

Economic Growth and Suicide Rate Changes: Case in India and United States from 2000 to 2019

Introduction :

Suicide is a complex and multi-faceted behaviour, resulting from a wide range of genetic, psychological, psychiatric, social, economic and cultural risk factors which interact to increase vulnerability to trauma and adversity in individuals, communities and society as a whole. The socio-ecological model proposed by the World Health Organization (World Health Organization, 2014) identifies several types (or levels) of risk factors: health system (e.g. barriers to accessing care in the health system); societal (e.g. easy access to means of suicide); community (e.g. stresses of acculturation and dislocation); relationship (e.g. lack of connectedness to people); and individual (e.g. previous suicide attempt, mental illness). A public health approach to suicide prevention seeks to reduce suicide risk by addressing factors at all these levels. Recognising the limitations of providing mental health services to people who are experiencing suicidal thoughts or who have engaged in suicidal behaviour (critical though these services are), a public health approach focuses on the importance of primary prevention, i.e. preventing the occurrence of suicidal thoughts or behaviours, and addresses a broad range of protective and risk factors. Socioeconomic disadvantage is a risk factor that has received insufficient attention, even in national suicide prevention strategies and action plans which incorporate a public health perspective.

Importance of socioeconomic disadvantage as a determinant of suicidal behaviour :

The weight of empirical evidence points to a significant association between socioeconomic disadvantage and suicidal behaviour. Key findings include:

There is a significantly higher risk of suicide among unemployed, compared to employed, people, even after taking into account other possible explanatory factors ('confounders').

The adverse effects of economic recession on suicide and other mental health outcomes are highlighted in a recent review (Gunnell & Chang, 2016). "Although increases in job loss contribute to this effect, a range of other stressors such as austerity measures, loss of home, debt, strains on relationships, and reductions in mental health services may also contribute. Those who are already vulnerable, such as individuals who are supported by social welfare or who have pre-existing mental health problems are at greatest risk."

There is an inverse relationship between occupational social class and risk of suicide and NFSH: the higher the social class position, the lower the rate of suicidal behaviour

Objective of the study :

From the data consisting of GDP Growth Rate and Suicide Rate (Male,Female,All) of India and United States from the year 2000 to 2019, we aim to find the relationship between GDP and suicide rates(Male,Female,All) of both the countries.

Data :

YEAR	INDIA GDP	USA GDP	INDIA SUICIDE RATE(MALE)	INDIA SUICIDE RATE (FEMALE)	INDIA SUICIDE RATE (ALL)	USA SUICIDE RATE (MALE)	USA SUICIDE RATE (FEMALE)	USA SUICIDE RATE (ALL)
2000	4.68395E+11	1.02523E+13	20.9	17.4	19.1	16.4	4	10
2001	4.85441E+11	1.05818E+13	20.6	16.9	18.7	16.9	4.1	10.3
2002	5.14938E+11	1.09364E+13	20.4	15.9	18.2	17.3	4.3	10.6
2003	6.07699E+11	1.14582E+13	19.7	14.8	17.3	17.1	4.4	10.6
2004	7.09149E+11	1.22137E+13	19.5	14.2	16.8	17.2	4.7	10.8
2005	8.20382E+11	1.30366E+13	19.8	14.2	17	17.1	4.6	10.7
2006	9.4026E+11	1.38146E+13	20.2	14	17.1	17.5	4.7	11
2007	1.21674E+12	1.44519E+13	19.9	13.4	16.7	17.7	4.9	11.2
2008	1.1989E+12	1.47128E+13	19.5	13.1	16.3	18.1	5	11.4
2009	1.34189E+12	1.44489E+13	18.4	12.8	15.6	18.1	5	11.4
2010	1.67562E+12	1.49921E+13	18	13.2	15.6	18.5	5.2	11.7
2011	1.82305E+12	1.55426E+13	17.9	13.1	15.5	18.9	5.3	12
2012	1.82764E+12	1.6197E+13	17.6	12.5	15.1	18.9	4.5	12.1

2013	1.85672E+12	1.67848E+13	16.8	12.1	14.4	18.8	4.2	12
2014	2.03913E+12	1.75272E+13	15.7	11.3	13.5	19.2	4	12.4
2015	2.10359E+12	1.82247E+13	14.8	11.1	12.9	19.9	3.9	12.9
2016	2.2948E+12	1.8715E+13	14.4	10.8	12.6	21.2	4	13.7
2017	2.65275E+12	1.95194E+13	14.3	10.7	12.5	22.5	3.9	14.1
2018	2.71317E+12	2.05802E+13	14.7	11.1	12.9	21.8	3.7	14.1
2019	2.86893E+12	2.14332E+13	14.7	11.1	12.9	22.4	3.7	14.5

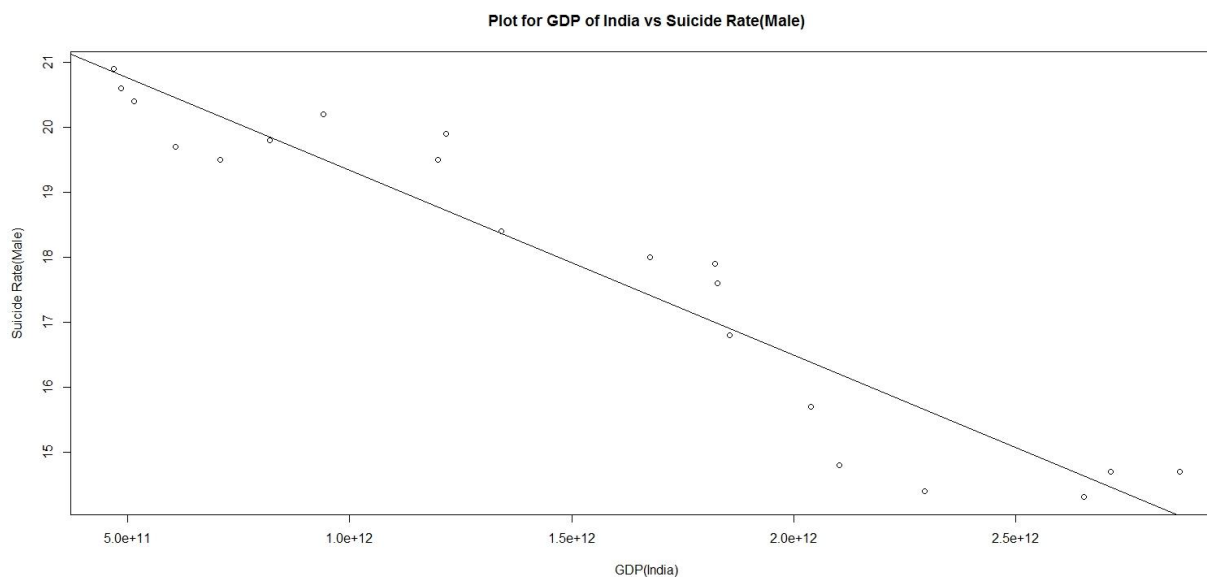
Data Analysis Description :

I have taken data of GDP Growth Rate (from <http://data.worldbank.org>) and Suicide Rate (Male,Female,All) of India and United States from the year 2000 to 2019(from WHO).

I have imported the data using R and performed linear regression (using R) between GDP and suicide rates(Male,Female,All) of both the countries.

The Regression Fitting from the data is as follows:

Plot 1 :



In this plot, the points of the scatter plot is close to the linear regression model between GDP of India and Suicide rate (Male)

Residuals:

	Min	1Q	Median	3Q	Max
	-1.39214	-0.41182	-0.00667	0.63831	1.17987

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.219e+01	3.623e-01	61.24	< 2e-16 ***
x	-2.851e-12	2.141e-13	-13.31	9.33e-11 ***

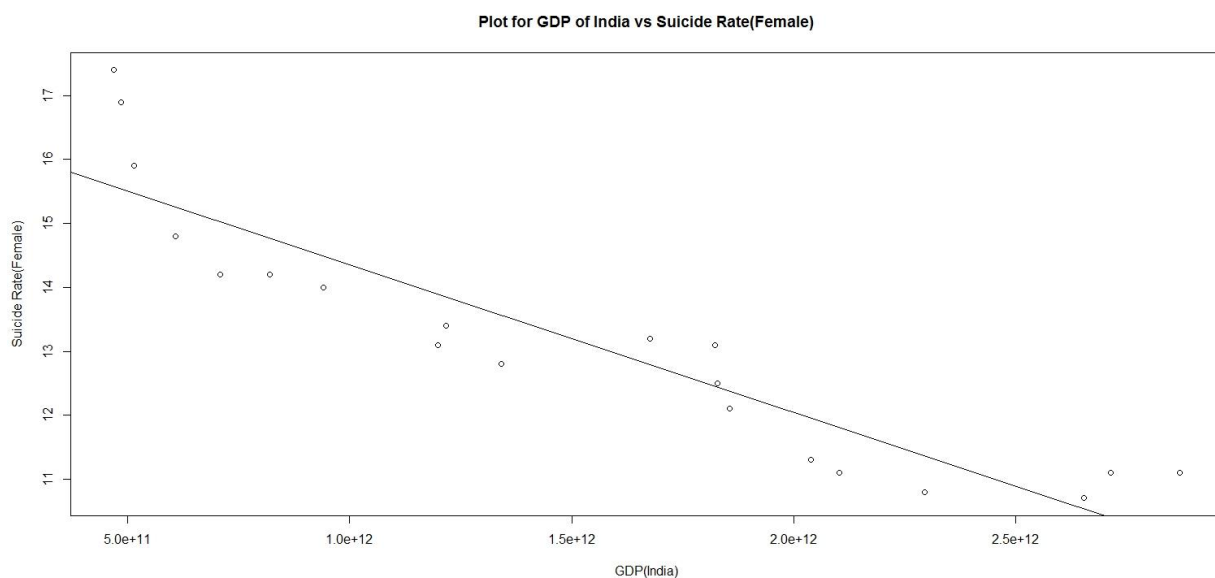
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Residual standard error: 0.7351 on 18 degrees of freedom

Multiple R-squared: 0.9078, Adjusted R-squared: 0.9027

F-statistic: 177.2 on 1 and 18 DF, p-value: 9.333e-11

Plot 2 :



In this plot, the points of the scatter plot is close to the linear regression model between GDP of India and Suicide rate (Female)

Residuals:

	Min	1Q	Median	3Q	Max
	-0.8292	-0.5940	-0.3686	0.4774	1.8150

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.667e+01	3.985e-01	41.826	< 2e-16 ***
x	-2.309e-12	2.355e-13	-9.804	1.21e-08 ***

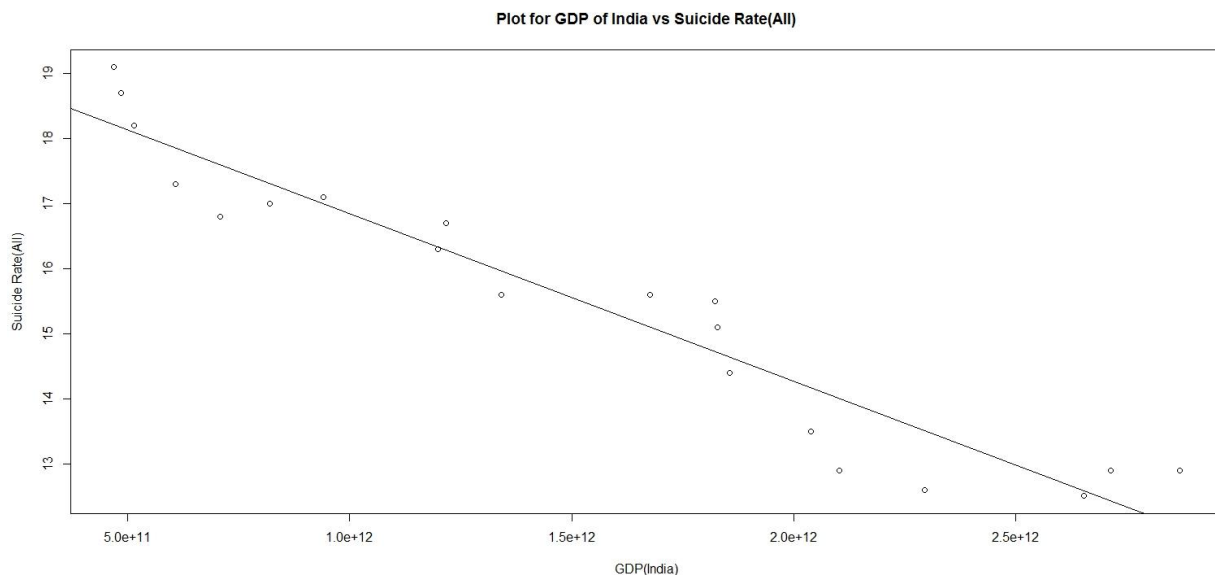
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Residual standard error: 0.8085 on 18 degrees of freedom

Multiple R-squared: 0.8423, Adjusted R-squared: 0.8335

F-statistic: 96.11 on 1 and 18 DF, p-value: 1.21e-08

Plot 3 :



In this plot, the points of the scatter plot is close to the linear regression model between GDP of India and Suicide rate (All)

Residuals:

Min	1Q	Median	3Q	Max
-1.09865	-0.41179	0.03426	0.47963	0.88358

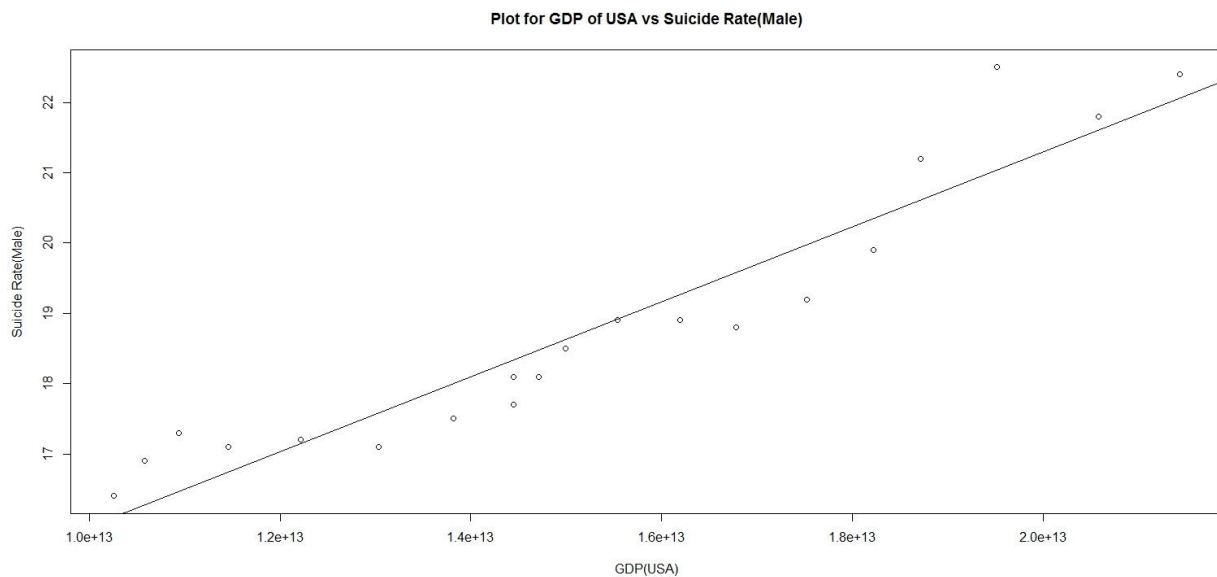
Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.942e+01	3.062e-01	63.43	< 2e-16 ***
x	-2.579e-12	1.810e-13	-14.25	3.02e-11 ***

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Residual standard error: 0.6213 on 18 degrees of freedom
Multiple R-squared: 0.9186, Adjusted R-squared: 0.9141
F-statistic: 203.1 on 1 and 18 DF, p-value: 3.022e-11

Plot 4 :



In this plot, the points of the scatter plot is close to the linear regression model between GDP of USA and Suicide rate (Male)

Residuals:

Min	1Q	Median	3Q	Max
-0.78139	-0.45750	-0.07296	0.34573	1.46176

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.064e+01	6.498e-01	16.37	2.95e-12 ***
x2	5.328e-13	4.161e-14	12.80	1.77e-10 ***

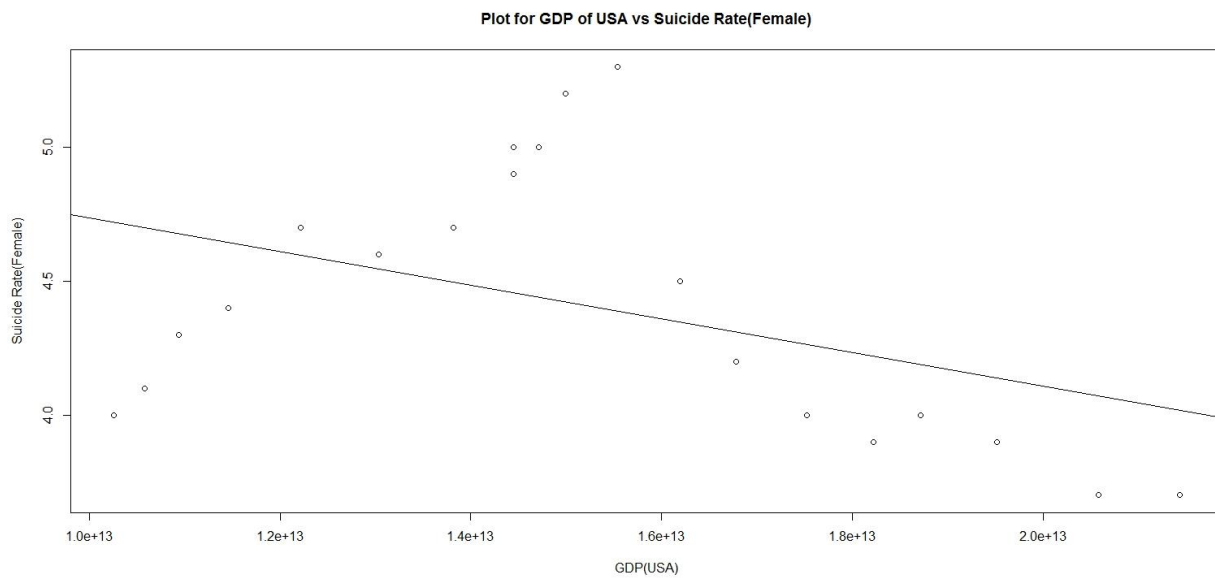
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Residual standard error: 0.6056 on 18 degrees of freedom

Multiple R-squared: 0.901, Adjusted R-squared: 0.8955

F-statistic: 163.9 on 1 and 18 DF, p-value: 1.768e-10

Plot 5 :



In this plot, few points of the scatter plot are not so close to the linear regression model between GDP of USA and Suicide rate (Female)

Residuals:

Min	1Q	Median	3Q	Max
-0.7199	-0.3187	-0.1495	0.2636	0.9120

Coefficients:

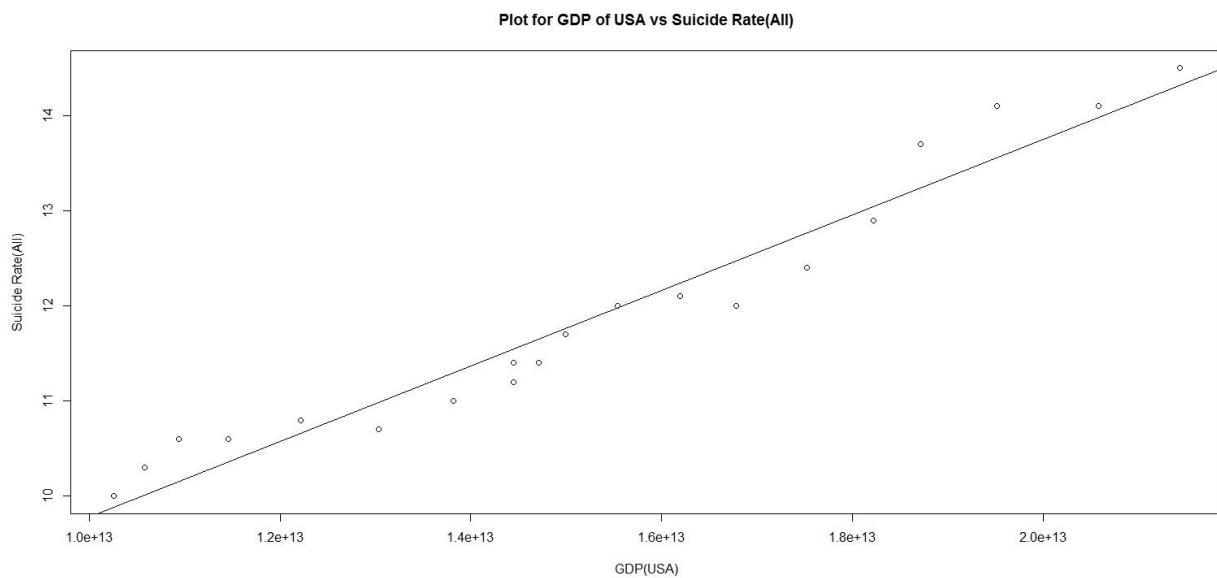
Estimate	Std. Error	t value	Pr(> t)
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(Intercept) 5.363e+00 5.004e-01 10.718 3.04e-09 ***
x2 -6.275e-14 3.205e-14 -1.958 0.0659 .

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Residual standard error: 0.4664 on 18 degrees of freedom
Multiple R-squared: 0.1756, Adjusted R-squared: 0.1298
F-statistic: 3.834 on 1 and 18 DF, p-value: 0.0659

Plot 6 :



In this plot, the points of the scatter plot is close to the linear regression model between GDP of USA and Suicide rate (All)

Residuals:

	Min	1Q	Median	3Q	Max
Residuals	-0.47527	-0.26238	-0.02349	0.19525	0.54026

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	5.819e+00	3.303e-01	17.62	8.51e-13 ***
x2	3.966e-13	2.115e-14	18.75	2.93e-13 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3079 on 18 degrees of freedom

Multiple R-squared: 0.9513, Adjusted R-squared: 0.9486

F-statistic: 351.4 on 1 and 18 DF, p-value: 2.935e-13

These Scatter plots show that the GDP of the two countries India and United States of America are linearly related to the suicide rate.

Conclusion :

The present study shows that GDP is strongly correlated to suicide rates worldwide and that the direction and magnitude of the correlation differs between developing and developed countries.

Suicide is an extremely complex behaviour, and its conceptualisation as a single final pathway might be simplistic. Some authors have suggested that the suicide rate is more responsive to economic factors, such as real GDP per capita or growth rate of real GDP per capita, than to social factors, such as female labour participation or divorce rate. In order to reduce population suicide rates, macroeconomic public health interventionsdfor example, the provision of basic needs, the reduction of socioeconomic inequalitiesdmight be more suitable for developing countries where socioeconomic and cultural factors appear to play a major contributing role in suicide.

In high-income countries, where the medical model prevails and suicide is understood as an unfortunate consequence of psychiatric illnessdparticularly depressive disorders3 d preventive measures based on the medical modeldfor example, incrementing the number of psychiatric or counselling servicesdmight prove more fruitful in helping to decrease the daunting suicide rates worldwide.