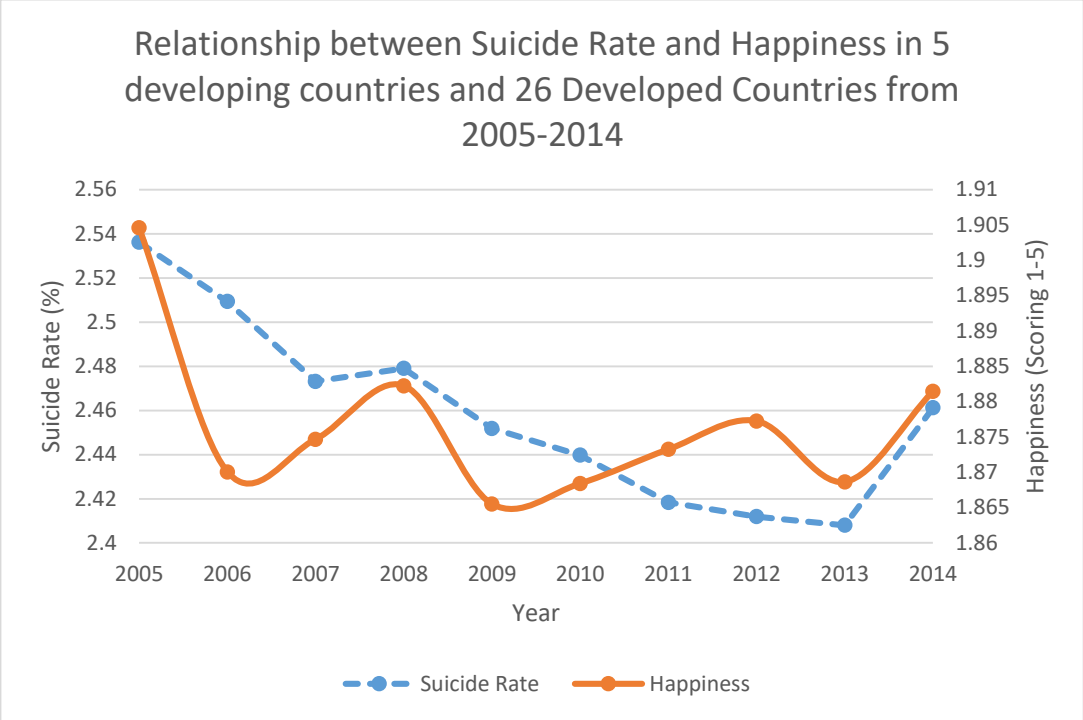
1.1 Research Background

This research studies the impact of happiness on suicide rate in 26 developed, 5 developing countries and total 31 countries respectively.

According to Vijayakumar, Nagaraj, Pirkis and Whiteford (2005), the seriousness of suicide rate in developing countries has become a subject of debates of the society. Based on their research, the suicide rate in developing countries is slightly higher than that of developed countries when these researchers use HDI (Human Development Index) as a measurement of whether the nation is a developing or developed country. The HDI is calculated by the United Nations Development Programme (UNDP) and measures adult literacy rate and GDP per capita of a nation. A low HDI means the country is a developing country and a high HDI means the country is a developed nation. According to Sartorius (1995), the suicide rates in developing countries outweigh that of developed countries due to several reasons such as the instability of economy and politics. On the other hand, developed countries experienced lower suicide rate due to better economic and political condition. Phillips (2004) which concludes that the low and middle income countries contributed 85% of the suicide rate in the world and it supported the thesis of Vijayakumar et al. (2005). However, Easterlin, McVey, Switek, Sawangfa and Zweig (2010) argued that countries with better economic performance do not necessary have higher happiness level.

1.1.1 The significant impact of happiness on suicide rate in developed and developing countries

Figure 1.1.1: The Relationship Between Suicide Rate And Happiness In 26 Developed And 5 Developing Countries From 2005 to 2014.



Source: World Happiness Report and OECD
Remarks : 1 represent Very Unhappy, 2 represent Unhappy, 3 represent neither Happy nor Unhappy ,4 represent Happy, 5 represent Very Happy

The Figure 1.1.3 indicates the relationship between suicide rate and happiness in 31 developing and developed countries from 2005 to 2014. This includes 5 developing countries and 26 developed countries.

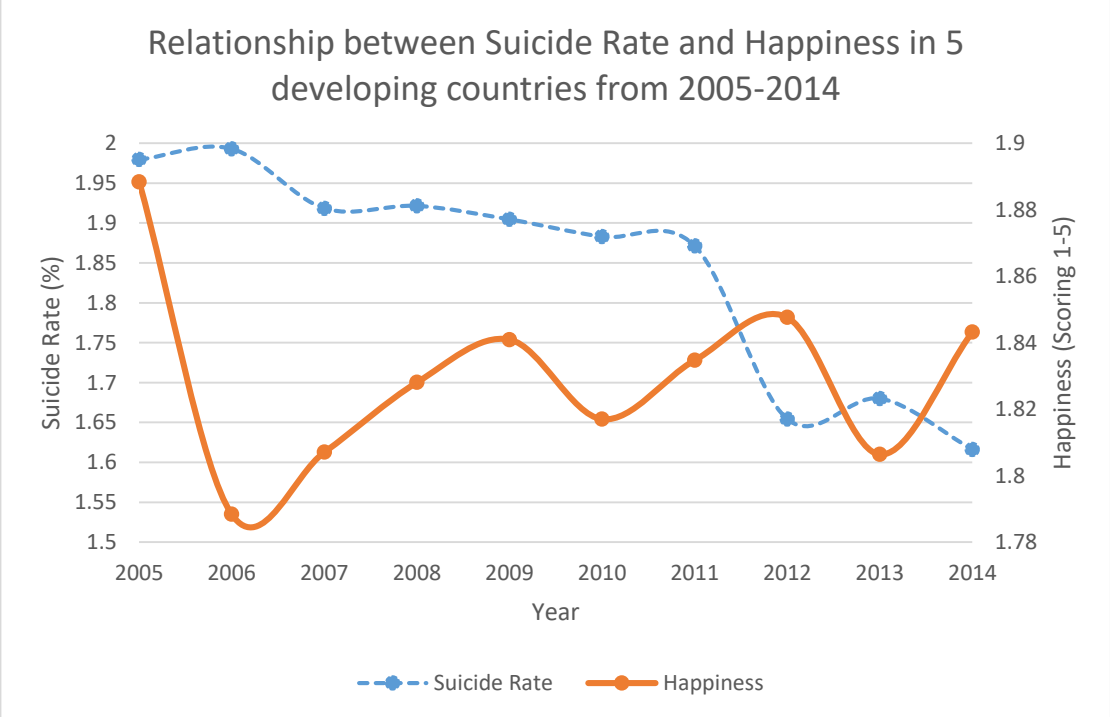
From the overall trend of suicide rate from year 2005 to 2013, the suicide rate consistently declines for these few years except for year 2007 to 2008. The suicide rate decreases from 2.54% to 2.41% in this period of time. Regarding to Chang, Struckler, Paul and Gunnell (2013), it may be caused by 2 factors, which are economic indicators, and change in suicide trends and excess suicide. The economic indicators are used to explain as the economic crisis in 2008 caused the increment of 37% in unemployment and a drop of 3% in GDP per capita (Chang et.al., 2013). The rising unemployment rate will result in a boost of global suicide rate, and in nations with low unemployment levels before the crisis. Besides, Hegerl et.al., (2013)

mentioned that the people who have depression and other mental disturbance are rising in Germany which reported by the statistic of health insurance and social system. Hence, this causes the rising of suicide rate in Germany. Moreover, there is a strong connection between the increment of suicide rate and the suicide trend and method. “Copycat” suicides mean that those people who suicide by following the trend, so they are following railway suicide case which performed by Robert Enke in November 2009 and this caused the huge changes in the trend of suicide (Hegerl et.al., 2013). However, the suicide rate becomes worsen again when it reaches 2.46% in year 2014. On the other hand, the happiness declines for about 1.58% from 2005 to 2006. Though there is some fluctuation for the happiness for overall 31 countries, it consistently remains in the range of 1.87 to 1.88 from 2006 to 2014.

In overall, this study observes that the relationship between suicide rate and happiness in 31 countries. However, there is no obvious trend observed in the graph.

1.1.2 The significant impact of happiness on suicide rate in developing countries

Figure 1.1.2: The Relationship Between Suicide Rate And Happiness In 5 Developing Countries From 2005 to 2014.



Source: World Happiness Report and OECD
Remarks : 1 represent Very Unhappy, 2 represent Unhappy, 3 represent neither Happy nor Unhappy ,4 represent Happy, 5 represent Very Happy

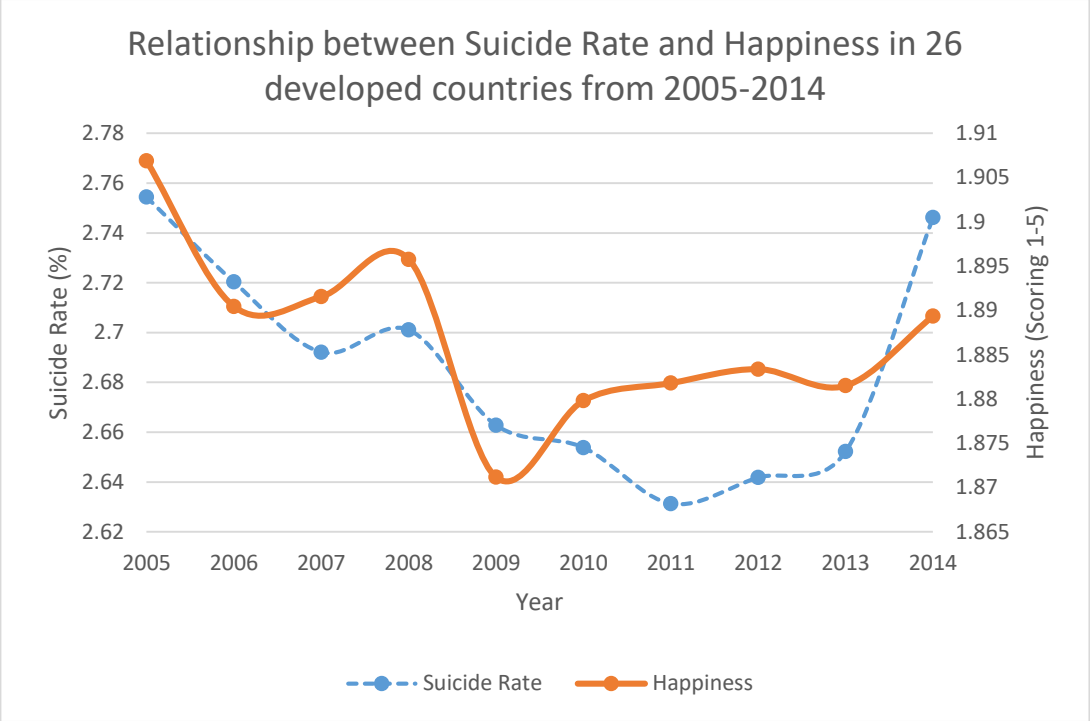
The Figure 1.1.1 indicates the relationship between suicide rate and happiness in 5 developing countries from 2005 to 2014, namely Brazil, Colombia, Costa Rica, Mexico and Russian Federation from year 2005 to 2014.

For suicide rate, the data shows that there is a small rise in suicide rate from 2005 to 2006 before it experiences a slight drop from 1.99% to 1.92% in the following year. From 2007 to 2008, the suicide rate experiences a very small and not significant rise. It then consistently drops from 1.92% to 1.83% in the following 4 years since there's a dramatic spike in year 2008 which can be mentioned as economic crisis (Varnik, 2012). The suicide rate drops in tremendous form in 2012 from 1.83% to 1.65% before it bounces back to 1.68% in the coming year. However, in the subsequent year, the suicide rate experiences a drop of 0.06%. Meanwhile, the happiness decreases dramatically in the first year from 1.89 to 1.79 before it shoots up to 1.84 in 3 years' time. In short, the life ladder or happiness level of developing countries fluctuates from 2009 to 2014 and 1.84 is recorded as the happiness level in 2014.

In overall, this study observes that the relationship between suicide rate and happiness is negative in 5 developing countries. Based on the figure above, when the happiness decreases in 2005, the suicide rate increases. The overall figure reflects negative impact of happiness on suicide rate.

1.1.3 The significant impact of happiness on suicide rate in developed countries

Figure 1.1.3: The Relationship Between Suicide Rate And Happiness In 26 Developed Countries From 2005 to 2014.



Source: World Happiness Report and OECD
Remarks : 1 represent Very Unhappy, 2 represent Unhappy, 3 represent neither Happy nor Unhappy ,4 represent Happy, 5 represent Very Happy

The Figure 1.1.2 indicates the relationship between suicide rate and happiness in 26 developed countries from 2005 to 2014.

From the year 2005 to 2008, the suicide rate experiences a drop from 2.75% to 2.69% before it roses back for one year in 2008. The suicide rate then continues to drop for a total of 0.07% in 3 consecutive years before it strikes back consistently for approximately 0.01% per year from 2011 to 2013. Finally, the suicide rate shoots up tremendously from 2.65% to 2.75%. Meanwhile, there is a decrease of 0.02 of happiness from year 2005 to 2006. It then rises consistently for 2 years before it drops in a huge amount from 1.9 in 2008 to 1.87 in 2009. The trend then shows a steady overall increase of happiness for the subsequent 5 years.

Not to mention that the annual suicide rate are much higher compare homicide and war (Kessler, Berglund, Borges, Nock & Wang, 2005). According to the World Health Organization (WHO), the rate of suicide (per 100,000 population) ranges from 0.6 to 35.1 (Shirazi, Hosseini, Zoladl, Malekzadeh, Momeninejad, Noorian & Mansorian, 2012). Meanwhile countries of the Eastern Mediterranean

Region (EMR) of the WHO are considered to be categorized to low rates of suicide rate of suicidal behaviour which is in between of 0-3.1 per 100,000 of population for suicide (Shirazi, et al., 2012).

In overall, this study observes that the relationship between suicide rate and happiness is positive in 26 developed countries. The overall figure reflects positive impact of happiness on suicide rate.

1.2 Problem Statement

The problem of suicide rate raises doubt for policy makers on how to counter such phenomenon to minimize loss for the country. Before any further actions can be carried out, the related authorities must find out what actually causes the rising suicide rates in the world. According to Daly, Oswald, Wilson & Wu (2011), they prove that United States is filled with happy and satisfied people in their life. However, a paradox was existed when Szalavitz (2011) found out in United States individual with higher happiness leaded to higher suicide rates. On the other hand, Szalavitz (2011) argued that countries with higher happiness will lower the suicide ideation and attempts. This argument can be shown that happiness has become an important factor which contributes to suicide attempts that has been proven by the study found below.

In contrast, in the report of Tavernise (2016), an epidemiologist at the Centers for Disease Control and Prevention, Dr. Alex Crosby had proven that the suicide rate will peak during economic recession. The suicide rate goes down when the economy goes better and vice versa. This can be supported by the article of Newman (2017) claiming that Tom Simon, an author of the report and associate director for science in the division of violence protection at the U.S. Centers for Disease Control and Prevention, had proven that the economic instability in the United States may cause rising suicide rate.

Suicide does not just exist in high-income countries. Based on the study done by Phillips (2004), he concludes that the low economy development countries contributed 85% of the suicide rate in the world. This can be supported by the research done by Vijayakumar, et.al., (2005) which conclude that over 78% of

global suicide occurred in low economy development countries in 2015. In contradict point of view, Easterlin, McVey, Switek, Sawangfa and Zweig (2010) argued that countries with better economic performance do not necessary have higher happiness level. Therefore, it come a problem that what are the potential components that might lead to rising suicide rate around the world?

Hence, it is shown that the suicide rate may also be contributed by economic factors. Will the economic factors be the reasons behind the rising suicide rate? What are the economic factors that might be a significant variable which will generate a strong relationship to the suicide rate that might haven't been done by previous researchers. Therefore, this study has classified the investigated countries into two categories which is the developed and developing countries in order to investigate whether the suicide rate is affected by happiness or other economic factors.

1.3 Research Objective

There are three objectives in this study. They are stated as below:

i. To investigate the impact of happiness and other economic factors on suicide rate in developed countries.
ii. To investigate the impact of happiness and other economic factors on suicide rate in developing countries.
iii. To investigate the impact of happiness and other economic factors on suicide rate in developed and developing countries.

1.4 Research Question

There are three research questions in this study. They are stated as below:

i. Is there any impact of happiness and other economic factors on suicide rate in developed and developing countries?

ii. Is there any impact of happiness and other economic factors on suicide rate in developed countries?

iii. Is there any impact of happiness and other economic factors on suicide rate in developing countries?

1.5 Significance of Study

This research basically will redound to the advantages of the society by considering the important suicide factors and roles. Today, most of the people who live in both developed and developing countries may have the opportunity to expose to suicide. For instance, World Health Organization (2018) illustrated that approximately 800,000 people worldwide die from committing suicide every year. In fact, in the year of 2012, suicide has become the second largest cause of death and mostly happened among teenager which can be seen in United State as it accounted 5,178 deaths in that year (Sullivan, Annest, Simon, Luo & Dahlberg, 2015). On the top of that, this study will contribute to the society and even the government in term of aiding in determining the vital proxy that will affect and influence the overall suicide rate. The purpose of this research is to assist in identifying several important major causation of suicidal which subsequently might encourage the government as well as society to take initiative in minimizing the suicide rate in both developing and developed countries. As a result, this investigation will become the significant endeavour in assisting the society to develop more effective strategies that could overcome the increment of suicide rate and pay more attention in managing the suicidal tendency. In most of the cases, suicide is the ultimate action of desperate life dissatisfaction (unhappiness) in terms of many factors and has become the priority concern around the world indeed. Based on the statement from Hendin, Phillips, Vijayakumar, Pirkis, Wang, Yip, Wasserman, Bertolote and Fleischmann (2008), the influences from cultural, religious sanctions, stigmatization of the mentally ill and socio-economic factors also will contribute to the suicide rate and behaviour. In fact, according to Kok, Goh and Gan (2015), the global suicide rates have risen by 60 per cent. Therefore, this research is also essential for the policy maker to be informed regarding which factors that would influence the suicide rate the most in both developing and

developed countries and subsequently develop and establish an effective policy as an attempt to further down the rate of suicidal.

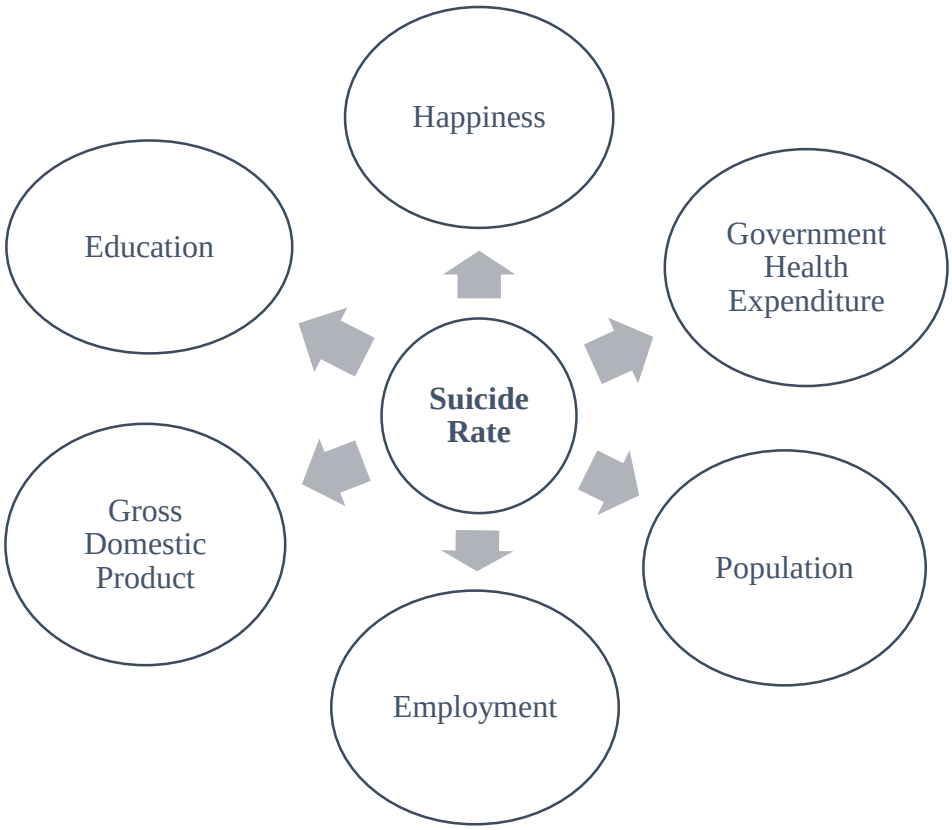
Nevertheless, with considering the matter above, several questions arise: How does the happiness affect the suicide rate? Does the happiness reduce or increase the suicide rate? What extent happiness influences the rate of suicide? Hereinafter, this study aim to examine and determine the element and proxy underlying the suicide rate which might able to improve and enhance the understanding the motive of each individual toward suicidal behaviour and search for the effective ways as well as guidelines as an attempt to prevent suicide at the global level. Additionally, this paper started with the empirical literature and be subsequent to the model to develop sufficient knowledge of the significant influences on suicidal behaviour in both developing and developed countries in order to provide suicidal prevention, intervention and assistance when needed.

In this paper, it evaluates and examines the result by using the data from 1960 to 2016 for 26 developed countries and 5 developing countries. The main methodologies that applied in this study composed of Pooled Ordinary Least Square (POLS), Fixed Effect (FE) as well as Random Effect (RE). Furthermore, nowadays there are many other factors and determinants that might have significant influence on suicide rate and hence decided to perform this study. As the global rates of suicide continually become the major concern, this is the best opportunity to study the effect of life satisfaction (happiness) towards suicide rate.

CHAPTER 2: LITERATURE REVIEW

2.0 Proposed Research Framework

Figure 2.0 Research Framework of Suicide Rate



This study focuses on the impact of happiness on the suicide rate. The suicide rate is the dependent variable of this model. The independent variables of this study include gross domestic product, education, government health expenditure, population and employment.

2.0.1 Durkheim's Theory

According to Ross, Yakovlev and Carson (2010), Durkheim's theory is one of the theories that have been applied for modelling the determinant of the suicide. This theory indicates that the suicidal forces and some other vital proxy are an instance of the actions which might lead to suicide. In fact, this theory claims that the more complicated social issue and factors, the higher the tendencies of people choose to end their life. In addition, Durkheim's theory basically considers the important proxy and describes the state of mind that will lead to suicide. Based on the Durkheim's theory, it has used the term egoistic to describe the suicide. On the top of that, egoistic suicide refers to those individual and people around the world who no longer feel the importance and purpose of life. This feeling may arise as the individual integrations to society have become worst, disappointed or even broken and therefore they choose to end their life by committing suicide.

2.0.2 Joiner's Interpersonal Theory of Suicide

This theoretical framework will be some different from the suicidal behaviour. It indicates that an individual that have suicide ideation when someone feel that themselves are alienated from one another and another perception was feeling of a burden on others (Van Orden, Witte, Cukrowicz, Braithwaite, Selby & Joiner, 2010). These two different perceptions can be categorized into different of suicidal attempt. The first example of feeling alienated comes in a more general states of personal emotional sorrow and desperate. Meanwhile for another perspective state that an individual are normally came from their personal feelings of low belonging and high burdensomeness. But this theory also state that an individual feeling of hopelessness and emotional pain on their mental states will not easily for suicide ideation to take place unless they involve the feeling of alienation or burden in their daily lifestyle.

2.1 Empirical Review of Concept

2.1.1 Impact of GDP on Suicide Rate

In the research of Hintikka, Saarinen and Viinamaki (1999), the gross domestic product (GDP) has a positive relationship with suicide rate. Hintikka et al. (1999) stated that the suicide rate increased when the GDP increased. Their studies also showed that the suicide rate decreased when the GDP decreased.

However, there are also studies which argue that the GDP has a negative relationship with the suicide rate such as the study of Rancans, Salander Renberg and Jacobsson (2001). Rancans et al. (2001) has proven that GDP is one of the factors that reflect economic situation. According to him, the suicide rate increased rapidly in 1993 when the GDP declined. The decline in GDP also caused the unemployment rate to increase which subsequently caused the suicide rate to increase. The cause of the simultaneous rise of suicide rate is due to the fact that people had to adjust themselves to adapt into vulnerable change in their life in every short period of time especially when there is lack of social support and protection. Many may fail to adapt into the changing environment when the GDP declined tremendously due to poor economic condition and this failure may contribute to their suicide attempts. However, a small amount of people especially the younger generation is able to take advantage of the new opportunities during this period of time (Rancans et al., 2001). The research by Agrrawal, Waggle and Sandwesiss (2017) also supports the thesis done by Rancans et al. (2001) whereby the GDP has a negative relationship with the suicide rate. In addition, Granados (2005) had done a research on the mortality rate during expansions of the United States economy. His research proved that the economic expansion was positively correlated with the mortality rate. However, in all the causes of death, only suicide rate was having a negative relationship with the economic expansions. Hence, Granados (2005) concluded that suicide rate drops when there is economic expansion (when the GDP rises). According to his study, GDP and unemployment rate are two very important indicators of economic conditions.

2.1.2 Impact of Health Expenditure on Suicide Rate

According to the previous research, some of the journals stated that there was a significant effect of health expenditure toward the suicide rate. On the top of that, some of the previous researches have provided limited evidence as whether that health expenditure was positively or negatively correlated with the suicide rate. However, according to Minoiu and Andres (2008), they proved that the health expenditures have a significant negative effect on the incidence of suicide which claims to be increase in health expenditure will lead to a decrease in suicide rate indeed. Moreover, this researcher basically uses the Ordinary Least Square method in attempt to analyse the data and obtain the significant result. Similarly, Minoiu and Andres (2008) investigated the effect by using Pooled Ordinary Least Square (POLS), Generalized Method of Moments (GMM) as well as Robustness check as a way to derive more significant result for their test. As a result, it possessed that the suicide rate will be significantly reduce when the spending and expenditure on health care increases.

Additionally, Ross, Yakovlev and Carson (2010) indicated that the health expenditure does have impact on suicide rate. According to their study, the spending in health especially in mental health treatment has continuously founded to have an inverse relationship toward suicide rate. However, their investigation was lack of evidence that higher health spending would lead the decrement in suicide rate. Hence, this is the good opportunity to test and study further regarding the relationships between health expenditure and suicide rate as an attempt to obtain more accurate and efficient outcome and results.

2.1.3 Impact of Happiness on Suicide Rate

Most of the earlier studies found that there is an inverse association between happiness and suicide rate, which mean that when the happiness increases, the suicide rate will be decrease. Kim and Kim (2007) uses participants method to determine the negative effect of happiness to the suicide rate, they concluded that the teenagers who intend to commit suicide indicated lower levels of life satisfaction compared to those teenagers who did not intend to commit suicide. Mahanta and

Aggarwal (2013) provided a strong evidence on negative effect of life satisfaction on suicide rate by using the same method, participant method. According to their study, their result proved that there's a strong connection between life satisfactions with social-emotional outcome. If the suicide attempts are lower, it may increase the level of life satisfaction, which proved by Kim and Kim (2007).

2.1.4 Impact of Employment on Suicide Rate

This study decides to use employment as one of the proxies is because employment status had being treated as an important factor that would potentially influences the suicidal behavior (Jin, Shah & Svoboda, 1995; Platt, 1984). The reason to use employment instead of unemployment is because some studies done by previous researchers suggest that the correlation between unemployment and suicide is casual or not significant and the reason provided by them between those two variables is correlation but not causation (Kraut & Walld, 2003). Moreover, the suicide rate cannot simply be judge with the increase or decrease of unemployment (Min, Park, Hwang & Min, 2015). Additionally, suicide rate will not just only affect based on an individual physiological problem but also get affected by their employment status (Yoshimasu, Kiyohara & Miyashita, 2008). Not to mention that there are no other studies have use large and nationally representative sample to investigate the relationship between other factors and suicidal behaviors while stratifying for employment status (Solano, Pizzorno, Gallina, Mattei, Gabrielli, & Kayman, 2011).

Harris (2016) also mentioned that employees working for wage or salary incurred the majority of workplace suicide. This indicates that mostly of individual that have suicidal attempt are employed as a permanent workers for the company or an organization. "An analysis of workplace suicide, 1992-2011", done by Pegula (2004), shows that the managerial and professional workers had the highest counts in suicide where mostly of them are engage in farming, forestry and fishing occupations. These categories of precarious occupation might be dangerous to them and suicide attempt might arise easily. Waitzkin (1998) states that when someone else wanted to perform well in the company they will take full responsibilities in

their job and will do their utmost best without taking into consideration the level of the dangerous of that particular of work. So when those workers are given tasks that have to complete in a given period of time which might cause them to be stressful and might be one of a factor for them to commit suicide regardless to their work which is precarious which might also a factor that causes them to have suicidal behaviour.

Roberts, Jaremin and Lloyd (2013) found that the occupation with the highest suicide rate in Britain during the late 1970s and the early 1980s were veterinarians which were in the first place. Meanwhile the Pharmacists were found in fourth place followed by dentist in the sixth, doctors in the tenth and farmers were in the thirteenth. These mainly professional occupations were considered to have more possibility in suicide risks because of an easy access to a tools through their occupation for suicide, such as pharmaceuticals or guns (Charlton, 1995; Marzuk, Nock, Leon, Portera & Tardiff, 2002; Thoresen, Mehlum & Moller, 2003). Corcoran and Arensman (2009) conclude that with an increase in the unemployment, there will be a weakening of the risk of suicide in the unemployed relative to the employed which may offset some of the anticipated rise in suicide.

2.1.5 Impact of Education on Suicide rate

According to the previous research, shows that there is a significant effect of school enrollment toward the suicide rate and also most of the previous researchers have found that there is positive relationship between school enrollment and suicide rate. Pompili, Vichi, Qin, Innamorati, Leo and Girarti (2012) shows that the studies of Enrico Morselli in Europe indicate that higher education level contributed higher risk of committing suicide. Alaraisanen, Miettunen, Lauronen, Rasanen and Isohanni (2006) reported that on a general population level, good school performance was a protective factor against suicide whereas there was high suicide risk in the group of psychotic patients with high premorbid intellectual functioning or high educational achievements. Besides that, Agerbo, Gunnell, Bonde, Mortensen and Nordentoft (2007) reported that the risk of suicide is higher in former psychiatric patients with a higher educational achievement and in patients who are

fully employed or married. Furthermore, Vijayakumar, Nagaraj, Pirkis and Whiteford (2005) found an association between high education levels and high male suicide rates pointing to the fact that those with relatively high socioeconomic standing had the highest suicide rates. Hem, Haldorsen, Aasland, Tyssen, Vaglum and Ekeberg (2005) found higher suicide rates among physicians and elderly graduates and pointed to the fact that graduates are more vulnerable than others when getting older. Voracek (2009) found that regional IQ and suicide rates in Italy were positively correlated. Moreover, Drake, Gates, Cotton and Whitaker (1984) reported that high suicide rate among college graduates was partly considered to be the results of their high expectations of themselves that were in line with their good premorbid functioning.

2.1.6 Impact of Population on Suicide Rate

According to the previous research, shows that there is a significant effect of population toward the suicide rate and also most of the previous researchers have found that there is positive relationship between population and suicide rate. Phillips, Li and Zhang (2002) had showed that an estimated mean annual suicide rate is 23 per 100,000 and a total of 287,000 suicide deaths per year which equivalent of every two minutes one person committed suicide. Moreover, Cheong, Choi, Cho, Yoon, Kim, Kim and Hwang (2012) had stated that suicide rate is high among the urban poor in urban areas where the gap between the rich and the poor is bigger than it is in the rural areas. Furthermore, Kumar Singh, Kumar Singh, Biswas and Rao (2013) had claimed that the frequency of suicide attempts recorded was very high, indicating the prevalence of this critical mode of death in the population.

2.2 Gap of Study

The impact of happiness and all exogenous variables in this study on the suicide rate has been a main focus of this study. Previous researchers have studied on this related topic in various methods. But there were few researchers that merge the economic factors to have interrelated relationship with the psychological factors.

For example, this topic concerns on how the happiness and gross domestic product affect suicide rate which involve both economic and psychology factors. Health expenditure is one of the variables that are mostly inappropriate to majority of the studies done previously by the researchers. For instance, Ross, Yakovlev and Carson (2010) indicated that the research for the effect of health expenditure on the suicide rate is limited and there are no precise results and outcomes obtained. By the same token, the finding that concerning the relationship between the health expenditure and suicide tends to have insufficient description as it was lacking of estimation attempting. Moreover, it was also due to the discrepancies used in the estimation methodology done by the previous researcher. Hence, this research take the initiative to investigate the relationship between health expenditure and suicide in order to derived a more accurate and precise result.

To study on the effect on suicide rate, many past studies have been done by investigating the association between unemployment to the suicide rate. These past studies prove that unemployment can be treated as an important indicator which might be a main cause of suicide rate. However, employment is used as a proxy instead of unemployment in order to identify whether there are association between employments to the suicide rate in this research. The reason for this research to use employment instead of unemployment is because the previous researchers stated that the suicide rate cannot be judge by the increase or decrease of the unemployment (Min et al., 2015). Besides that, some researchers also found that there are no other studies have used large sample size across the countries to investigate both the suicide rate together with the employment (Yoshimasu et al., 2008). This research focuses more on the employment especially for precarious employment due to the big possibility of suicide attempt may be easily arise from precarious workers compare to those non-precarious workers (Min et al., 2015).

On the other hand, previous researchers have done this related topic by carrying out thesis on different individual countries. Hence, this study aims to investigate whether the impact of relevant variables to suicide rate will remain identical when studying this topic among 31 countries. Besides, will it be resulting in different outcome when the study is done particularly in 26 developed countries or in 5 developing countries respectively during the period of 1960 to 2016?

Therefore, this study will further investigate on this relationship separately in developed and developing nations.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In Chapter 3, this study will discuss about the methodology used for this research. This study uses panel data. Hence, the panel data is used to investigate the relationship of the suicide rate with the independent variables of this research such as gross domestic product (GDP), happiness, education, employment, population and health expenditure. In this research, 5 developing countries have been selected and 26 developed countries (refer to Appendix 1) are selected to identify whether the suicide rate is affected by these variables after taking the development of the countries into account.

3.1 Empirical Model

Below is the panel regression model that is used to explain the effect of GDP, happiness, education, employment, population and health expenditure on the suicide rate in 31 countries. This can be expressed as below:

$$SR_{it} = f(GDP_{it}, HAP_{it}, EDU_{it}, EMP_{it}, POP_{it}, GHE_{it}) \quad (1)$$

The regression equation for the estimation of this study is as stated as the formulae below:

$$\widehat{LSR_{it}} = \hat{\beta}_0 + \hat{\beta}_1 LGDP_{it} + \hat{\beta}_2 LHAP_{it} + \hat{\beta}_3 LEDU_{it} + \hat{\beta}_4 LEMP_{it} + \hat{\beta}_5 LPOP_{it} + \hat{\beta}_6 LGHE_{it} + \mu_{it} \quad (2)$$

Where i stand for the counties and the t represents time. This combination makes it a panel regression model. SR_{it} represents the Suicide Rate, which is the endogenous variable of this study. For the exogenous variables, GDP_{it} stands for gross domestic product. In this study, the GDP is measured in constant 2010 US Dollar as a proxy for GDP. HAP_{it} represents happiness and the life ladder is used as a proxy to

describe happiness. EDU_{it} stands for education. School enrolment, tertiary (% gross) acts as the proxy for education. EMP_{it} represents employment rate and this study uses wage and salaried workers, total (% of total employment) as a proxy of employment. Besides that, $POP_{it}$is the total population. Finally, GHE_{it}represents the health expenditure. All the dependent and independent variables in the model will be transformed into logarithm form (L).

3.2 Hypothesis Development

Table 3.2: Description of Variables in 31 Countries.

Dependent Variable	**Abbreviation**	**Definition**	**Expected Sign**	**Source**
Suicide Rate	SR	Deaths performed by a person who is in full knowledge and expectation of its fatal outcome	-	OECD
Independent Variable	**Abbreviation**	**Definition**	**Expected Sign**	**Source**
Gross Domestic Product (constant 2010 US$)	GDP	Addition of all gross value in the economy and all the taxes of the products without taking any subsidies into account	Negative	WDI
Wage and salaried workers, total (% of total	EMP	Employees with regular working hours and receive salaries and wages regardless	Positive	WDI

employment)		of the revenue of the company		
Health Expenditure, Public (% of government expenditure)	GHE	The aggregate number of outlays made by the government that authorise it to purchase the health care's equipment, tools, systems, services as well as goods.	Negative	WDI
School enrolment, tertiary (% gross)	EDU	The ratio of total enrolment that is an indication of the percentage of secondary education level that successfully enrols into university.	Positive	WDI
Population, total	POP	The number of all residents regardless of legal status or citizenship in the world.	Positive	WDI
Happiness	HAP	Set of happiness score to determine happiness and life satisfaction which across the world.	Positive	World Happines Report

Remarks: GDP, EMP, GHE, EDU, POP data are obtained from World Development Indicator. HAP is obtained from World Happiness Report; SR is obtained from OECD.

3.3 Data

The set of statistic and data of this research was balanced panel data. The model in this study encompasses 244 observations which cover over 31 countries from the year of 1960 to 2016. By gathering all the relevant data and effective method, this research has considering both the endogenous variable (suicide rate) and exogenous variables (employment, health expenditure, population, happiness, gross domestic product and school enrolment). The data derived for suicide rate was measured in percentage which retrieved from Organization for Economic Co-operation and Development (OECD) statistic. On the other hand, the data of happiness was derived from the World Happiness Report and it was measured in scoring from 1 to 5 (weak to strong) by Diener and Dinner (2009). Based on Helliwell and Huang (2013), they use Cantril Ladder as the proxy of happiness. In this study, Cantril ladder will be used to proxy the happiness.

Continuation, the gross domestic product was measured in constant 2010 US dollar (US$) and it is obtained from World Development Indicators (WDI) while the employment (wage and salaried workers) was measured in percentage of the total employment and the data if this variable is also obtained from the WDI. In the same way, government health expenditure and school enrollment were gathered from WDI which were both measured in percentage. Indeed, the data set for population was measured in total amount of citizen and it was attained from WDI. The variables adopted in this research are demonstrated in Table 3.3.

3.4 Empirical Methodology

In this study, the methodologies used include Pooled Ordinary Least Square, Random Effect Model, Fixed Effect Model, Breusch-Pagan Lagrangian Multiplier test and Hausman test to study the impact of happiness, gross domestic product, education, population, health expenditure and employment on the suicide rate for 26 developed countries and 5 developing countries respectively, or 31 countries in total.

3.4.1 Pooled Ordinary Least Square: (POLS)

POLS is one of the primary methods that is used in this studies .Under this category of test the model must be fulfil five cores of assumptions (Greene, 2008). It must be linear in all the parameter. Besides that, the independent variables are not correlated with each other in the model. The model must be having constant variances (homoscedasticity) and also no multi-collinearity problem. The number of observation must not be randomly pick but must be constant in repeating sampling. Below shown was one of the examples while constructing this model:

$$y_{it} = \alpha + \beta x_{it} + u_{it} \quad (3)$$

Where i represents cross-sectional unit. t represents year while y_{it} represents the dependent variable. α is the constant intercept of the model. u_{it} represents the error term whereas β is the slope of parameters. x_{it} represents independent variable.

3.4.2 Breusch-Pagan Lagrangian Multiplier test: (BPLM test)

The BPLM test can test either for the heteroscedasticity test in a linear regression model or for selection of model between ordinary least square and random effect model. It also used to determine whether there are similar variances across the model. In this study the BPLM test was used for selection of model therefore after the test conducted will be able to identify the best model that best suit for this topic of study (Breusch & Pagan, 1980).

The statistical hypothesis is as below:

$$H_0: \sigma^2 v=0$$

$$H_1: \sigma^2 v\neq 0$$

Based on the research done by (Torres-Reyna, 2007), in order to explain the null hypothesis ($\sigma^2 v=0$), it indicates that the variances which across the model is zero which bring that there are no significant difference across countries. In case of that each proxy will have the same intercept and therefore pooled ordinary least

square is preferable otherwise reject null hypothesis and consider the model of random effect model.

3.4.3 Fixed Effect Model (FEM)

A fixed effect model (FEM) is a regression model which has group means which are not random. In the Fixed Effect Model, there is one assumption which states that there is only a true effect size shared by all the studies (Borenstein, Hedges, Higgins & Rothstein, 2010). Borenstein, Hedges and Rothstein (2007) also state that all the effect size is estimated to be same and therefore the weights assigned to all the studies are based entirely on the amount of information captured by that study. Therefore, small studies tend to be ignored. A FEM helps to control for unobserved heterogeneity to obtain consistent and efficient estimates of the parameters of the variables (Ashenfelter & Card, 2010). Heterogeneity is a problem which occurs when an explanatory variable to correlated with the error term. Since an individual specific effect is time invariant and it is considered a part of the intercept, individual effect is allowed to be correlated with other regressors. Hence, the assumption of Pooled OLS: disturbances are not correlated with any regressors, is not violated. The regression model of FEM is as followed:

$$Y_{it} = \alpha_i + X'_{it}\beta + U_{it} \quad \text{(fixed effect model)} \qquad (4)$$

3.4.4 Random Effect Model (REM)

A random effect model (REM) is a regression model which has group means with random sample from a population. There is a difference between Fixed Effect Model and Random Effect Model. According to the studies of Borenstein et.al. (2010), the true effect could be different across all studies in the REM. Borenstein, Hedges and Rothstein (2007) state that the mean of distribution of true effects is estimated in the REM. Hence, the weight in the REM is more balanced compared to FEM because there is different effect sizes in different studies and each of these effect sizes serve as a sample from the population whose mean wants to be

estimated (Borenstein, Hedges & Rothstein, 2007). A REM assumes individual effect to be not correlated with any regressors, and estimate error variance specific to group (or times). Hence, μ_{it} is an individual specific random heterogeneity or a component error term? The intercept and slope of regressors are the same. The difference among individuals (or time periods) lies in their individual specific errors, not their intercept. The regression model of REM is as followed:

$$Y_{it} = \beta_o + X'_{it}\beta + \alpha_i + U_{it} \text{ (random effect model)} \quad (5)$$

3.4.5 Hausman Test

According to O'Brien and Patacchini (2003), recognizing a distinction random effect and fixed effect model is known as hausman test. Similarly, hausman refer to statistical hypothesis test which assist in determining the consistency of an estimator in econometrics. Basically, hausman is applied as an attempt to compare and test the fixed and random effect model. O'Brien and Patacchini (2003) state the hausman statistic as shown below:

$$H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})'[VAR(\hat{\beta}_{FE}) - VAR(\hat{\beta}_{FE})]^{-1}(\hat{\beta}_{FE} - \hat{\beta}_{RE}) \quad (6)$$

Where $\hat{\beta}_{RE}$ represent the estimator from Random Effect Model and $\hat{\beta}_{FE}$ represent the estimator from Random Effect Model.

H_0: $Y_{it} = \beta_o + X'_{it}\beta + \alpha_i + U_{it}$ (random effect model)

H_1: $Y_{it} = \alpha_i + X'_{it}\beta + U_{it}$ (fixed effect model)

In fact, hausman test is also useful in term of identifying whether *Fixed Effect Model* or *Random Effect Model* is more preferred. In the case that there is no correlation between exogenous variable and the individual effect, it means that the fixed effect is inefficient (null hypothesis not rejected). On the other hand, random effect will be inconsistent and fixed effect is consistent when there is a correlation exists (null hypothesis rejected).

3.4.6 Wooldridge Test

Wooldridge (2002) indicate that this method is used to test for the autocorrelation in fixed effect as well as random effect of the linear panel data. This Wooldridge test is very attractive as it is readily to be applied, has simple interpretation and only few assumptions needed. Indeed, Wooldridge test for the autocorrelation is done in a one-way linear model which is illustrated below:

$$Y_{it} = \alpha + \beta_1 X_{it} + \beta_2 Z_i + \mu_i + \varepsilon_{it} \quad (7)$$

Where Y_{it} signify the endogenous variable, X_{it} and Z_i represent the vector of time-varying covariates and time-invariant covariates respectively. In the procedure of Wooldridge test, it initiates by estimating and predicting the parameter of β_1 by regressing the change of Y_{it} on change of X_i which eventually derive the residuals $\hat{e}_{it.}$ Further, in the event of uncorrelated of μ_i toward X_{it} and $Z_{i,,}$ the coefficient can be consistently estimated. On the other hand, the residuals derived from a regression which first-differencing the data was used in Wooldridge test as an attempt to terminate the individual effect indeed.

3.4.7 Fixed Effects Regression with Driscoll and Kraay Standard Error

The Driscoll and Kraay Standard Error is the robust standard errors which is proposed by Driscoll and Kraay (1998) that the nonparametric covariance matrix estimator which produces heteroscedasticity consistent standard errors that are robust to very general forms of spatial and temporal dependence (Hoechle, 2007). It used to estimate the panel regression by fixed effect regression. The error terms in this approach are assumed to be heteroscedastic, possibly to correlate to each other and autocorrelated due to some lag. So, these standard errors are robust to general form of cross sectional and temporal dependence when time dimension is huge. By using this approach, the respective fixed-effects estimator can be applied into two steps. At first, all of the model variables $c_{it} \in [a_{it}, b_{it}]$ are within transformed as below:

$$\ddot{\bar{C}}_{it}=c_{it}-\bar{c}_{it}+\hat{c} \quad (8)$$

$$\bar{c}_i = T_i^{-1}\sum_{t=t_i}^{T_i} c_{it} \quad (9)$$

$$\hat{c} = (\sum T_i)^{-1}\sum_i \sum_t c_{it} \quad (10)$$

The within-estimator corresponds with the OLS estimator known as:

$$\hat{a}_{it} = \hat{b}_{it}\,\theta + \varepsilon_{it} \quad (11)$$

After that, the second step will estimate the transformed regression model (11) by fixed effect model estimation with Driscoll and Kraay standard errors.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

Previous chapters have discussed about the methodology and data that were used to study the impact of happiness toward suicide rate. Hereinafter, this section introduces the panel regression model that applied in this study. After the model has been constructed, the results generated are able to determine the potential independent variable that might affect the tendency of suicidal behaviour.

4.1 Empirical Results

An empirical analysis has been tested by making estimation of the regression model which can help to determine whether the exogenous variable might be an important factor or not in affecting the suicide rate. In the following, the summarizations of descriptive statistic as well as correlation coefficient are illustrated in Table 4.1 (a) and Table 4.1 (b).

Table 4.1 (a) Summary of Descriptive Statistics and Correlation Analysis

Variables	Observation	Mean	Std. Dev.	Min	Max
LSR	295	2.5182	0.5141	0.9932	3.6988
LGDP	310	26.6020	1.6418	23.2626	30.4146
LHAP	274	1.8773	0.1395	1.5405	2.0818
LEDU	294	4.1685	0.2920	3.1407	4.5677
LEMP	310	4.3970	0.1461	3.8254	4.5384
LPOP	310	16.4446	1.5999	12.6006	19.5793
LGHE	310	2.6580	0.2764	1.6047	3.4212

where LSR is log of suicide rate, LGDP is log of gross domestic product, LHAP is log of happiness, LEDU is log of education, LEMP is log of employment, LPOP is log of population, and LGHE is log of government health expenditure.

Table 4.1 (b) Correlation coefficients

	LSR	LGDP	LHAP	LEDU	LEMP	LPOP	LGHE
LSR	1.0000						
LGDP	-0.2920	1.0000					
LHAP	-0.3328	0.3567	1.0000				
LEDU	0.4647	-0.1770	0.0319	1.0000			
LEMP	0.6472	-0.0437	0.0490	0.6114	1.0000		
LPOP	-0.3774	0.9036	0.0872	-0.4261	-0.3229	1.0000	
LGHE	0.0460	0.1878	0.4396	0.2927	0.1622	-0.0302	1.0000

where LSR is log of suicide rate, LGDP is log of gross domestic product, LHAP is log of happiness, LEDU is log of education, LEMP is log of employment, LPOP is log of population, and LGHE is log of government health expenditure.

4.1.1 Empirical Result in 31 Countries

The below empirical results of the estimators for POLS, REM, FEM and Driscoll-Kraay Standard Error (XTSCC) of the studies in 31 countries after running the regression are presented in Table 4.1.1.

Table 4.1.1: Results of POLS, REM, FEM and Driscoll-Kraay Standard Error in 31 countries

Variables	POLS	REM	FEM	Driscoll-Kraay Standard Error
LGDP	-0.131*	-0.208**	-0.420***	-0.420***
	(-1.91)	(-2.31)	(-3.40)	[-4.38]
LHAP	-1.151***	-0.0498	0.0609	0.0609
	(-4.44)	(-0.34)	(0.42)	[0.49]
LEDU	0.119	0.103**	0.0609	0.0609
	(1.11)	(2.06)	(0.99)	[1.24]
LEMP	2.432***	0.996***	0.627***	0.627***
	(9.94)	(4.29)	(2.64)	[5.57]
LPOP	0.0905	0.131	0.729***	0.729***
	(1.23)	(1.35)	(2.91)	[7.15]
LGHE	0.256***	-0.0255	-0.0141	-0.0141

	(2.73)	(-0.41)	(-0.22)	[-0.60]
Constant	-5.172*** (-5.01)	1.233 (0.88)	-1.420 (-0.36)	-1.420 [-0.46]
BPLM Test	653.16***			
Hausman Test		25.96***		
Wooldridge Test			9.299***	
Observation	244	244	244	244
Countries	31	31	31	31

Notes: LGDP is log of gross domestic product, LHAP is log of happiness, LEDU is log of education, LEMP is log of employment, LPOP is log of population, and LGHE is log of government health expenditure. Figures in the parentheses (.) are t-statistic the figures in the bracket [.] is Driscoll-Kraay standard error. Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% respectively.

After running the Driscoll-Kraay Standard Error test in overall, the gross domestic product (LGDP), the employment (LEMP), and the population (LPOP) are significant at the level of significance of 1%. Meanwhile, for the happiness (LHAP), the education (LEDU), and the health expenditure (LGHE), these variables are insignificant after the test has been carried out.

The value of estimator of the gross domestic product is -0.42, which represent that the gross domestic product has a negative relationship with the suicide rate. The result derived from the test indicate that if the gross domestic product increase by 1%, on average, the suicide rate will decrease by 0.42% by holding all other variables constant (ceteris paribus). Besides, the estimator value of happiness is 0.061 which showed that the happiness has positive relationship with the suicide rate. The increase of 1% of happiness, on average, suicide rate will experience an increment by 0.061% by holding all other variable constant (ceteris paribus).

Moreover, the value of estimator of the education is 0.061, which means that the education has a positive relationship with suicide rates. When the education increased by 1%, on average, the suicide rates will consequently increase by 0.061% by holding all other valuables constant (ceteris paribus). The interpretation for education point out that suicide rates would increase when the school enrolment increase. On the top of that, the value of estimator of the employment is 0.627 which

shows that the employment has a positive relationship with the suicide rate. In fact, when the employment increase by 1%, on average, the rate of suicide will rises by 0.627% by holding all other variables constant. On the other hand, the value of estimator of the population is 0.729 which shows that the population has a positive relationship with the suicide rate. When the population increased by 1%, on average, the suicide rates will increase by 0.729% by holding all other valuables constant (ceteris paribus). It means that the population has a positive relationship with suicide rates. Next, the result for estimated value that derived from the test is -0.014 which indicates that when government health expenditure rise by 1%, on average, the suicide rate decrease by 0.014% by holding other variables constant. It means that the suicide rate will decrease if the government health expenditure rises and hence they have a negative relationship.

Finally, the relationship between the suicide rate with other independent variables including the happiness, the education, and the government health expenditure is not significant. In the process of selection of model, BPLM test was carried out in order to select the best model for the research. The result that generate from the Stata shows that null hypothesis was rejected. The hypothesis is as shown below:

$$H_0: \sigma^2 v = 0$$
$$H_1: \sigma^2 v \neq 0$$

The probability of this result is 0.000. Since P-value is smaller than 0.05 significant levels, therefore this research considers that Pooled Ordinary Least Square Model is not the best model. In order to proceed to the research, a test called Hausman Test was carried out to test whether Random Effect Model (REM) or Fixed Effect Model (FEM) is more suitable for this topic of study. The hypothesis is as shown below:

$$H_0: Y_{it} = \beta_o + X'_{it}\beta + \alpha_i + U_{it} \text{ (random effect model)}$$
$$H_1: Y_{it} = \alpha_i + X'_{it}\beta + U_{it} \text{ (fixed effect model)}$$

According to the result, it shows H_0 was rejected. Hence, FEM is the more preferable model in this research. FEM was then modified into robust version in order to have a more consistent and preferable set of result.

4.1.2 Empirical Result in 26 Developed Countries

The below empirical results of the estimators for POLS, REM, FEM and Driscoll-Kraay Standard Error (XTSCC) after running the regression are presented in Table 4.1.2.

Table 4.1.2: Results of POLS, REM, FEM and Driscoll-Kraay Standard Error in 26 Developed Countries

Variables	**POLS**	**REM**	**FEM**	**Driscoll-Kraay Standard Error**
LGDP	-0.184*	-0.357***	-0.342**	-0.342***
	(-1.86)	(-2.96)	(-2.19)	[-2.97]
LHAP	-1.234***	0.137	0.0271	0.0271
	(-3.57)	(0.76)	(0.15)	[0.15]
LEDU	0.146	0.0932	0.0459	0.0459
	(0.99)	(1.55)	(0.65)	[0.80]
LEMP	3.327***	1.799***	0.561	0.561
	(10.05)	(3.59)	(0.93)	[1.12]
LPOP	0.104	0.299**	0.595**	0.595***
	(0.98)	(2.18)	(2.02)	[3.52]
LGHE	0.673***	-0.00891	-0.0684	-0.0684
	(4.09)	(-0.11)	(-0.83)	[-1.50]
Constant	-9.041***	-1.408	-0.533	-0.533
	(-6.01)	(-0.64)	(-0.11)	[-0.12]
BPLM Test	646.00***			
Hausman Test		20.07***		
Wooldridge Test			7.731***	
Observation	206	206	206	206
Countries	26	26	26	26

Notes: LGDP is log of gross domestic product, LHAP is log of happiness, LEDU is log of education, LEMP is log of employment, LPOP is log of population, and LGHE is log of government health expenditure. Figures in the parentheses (.) are t-statistic the figures in the bracket [.] is Driscoll-Kraay standard error. Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% respectively.

After running the Driscoll-Kraay Standard Error test in overall, the gross domestic product (LGDP) and the population (LPOP) are significant at the level of significance of 1%. Meanwhile, for the happiness (LHAP), the education (LEDU), the employment (LEMP), and the health expenditure (LGHE), these variables are insignificant.

The value of estimator of the gross domestic product is -0.342, which represent that the gross domestic product has a negative relationship with the suicide rate. The result derived from the test indicate that if the gross domestic product increase by 1%, on average, the suicide rate will decrease by 0.342% by holding all other variables constant (ceteris paribus). Besides, the estimator value of the happiness is 0.027 which showed that the happiness has negative relationship with the suicide rate. The increase of 1% of life ladder, on average, suicide rate will experience an increment by 0.027% by holding all other variable constant (ceteris paribus).

Moreover, the results showed the value of estimator of the education is 0.046, which means that the education has a positive relationship with suicide rates. When the education increased by 1% on average, the suicide rates will increase by 0.046% by holding all other valuables constant (ceteris paribus). The interpretation for the education point out that suicide rates would increase when the education increase. On the top of that, the result for estimated value of the employment is 0.561 which show that the employment has a positive relationship with the suicide rate. In fact, when the employment increase by 1%, on average, the rate of suicide will rises by 0.561% by holding all other variables constant.

On the other hand, the results showed the value of estimator of the population is 0.595, which means that the population has a positive relationship with suicide rates. When the population increased by 1%, on average, the suicide rates will increase by 0.595% by holding all other valuables constant (ceteris paribus). Next, the result for estimated value of the government health expenditure that derived from the test is -0.068 which indicates that when the government health expenditure rise by 1%, on average, the suicide rate decrease by 0.068% by holding other variables constant. It means that the suicide rate will decrease if the government health expenditure rises and hence they have a negative relationship.

The robustness test was carried out for these 26 developed countries after considering the best model in order to show the consistency between the best models. The consistency of the different test can be used to strengthen explanation between variable.

4.1.3 Empirical Result in 5 Developing Countries

The below table shows the empirical results of the estimators for 5 developing countries after running the regression are presented in Table 4.1.3.

Table 4.1.3: Result of POLS, POLS Robust and Driscoll-Kraay Standard Error in 5 developing countries

Variables	**POLS**	**POLS robust**	**Driscoll-Kraay Standard Error**
LGDP	-0.860***	-0.860***	-0.860*
	(-2.91)	(-2.91)	[-2.26]
LHAP	-1.377***	-1.377***	-1.377**
	(-3.37)	(-3.37)	[-3.54]
LEDU	0.614***	0.614***	0.614***
	(7.41)	(7.41)	[17.22]
LEMP	1.709***	1.709***	1.709***
	(7.75)	(7.75)	[6.73]
LPOP	0.969***	0.969***	0.969*
	(3.06)	(3.06)	[2.38]
LGHE	0.0216	0.0216	0.0216
	(0.25)	(0.25)	[0.35]
Constant	1.017	1.017	1.017
	(0.71)	(0.71)	[0.63]
BPLM Test		POLS Preferable	
Observation	38	38	38
Countries	5	5	5

Notes: LGDP is log of gross domestic product, LHAP is log of happiness, LEDU is log of education, LEMP is log of employment, LPOP is log of population, and LGHE is log of government health expenditure. Figures in the parentheses (.) are t-statistic the figures in the bracket [.] is Driscoll-Kraay standard error. Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% respectively.

After the result have generate based of the developing countries, the BPLM test shows that do not reject the H_0 which means the research done on the developing countries are OLS preferable. Therefore, the research of this studies in developing countries which just concern on POLS model. The education (LEDU) and the employment (LEMP) are significant at the level of significance of 1%; the happiness (LHAP) is significant at the level of significance of 5%; the gross domestic product (LGDP) and the population (LPOP) are significant at the level of significance of 10%. Meanwhile, the health expenditure (LGHE) is insignificant.

The result shows that if the GDP increases by 1% on average, the suicide rate will decrease by 0.860%, ceteris paribus. This shows that the GDP of a nation has a negative relationship with its suicide rate. This can be supported by the research done by Rancans et al. (2001) which states that the suicide rate will rises on account of poor economic condition that leads to the decline of GDP. Additionally, Granados (2005) also proves that there is a negative association between GDP and suicide rate. For instance, Rancans et al. (2001) stated that the increase in unemployment rate is caused by the decline in GDP and this is a chain reaction because the rising unemployment rate will cause the people to suffer from the vulnerable change in their life sue to poor economic condition. Subsequently, the failing of which will contribute to the rising suicide rate due to lack of social support.

Besides that, when happiness rises by 1%, on average, suicide rate will decrease by 1.377%, ceteris paribus. The result shows a negatively effects between suicide rate and happiness. The result was consistent with the previous research of Mahanta and Aggarwal (2013) and Kim and Kim (2007). After the research on 26 developed countries and 5 developing countries, the result showed happiness is significant in 5 developing countries but not 26 developed countries. Due to disproportion of data, the insignificance of happiness in 26 developed countries brings huge impact to determine the significance of overall countries. So, the insignificant relationship of happiness in developed countries is being determined in

this research. Based on University of Warwick (2011), the result indicates that the higher happiness will bring higher suicide rate because of the people are trying to compare with each other at all time and create stress in United States. Besides, the result showed that the people who fill with resentful in higher happiness place will feel toughly in their life. Moreover, University of Warwick (2011) proofed that unemployment is one of the factor that increase the suicide rate in higher happiness place.

On the other hand, the education has a positive association with the suicide rate. This indicates that whenever the school enrolment increases by 1%, on average, the suicide rate will increase by 0.614%, ceteris paribus. Pompili et al. (2012) concludes that higher education was correlated with higher risk of completed suicide, because education may be a proxy of high expectation in certain domains such as a person's career achievement, life quality and satisfaction or certain psychological needs. In addition, there is a positive relationship between employment and suicide rate. This can be proven by the results which show that whenever there is an increase of 1% in employment, on average, it will result in a 1.709% increase in suicide rate. The research done by Chen, Choi, Mori, Sawada and Sugano (2012) shows that there is a positive relationship between the employment rate and suicide rate while the gap between a husband to wife is wide. Based on the analysis done by Pegula (2004), proves that mostly of the victim that commit to suicide which normally are professional workers. The reason for this because the mostly of the professional workers will take full responsibilities when they tend to perform well in certain job task in a given period of time without consider the level of dangerous Waitzkin (1998). Therefore, when those workers tend to complete job task in time they will be stressful and commit suicide easily.

Furthermore, for the relationship between population and suicide rate, there is a positive association. When the population increases by 1% on average, the suicide rate will also increase by 0.969%, ceteris paribus. This relationship is supported by the study of Wilkinson and Israel (1984); Saunderson, Haynes and Langford (1998); Morrell, Taylor, Slaytor and Ford (1999); Dudley, Kelk, Florio, Howard and Waters (1998), which stated that the suicide mortality among the individuals in the rural areas are much higher compare to the urban areas. Rural areas experience higher suicide rate due to physical, social isolation and also lack of

social interaction. Other than that, social instability and disruption may occur owing to changes in demographic structure and industrial activities, leading to the rising suicide rate in rural areas.

Moreover, when the health expenditure increases by 1%, on average, the suicide rate will also increase by 0.022%. This indicates that there is a positive relationship between health expenditure and suicide rate. However, the result shows that the government health expenditure is an insignificant variable.

Among these three models, POLS is considered the best model for the developing countries. The decision of the model is solely based on the BPLM test that is carried out in the beginning of the test which is used to select between POLS and REM. Among all the tests that have been carried out based on three categories of country which is developed, developing and in overall countries, the model of developing countries would be the best for this topic of research. This is because this model has the most number of significant variables which will make the interpretation of this study more precise. Hence, the outcome of this study encourages more researchers to carry out investigations on the correlation between psychological and economic variables in order to derive more results for further research.

CHAPTER 5 : CONCLUSION

5.0 Recommendation

The topic of rising suicide rate has become one of the main subjects of debates among policy makers as it has caused major economic loss for the world. According to Tavernise (2016), 13 people die from suicide in every 100,000 people. Hence, policy makers have to propose some ways to reduce the impact of suicide rate. At first, they need to pay attention to what factors that will cause the rising suicide rate. Therefore, this study shows what the main causes that will contribute to the suicide rate are.

In all empirical result in Table 4.1.1, 4.1.2, and 4.1.3, it shows that the gross domestic product is a very important and significant variable which will impact the suicide rate in different categories of countries. The government and policy makers should always be concerned about the economy and gross domestic product. The government should implement some policies that will stimulate the economic growth of the nation to improve the lifestyle and standard of living of the people. When the standard of living of people improves, the people will be more satisfied with their life. As a consequence, this will reduce the probability of the people to end their life.

Based on Table 4.1.3, the education acts as an important variable that will influence the suicide rate in the developing countries. The education ministry and education should work together in order to promote the suicide prevention through their syllabus of study. For example, campaigns and speeches about the importance of suicide prevention can be organised in primary and secondary education. Subjects like Morale Education which stress on the importance of life can also be included. This is vital because when the awareness about how valuable about own life is implanted in the students since small, this will help to reduce the likelihood for them to end their life.

The big companies and also big firms who act as the employers also act as a very important role which will consequently affect the suicide rate. As shown in the result generated through Stata, the employment serves as a significant variable in 31 overall countries and 5 developing countries. Big companies should provide psychosocial support to the employees in order to prevent them from suffering from mental breakdown which may eventually cause them to have suicidal ideation. Besides, the employers should also provide trainings and educations to the employees. This is step to prepare them ahead of the tough challenges ahead and also the changing working environment and culture. When the employees are more self-prepared mentally and physically, they will have a higher chance to counter all those challenges faced. As a result, these are suggestions for employers to reduce the suicide rate among the employees.

As studies showed in Table 4.1.2 empirical result in 26 developed countries, the people should take more care of their surroundings to make sure they can provide help and assist those people whom need to help. The people should raise their awareness to make sure they can always observe the depression found in the surroundings. Besides, the people should be educated since small and in a proper way to have positive thinking mind so that they can reduce their suicide attempt and they can even face the problem when something bad happened on them.

5.1 Limitation

5.1.1 Difficulties in selecting method for running data

In this topic of research, there are some difficulties when arranging those collected data that is required by this topic of research. Instead of running the data independently based on time series or cross sectional, this study concerns to study over the worldwide. Therefore, this study combines those two methods and applies panel data. In case of using the wrong method for this topic of research, there are few circumstances that should be concerned. For example, time-series data could be

applied across the countries which could be more specific because each country may have independent characteristics. However, it was time consuming if the research intends to study over the worldwide. Meanwhile, there must be some disadvantages while using panel data. Although study can be done over the worldwide, there are some inconsistency in data which makes it difficult when making comparison over the countries. The variable that acts as a proxy for this topic of research might be omitted in some of the years for each country and result in exist a small sample size in making the comparison.

5.1.2 Least researchers have done the related studies over the world

Under those circumstances, this study consist some limitation. First, this research was typically tended to have lacking of some important and reliable data in estimating the regression model which cover over the worldwide. Mostly of the researchers done the research were solely based on their home country instead of the worldwide. Therefore, the availability of the data that used to illustrate the global suicide rate was totally weak. Subsequently, it will narrow down the scope of this research, increase the hindrance in the process and enhance the inconsistency and differential in the previous research's result. In that case, the limitation of some reliable data and support basically believed to be occurring in the situation whereas majority of the prior researchers had done the study for their individual country only instead of all countries. In other word, it tends to have limited researchers that study on the discussed topic at the global level. In that case, this investigation tends to be difficult in obtaining a reliable data and support in attempt to run the test for the whole world. Hence, this situation has led to the separation of the countries into two categories which were developing countries and developed countries. Then, this study has summarise and decided to use 5 developing countries and 26 developed countries. By doing this, it may help this study to minimize the significant obstacles in searching a meaningful result.

5.1.3 Ecological inference fallacy

This research used cross sectional data to determine and interpret the result and this will cause the result easily affected to ecological inference fallacy. According to Robinson (1950), there will be an inaccurate in the interpretation of the data when the data collected for the group of which those individuals belong used to determine the specific individuals. As this research, the data collected for particular countries. It will be a problem while determining the result of other categories since it is used to determine the developed, developing or both countries.

5.2 Conclusion

In this study, the relationship of happiness, employment, gross domestic product (GDP), education, health expenditure and population towards suicide rate is investigated in 31 countries which are 26 developed countries and 5 developing countries using panel data regression model from 1960 to 2015. This study intends to study much on the impact of psychological factor such as happiness on the suicide rate as an answer to the paradox on "country with higher happiness level tends to have higher suicide rate" (Daly, Oswald, Wilson & Wu, 2011).

Surprisingly, based on the result it can be concluded that the happiness in developing countries will significantly impact and influence the suicide rate indeed. It is important to realize that the happiness is negatively affect the suicide rate in developing countries which means that increase in the happiness will subsequently lower down the suicide rate. Moreover, other economic factors such as employment, gross domestic product, government health expenditure, education and population are also included in this study to carry out their impact towards the suicide rate.

This study has been using Stata 12 software in order to conduct the estimation of the result by performing the statistical and econometric analysis. The data for this study is obtained from World Happiness Report, Organization for Economic Co-operation and Development, and the World Development Indicators. On the other hand, the result shows that the gross domestic product and happiness

have a negative relationship with the suicide rate. Furthermore, the education, health expenditure, population and employment have positive sign with the suicide rate. Hence, it is important for the government, society as well as policymaker to take initiative to enhance the happiness in order to reduce the suicide rate effectively and efficiently.

This study aims to redound to the advantages of the society by considering the importance of factors that lead to suicide which subsequently will contribute to the society and even the government in term of aiding in determining the vital proxy that will affect and influence the overall suicide rate. Panel data analysis was used to test the significant level of these factors towards suicide rate. In this study, some of the recommendation for social media, education and government were given as an attempt to reduce and overcome the suicidal issues.

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Appendix 1: Countries

Developed Countries	**Developing Countries**
Australia	Brazil
Austria	Colombia
Belgium	Costa Rica
Chile	Mexico
Czech Republic	Russian Federation
Denmark	
Estonia	
Finland	
France	
Greece	
Hungary	
Iceland	
Ireland	
Israel	
Japan	
Latvia	
Lithuania	
Netherlands	
New Zealand	
Norway	
Slovenia	
Spain	
Sweden	
Turkey	
United Kingdom	
United States	

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 2: Descriptive Analysis in 31 Countries

Variable	Obs	Mean	Std. Dev.	Min	Max
ly	295	2.518171	.5141211	.9932518	3.69883
lx54	310	26.60204	1.641782	23.26258	30.41464
lx29	274	1.877312	.1395118	1.54051	2.081805
lx19	294	4.168485	.2920385	3.140713	4.567701
lx13	310	4.396985	.1460942	3.825375	4.538389
lx8	310	16.44455	1.59991	12.60059	19.57933
lx66	310	2.658021	.2763894	1.604704	3.421241

Appendix 3: Correlation Coefficient in 31 Countries

	ly	lx54	lx29	lx19	lx13	lx8	lx66
ly	1.0000						
lx54	-0.2920	1.0000					
lx29	-0.3328	0.3567	1.0000				
lx19	0.4647	-0.1770	0.0319	1.0000			
lx13	0.6472	-0.0437	0.0490	0.6114	1.0000		
lx8	-0.3774	0.9036	0.0872	-0.4261	-0.3229	1.0000	
lx66	0.0460	0.1878	0.4396	0.2927	0.1622	-0.0302	1.0000

Appendix 4: POLS Test in 31 Countries

Source	SS	df	MS		
Model	37.8773111	6	6.31288518	Number of obs	= 244
Residual	26.3683349	237	.111258797	F(6, 237)	= 56.74
Total	64.2456459	243	.264385374	Prob > F	= 0.0000
				R-squared	= 0.5896
				Adj R-squared	= 0.5792
				Root MSE	= .33355

ly	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lx54	-.1313358	.0687009	-1.91	0.057	-.2666781	.0040066
lx29	-1.150723	.2592824	-4.44	0.000	-1.661516	-.6399303
lx19	.1185742	.1073055	1.11	0.270	-.0928201	.3299686
lx13	2.432334	.2446589	9.94	0.000	1.95035	2.914318
lx8	.0905006	.0734255	1.23	0.219	-.0541493	.2351505
lx66	.2559833	.0936864	2.73	0.007	.0714189	.4405477
_cons	-5.172265	1.032823	-5.01	0.000	-7.20695	-3.137579

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 5: REM Test in 31 Countries

```
Random-effects GLS regression                   Number of obs      =       244
Group variable: code                            Number of groups   =        31

R-sq:  within  = 0.0642                         Obs per group: min =         2
       between = 0.3869                                        avg =       7.9
       overall = 0.3859                                        max =        10

                                                Wald chi2(6)       =     31.28
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
          ly |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.2083653   .0901983    -2.31   0.021    -.3851507   -.0315798
        lx29 |   -.049754   .1450828    -0.34   0.732    -.3341111     .234603
        lx19 |   .1030354   .0501323     2.06   0.040      .004778    .2012928
        lx13 |   .9959367   .2322573     4.29   0.000     .5407207    1.451153
         lx8 |   .1311209    .096962     1.35   0.176    -.0589212     .321163
        lx66 |  -.0254552   .0628497    -0.41   0.685    -.1486384     .097728
       _cons |   1.232572   1.396097     0.88   0.377    -1.503727    3.968872
-------------+----------------------------------------------------------------
     sigma_u |  .37484989
     sigma_e |   .0656544
         rho |  .97023607   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix 6: FEM Test in 31 Countries

```
Fixed-effects (within) regression               Number of obs      =       244
Group variable: code                            Number of groups   =        31

R-sq:  within  = 0.1020                         Obs per group: min =         2
       between = 0.0604                                        avg =       7.9
       overall = 0.0936                                        max =        10

                                                F(6,207)           =      3.92
corr(u_i, Xb)  = -0.8141                        Prob > F           =    0.0010

------------------------------------------------------------------------------
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.4203952   .1237203    -3.40   0.001    -.6643085   -.1764819
        lx29 |   .0608953   .1440437     0.42   0.673    -.2230855    .3448761
        lx19 |   .0609415   .0614611     0.99   0.323    -.0602286    .1821115
        lx13 |   .6270628   .2375444     2.64   0.009     .1587463    1.095379
         lx8 |    .729378   .2504981     2.91   0.004     .2355234    1.223233
        lx66 |  -.0141475   .0636914    -0.22   0.824    -.1397146    .1114195
       _cons |  -1.419988   3.899812    -0.36   0.716     -9.10843    6.268453
-------------+----------------------------------------------------------------
     sigma_u |  .88168783
     sigma_e |   .0656544
         rho |  .99448562   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(30, 207) =   197.01             Prob > F = 0.0000
```

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 7: Driscoll-Kraay Standard Error in 31 Countries

```
Regression with Driscoll-Kraay standard errors   Number of obs     =       244
Method: Fixed-effects regression                 Number of groups  =        31
Group variable (i): code                         F(  6,    30)     =     31.63
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.1020

------------------------------------------------------------------------------
             |             Drisc/Kraay
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.4203995   .0960788    -4.38   0.000    -.6166186   -.2241803
        lx29 |   .0608986   .1242257     0.49   0.628     -.192804    .3146012
        lx19 |   .0609399   .0493383     1.24   0.226    -.0398223    .1617022
        lx13 |    .627046   .1124807     5.57   0.000     .3973297    .8567623
         lx8 |   .7293837   .1019554     7.15   0.000      .521163    .9376044
        lx66 |  -.0141445   .0237109    -0.60   0.555    -.0625687    .0342797
       _cons |    -1.4199   3.100309    -0.46   0.650    -7.751577    4.911776
------------------------------------------------------------------------------
```

Appendix 8: BPLM Test in 31 Countries

```
Breusch and Pagan Lagrangian multiplier test for random effects

        ly[code,t] = Xb + u[code] + e[code,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                      ly |   .2643854       .5141842
                       e |   .0043105       .0656544
                       u |   .1405124       .3748499

        Test:   Var(u) = 0
                                 chibar2(01) =   653.16
                              Prob > chibar2 =   0.0000
```

Appendix 9: Serial Correlation in 31 Countries

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      29) =      9.299
           Prob > F =      0.0049
```

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 10: Hausman Test in 31 Countries

```
                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
        lx54 |   -.4203952    -.2083653       -.2120299         .092836
        lx29 |    .0608953     -.049754        .1106493        .0407648
        lx19 |    .0609415     .1030354       -.0420939        .0402674
        lx13 |    .6270628     .9959367       -.3688739        .0884318
         lx8 |     .729378     .1311209        .5982571        .2434787
        lx66 |   -.0141475    -.0254552        .0113077        .0221391
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       25.96
                Prob>chi2 =      0.0002
```

Appendix 11: POLS Test in 26 Developed Countries

```
      Source |       SS       df       MS              Number of obs =     206
-------------+------------------------------           F(  6,   199) =   37.01
       Model |  23.4619269     6  3.91032116           Prob > F      =  0.0000
    Residual |  21.0256864   199  .105656715           R-squared     =  0.5274
-------------+------------------------------           Adj R-squared =  0.5131
       Total |  44.4876133   205  .217012748           Root MSE      =  .32505

------------------------------------------------------------------------------
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.1844999   .0994202    -1.86   0.065    -.3805523    .0115524
        lx29 |  -1.233671   .3454406    -3.57   0.000    -1.914865   -.5524772
        lx19 |   .1457218   .1466189     0.99   0.321    -.1434043    .4348478
        lx13 |   3.326958   .3309173    10.05   0.000     2.674404    3.979513
         lx8 |   .1042424    .105921     0.98   0.326    -.1046292    .3131141
        lx66 |   .6729003   .1646666     4.09   0.000      .348185    .9976156
       _cons |  -9.040836    1.50499    -6.01   0.000    -12.00861   -6.073062
------------------------------------------------------------------------------
```

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 12: REM Test in 26 Developed Countries

```
Random-effects GLS regression                   Number of obs      =       206
Group variable: code                            Number of groups   =        26

R-sq:  within  = 0.0319                         Obs per group: min =         2
       between = 0.4441                                        avg =       7.9
       overall = 0.3467                                        max =        10

                                                Wald chi2(6)       =     24.35
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0004

------------------------------------------------------------------------------
          ly |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.3566384   .1206282    -2.96   0.003    -.5930654   -.1202114
        lx29 |   .1367181   .1789432     0.76   0.445    -.2140041    .4874403
        lx19 |   .0931591   .0602355     1.55   0.122    -.0249003    .2112185
        lx13 |   1.799389   .5013331     3.59   0.000     .8167943    2.781984
         lx8 |   .2985931   .1368185     2.18   0.029     .0304337    .5667524
        lx66 |  -.0089147   .0800137    -0.11   0.911    -.1657386    .1479092
       _cons |  -1.408405   2.216959    -0.64   0.525    -5.753565    2.936756
-------------+----------------------------------------------------------------
     sigma_u |  .34633217
     sigma_e |  .06713193
         rho |  .96378787   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix 13: FEM Test in 26 Developed Countries

```
Fixed-effects (within) regression               Number of obs      =       206
Group variable: code                            Number of groups   =        26

R-sq:  within  = 0.0637                         Obs per group: min =         2
       between = 0.0382                                        avg =       7.9
       overall = 0.0235                                        max =        10

                                                F(6,174)           =      1.97
corr(u_i, Xb)  = -0.6673                        Prob > F           =    0.0721

------------------------------------------------------------------------------
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.3415358   .1558419    -2.19   0.030    -.6491197   -.0339519
        lx29 |   .0271155   .1844725     0.15   0.883    -.3369763    .3912072
        lx19 |   .0459302   .0705828     0.65   0.516    -.0933785    .1852389
        lx13 |   .5612703   .6008184     0.93   0.352    -.6245598      1.7471
         lx8 |   .5947325   .2943983     2.02   0.045      .013681    1.175784
        lx66 |  -.0684467   .0824067    -0.83   0.407    -.2310921    .0941986
       _cons |  -.5333557   4.813705    -0.11   0.912    -10.03412    8.967412
-------------+----------------------------------------------------------------
     sigma_u |  .70259528
     sigma_e |  .06713193
         rho |  .99095308   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(25, 174) =   179.66             Prob > F = 0.0000
```

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 14: Driscoll-Kraay Standard Error in 26 Developed Countries

```
Regression with Driscoll-Kraay standard errors   Number of obs     =       206
Method: Fixed-effects regression                 Number of groups  =        26
Group variable (i): code                         F(  6,    25)     =      9.08
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.0637

------------------------------------------------------------------------------
             |             Drisc/Kraay
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.3415358   .1149732    -2.97   0.006    -.5783276   -.1047441
        lx29 |   .0271155    .180122     0.15   0.882    -.3438526    .3980836
        lx19 |   .0459302   .0575366     0.80   0.432    -.0725686    .1644289
        lx13 |   .5612703   .4989175     1.12   0.271    -.4662696     1.58881
         lx8 |   .5947325   .1688261     3.52   0.002     .2470288    .9424363
        lx66 |  -.0684467   .0456805    -1.50   0.147    -.1625275    .0256341
       _cons |  -.5333557   4.398398    -0.12   0.904    -9.592026    8.525315
------------------------------------------------------------------------------
```

Appendix 15: BPLM Test in 26 Developed Countries

```
Breusch and Pagan Lagrangian multiplier test for random effects

        ly[code,t] = Xb + u[code] + e[code,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                      ly |   .2170127       .4658463
                       e |   .0045067       .0671319
                       u |    .119946       .3463322

        Test:   Var(u) = 0
                             chibar2(01) =   646.00
                          Prob > chibar2 =   0.0000
```

Appendix 16: Serial Correlation in 26 Developed Countries

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      24) =      7.731
           Prob > F =      0.0104
```

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 17: Hausman Test in 26 Developed Countries

```
                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
        lx54 |   -.3415358    -.3566384        .0151025        .1079242
        lx29 |    .0271155     .1367181       -.1096026        .0684735
        lx19 |    .0459302     .0931591       -.0472289        .0417834
        lx13 |    .5612703     1.799389       -1.238119        .3715751
         lx8 |    .5947325     .2985931        .2961395        .2734495
        lx66 |   -.0684467    -.0089147        -.059532        .0303861
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       20.07
                Prob>chi2 =      0.0027
```

Appendix 18: POLS Test in 5 Developing Countries

```
      Source |       SS       df       MS              Number of obs =      38
-------------+------------------------------           F(  6,    31) =  204.06
       Model |  10.1758795     6  1.69597992           Prob > F      =  0.0000
    Residual |  .257646722    31  .008311185           R-squared     =  0.9753
-------------+------------------------------           Adj R-squared =  0.9705
       Total |  10.4335262    37  .281987195           Root MSE      =  .09117

------------------------------------------------------------------------------
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.8599239    .295392    -2.91   0.007     -1.46238    -.257468
        lx29 |  -1.376867   .4082373    -3.37   0.002    -2.209473   -.5442615
        lx19 |   .6135789    .082749     7.41   0.000     .4448111    .7823467
        lx13 |   1.708836   .2204645     7.75   0.000     1.259196    2.158477
         lx8 |   .9686159   .3161654     3.06   0.004     .3237923    1.613439
        lx66 |    .021645   .0857123     0.25   0.802    -.1531665    .1964565
       _cons |    1.01684   1.429897     0.71   0.482    -1.899454    3.933134
------------------------------------------------------------------------------
```

where ly = LSR, lx54 = LGDP, lx29 = LHAP, lx19 = LEDU, lx13 = LEMP, lx8 = LPOP, lx66 = LGHE

Appendix 19: POLS Robust Test in 5 Developing Countries

```
Linear regression                                       Number of obs =      38
                                                        F(  6,    31) =  177.00
                                                        Prob > F      =  0.0000
                                                        R-squared     =  0.9753
                                                        Root MSE      =  .09117

------------------------------------------------------------------------------
             |               Robust
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.8599239   .4402158    -1.95   0.060     -1.75775    .0379021
        lx29 |  -1.376867   .4293709    -3.21   0.003    -2.252575   -.5011592
        lx19 |   .6135789   .0673638     9.11   0.000     .4761894    .7509684
        lx13 |   1.708836   .2933692     5.82   0.000     1.110506    2.307167
         lx8 |   .9686159   .4620495     2.10   0.044     .0262598    1.910972
        lx66 |    .021645   .1044018     0.21   0.837    -.1912839    .2345739
       _cons |    1.01684    2.20312     0.46   0.648    -3.476452    5.510133
------------------------------------------------------------------------------
```

Appendix 20: Driscoll-Kraay Standard Error in 5 Developing Countries

```
Regression with Driscoll-Kraay standard errors   Number of obs     =        38
Method: Pooled OLS                               Number of groups  =         5
Group variable (i): code                         F(  6,     4)     =   5962.82
maximum lag: 2                                   Prob > F          =    0.0000
                                                 R-squared         =    0.9753
                                                 Root MSE          =    0.0912

------------------------------------------------------------------------------
             |             Drisc/Kraay
          ly |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lx54 |  -.8599239   .3801876    -2.26   0.087    -1.915494    .1956461
        lx29 |  -1.376867   .3890257    -3.54   0.024    -2.456976   -.2967585
        lx19 |   .6135789   .0356325    17.22   0.000     .5146471    .7125107
        lx13 |   1.708836    .253907     6.73   0.003     1.003877    2.413795
         lx8 |   .9686159   .4063977     2.38   0.076    -.1597251    2.096957
        lx66 |    .021645   .0625793     0.35   0.747     -.152103    .1953929
       _cons |    1.01684    1.61747     0.63   0.564    -3.473976    5.507656
------------------------------------------------------------------------------
```

Appendix 21: BPLM Test in 5 Developing Countries

```
Breusch and Pagan Lagrangian multiplier test for random effects

        ly[code,t] = Xb + u[code] + e[code,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                      ly |   .2819872       .5310247
                       e |   .0029554       .0543636
                       u |          0              0
```

```
Test:   Var(u) = 0
                        chibar2(01) =      0.00
                    Prob > chibar2 =    1.0000
```

Appendix 22: Literature Review Table

Author	IV & DV	Method	Results	Remarks
Agerbo, Gunnell, Bonde, Mortensen, and Nordentoft (2007)	DV: Suicide rate IV: Educational achievement	❖ Conditional logistic regression	❖ The risk of suicide is higher in former psychiatric patients with a higher educational achievement and in patients who are fully employed or married	
Agrrawal, Waggle, and Sandweiss (2017)	DV: Suicide Rate IV: Unemployment IV: Inflation IV: Gross Domestic Product	❖ OLS Regression	❖ GDP has a negative relationship with the suicide rate.	
Alaraisanen, Miettunen, Lauronen, Rasanen, and Isohanni (2006)	DV: Suicide rate IV: Scholastic achievement	❖ Cox regression model	❖ On a general population level, good school performance was a protective factor against suicide whereas there was high suicide risk in the group of psychotic patients with high premorbid intellectual functioning or high educational achievements.	
Cheong, Choi, Cho, Yoon, Kim, Kim, and Hwang (2012)	DV: Suicide rate IV: Population	❖ -	❖ Suicide rate is high among the urban poor in urban areas where the gap between the rich and the poor is bigger than it is in the rural areas.	

Corcocran, and Arensman (2009)	DV: suicide IV: employment status	❖ Statistical analysis ❖ Likelihood ratio test (LRT) ❖ Incidence rate ratios (IRRs) ❖ Stata version 6.0	❖ Male and female rates of suicide and undetermined death were stable during 1996-2006 though suicide among unemployed men increased. ❖ Relative to employment, unemployment was associated with a 2-3-fold increased risk of male suicide and undetermined death but generally a 4-6 fold increased risk in women.	
Daly, Oswald, Wilson and Wu (2011)	DV: suicide rate IV: level of others' happiness	❖ Scatter Plot ❖ Spearman Rank Correlation	❖ The happiest places tend to have the highest suicide rates. *(Personal unhappiness may be at its worst when surrounded by those who are relatively more content with their lives.)*	**Other source:** Luttmer, E.F.P., 2005. Neighbors as negatives: relative earnings and well-being *(people consciously or subconsciously compare their income to those of others)*
Drake, Gates, Cotton, and Whitaker (1984)	DV: Suicide rate IV: Education	❖ -	❖ High suicide rate among college graduates was partly considered to be the results of their high expectations of themselves that were in line with their good premorbid functioning.	
Granados (2005)	DV: Suicide Rate	❖ Concomitant Variation	❖ Economic expansion was positively correlated with the	

	IV: Economic Expansion IV: Economic Recession		mortality rate. ❖ Suicide rate drops when there is economic expansion.	
Hem, Haldorsen, Aasland, Tyssen, Vaglum, and Ekeberg (2005)	DV: Suicide rate IV: Education	❖ -	❖ Higher suicide rates among physicians and elderly graduates and pointed to the fact that graduates are more vulnerable than others when getting older.	
Hintikka, Saarinen, and Viinamaki (1999)	DV: Suicide Mortality IV: Gross Domestic Product IV: Unemployment IV: Divorce Rate IV: Alcohol Consumption	❖ Bivariate correlations ❖ Univariate and multivariate regression analyses ❖ Cochran-Orcutt correction	❖ Gross Domestic Product (GDP) has a positive relationship with suicide rate. ❖ Suicide rate increased when the GDP increased. ❖ Suicide rate decreased when the GDP decreased.	
Kessler, Berglund, Borges, Nock, and Wang (2005)	DV: Suicide ideation IV: Suicidal behaviors	❖ Pooled logistic regression ❖ Wald Test	❖ The annual suicide rate are much higher compare homicide and war.	
Kim and Kim (2007).	DV: Suicide Attempt IV: Happiness	❖ Participants (Survey)	❖ The youngster with lower of happiness will have higher percentage of suicide attempt than normal youngster.	
Kraut and Walld	DV: Suicide Attempt	❖ -	❖ The correlation between	

(2003)	IV: Unemployment		unemployment and suicide is casual or not significant and the reason provided by them between those two variables is correlation but not causation.	
Kumar Singh, Kumar Singh, Biswas, and Rao (2013)	DV: Suicide rate IV: Population	❖ Z test ❖ Linear multiple regressions	❖ The frequency of suicide attempts recorded was very high, indicating the prevalence of this critical mode of death in the population.	
Marzuk, Nock, Leon, Portera, and Tardiff (2002)	DV: Suicide rate IV: Employment	❖ -	❖ These mainly professional occupations were considered to have more possibility in suicide risks because of an easy access to a tools through their occupation for suicide, such as pharmaceuticals or guns.	
Minoiu and Andres (2008)	DV: Suicide Rate IV: Health Expenditure	❖ Ordinary Least Squares estimator ❖ Generalized Method of Moments (GMM) estimator	❖ An increase in the public health expenditure would lead to a reduction in total suicide rates. ❖ There is a negative correlation between suicide rate and public health expenditure	
Min, Park, Hwang and Min (2015	DV: suicide ideation and suicide attempts IV: precarious employment	❖ Chi-square test ❖ Logistic regression	❖ Employees with precarious work were more likely to exhibit suicidal ideation and suicide attempts than employees with non-precarious work. ❖ Precarious workers had a higher risk of suicidal ideation and	This studies suggested that precarious employment is an important risk for suicide

			suicide attempts than non-precarious workers.	
Pompili, Vichi, Qin, Innamorati, De Leo, and Girardi (2013).	DV: Suicide rate IV: Education	❖ Logistic regression models	❖ Individual with higher educational achievement may be more prone to suicide risk when facing failures, public shame, and high premorbid functioning. ❖ Higher education was correlated with higher risk of completed suicide. ❖ Education may be a proxy of high expectation in certain domains such as a person's career achievement, life quality and satisfaction or certain psychological needs.	
Phillips, Li, and Zhang (2002)	DV: Suicide rate IV: Population	❖ -	❖ An estimated mean annual suicide rate is 23 per 100,000 and a total of 287,000 suicide deaths per year which equivalent of every two minutes one person committed suicide	
Rancans, SalanderRenberg, and Jacobsson (2001)	DV: Suicide Rate IV: Gross Domestic Product IV: First Time Alcohol Psychosis IV: Percentage of People Unemployed	❖ Descriptive statistics	❖ Suicide rate increased rapidly when the GDP declined. ❖ The decline in GDP also caused the unemployment rate to increase which subsequently caused the suicide rate to increase.	

Roberts, Jaremin, Lloyd (2013)	DV: Suicide rate IV: High-risk occupation	❖ Simple ordinary least square linear regression ❖ Fisher's exact test ❖ Pearson's correlation coefficient	❖ Occupations with significant increases over time in suicide rates were all manual occupations whereas occupations with suicide rate that decreased were mainly professional or non-manual.	
Ross, Yakovlev and Carson (2010)	DV: Suicide Rate IV: Health Expenditure (Spending on Mental Health)	❖ Generalized Method of Moments (GMM) estimator	❖ The studies indicated that spending of health expenditure especially in mental health treatment has continuously founded to have an inverse relationship towards suicide rate.	
Solano, Pizzorno, Gallina, Mattei, Gabrielli, and Kayman (2011)	DV: Suicidal behaviour IV: Economic inflation	❖ Italian Institute for Stastical Analysis (ISTAT) ❖ Sperman's correlation ❖ Scattergraphs	❖ The unemployed are at higher suicide risk than the employed. Among the PE, a significant association between inflation and suicide attempt was found, whereas no association was reported concerning completed suicides. No association was found between completed and attempted suicides among the employed.	
Vijayakumar, Nagaraj, Pirkis, and Whiteford (2005)	DV: Suicide rate IV: Education level	❖ -	❖ An association between high education levels and high male suicide rates pointing to the fact that those with relatively high socioeconomic standing had the highest suicide rates.	

Yoshimasu, Kiyohara, and Miyashita (2008)	DV: Suicide rate IV: Substance-related disorders IV: Mood disorders IV: Adverse marital status IV: Adverse employment status IV: Self-harm behaviours	❖ Fixed effect (the inverse variance-weighted method ❖ Random effects (dersimonian-laird method	❖ Depressive disorders showed a very strong association with suicide risk	