

Time Series Analysis of Indian Suicides: Correlation with Human Development Index (HDI)

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ABSTRACT

Background: There was an increasing trend for suicide **Objective:** To examine the trend and relationship between Indian Suicide Rates and Human Development Index (HDI). **Method:** Trends of Suicide rates and HDI values were evaluated by moving averages time series analysis (ARIMA Model). S. Rate and HDI were subjected to Pearson Correlation Coefficient and Spearman's ρ . **Results:** There was an increasing trend for both the parameters with minor exceptions in suicide rates. Significant correlation between suicide rates and HDI values were found. **Conclusion:** The notion that suicide and development were related found support. It warrants further analysis into contribution of individual components of HDI.

Keywords: India-Suicide-HDI-Trend-Correlation

Time series analysis is resorted to for knowing the trend of an event, forecasting future for planning. Here time is the variable. Time series analyses were extensively used in economics. It can also be used for social purposes. The principle is to project the trend from extensive past behaviour. This has been used by economists for suicide analysis to correlate agrarian suicides in India with various parameters. Suicide depends on a host of factors including socioeconomic environment, including development in which the individual lives. The development of a country does not mean economic development alone. There should be a yardstick to point the growth of the people –positive or negative and not economy only. Hence for this purpose United Nations Development Programme (UNDP) developed an index called Human Development Index (HDI) in 1980 for various countries. India was grouped under medium human development with the rank 135 among 187 countries. The definition of HDI as per UNDP was “A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living”.¹ It was created to emphasize that people

and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone.² Hence HDI gives a good picture of the environs of the individual. An exercise was undertaken to see the trend of suicide and HDI in India and to see if there was any correlation between Suicide Rate and HDI.

MATERIALS AND METHODS

The data for suicides from 1980 to 2013 was taken from National Crimes Bureau statistics on Accidental Deaths and Suicides of Ministry of Home Affairs, Govt. of India.³ The effective suicide rate⁴ (> 6 Yrs age population) was computed. The HDI for various years (1980-2013) was taken from UNDP site⁵. The years for which HDI was not given was computed by exponential growth rate method by taking the development of previous and subsequent years.

Statistical Analysis

The data was analyzed for time series analysis ARIMA model by Wessa.net - Free Statistics and Forecasting Software.⁶ After running Kolmogorov-Smirnov test for Goodness-of-fit to see the type of distribution, Pearson Correlation Coefficient and Spearman's Rho tests were done using Social Science Statistics.⁷

RESULTS

There was an increasing trend for the suicide except for some years in the thirty-four years of study period.

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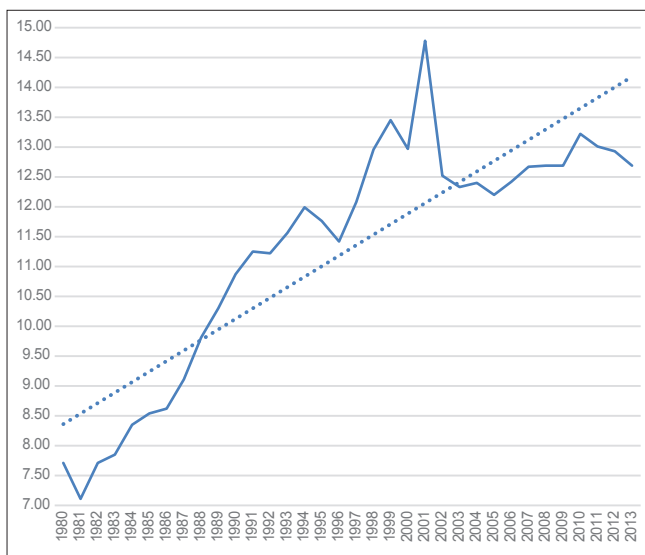
It ranged from 7.11 (1981) to 14.78 (2001). After peaking in 2001, there was decline and consequent mild increase. HDI showed an increasing trend and did not show any decline in any of the years.

Graph 1 depicts the trend of suicide rate. Graph 2 depicts the trend of HDI. Figure 1 gives the extrapolated fit of exponential smoothing in suicide.

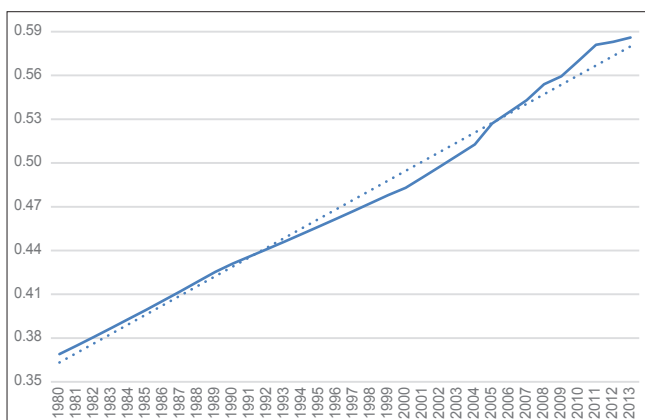
Goodness-of-Fit Tests

For effective S. Rate: Kolmogorov-Smirnov test: $P = 0.014$. The data set was not following the normal distribution.

For HDI: Kolmogorov-Smirnov test: $P > 0.15$. The data can be modelled according to the normal distribution.



Graph 1: Suicide rate and small trend



Graph 2: HDI and small trend

Pearson Correlation Coefficient

The value of R is 0.8317. There was a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa). The value of R^2 , the coefficient of determination, is 0.6917. The P -Value is < 0.00001 .

Spearman's Rho

The value of R is 0.885136 and the two-tailed value of P is 0. implying significance.

DISCUSSION

One study found a positive correlation between suicide rates and HDI values⁸. In a similar manner the present analysis found a positive correlation between Suicide Rates and HDI values. It implies that developmental parameters used can lead to distress at least in some to the extent of committing suicide. It may also be due to the reality of those left behind by the measured yardsticks suffering and ending their life due to frustration. There are multiple components in the computation of HDI. It has to be seen what individual components the contribution of the individual contributors is for the correlation. Further suicide rate as a whole was taken into consideration-break-up into sex and age specific rates vis a vis the individual components might throw interesting light. It was observed that children in high HDI countries suffer from boredom, higher suicidal tendencies and the urge to harm themselves.⁹ The same might be happening in India, where it was reported that the rate among young is increasing. This coupled with those left behind as mentioned above might explain the raising trend and correlation. The HDI measures health, education and income of the people and include life expectancy, access to education and adult literacy, years of schooling, equitable distribution of income, GDP per person adjusted to reflect Purchasing Power Parity (PPP),

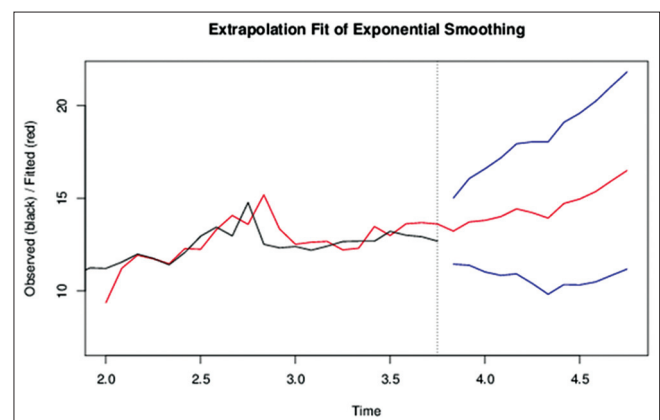


Figure 1: Extrapolation of exponential smoothing of S. Rates

achievements in health and gender equity.¹⁰ Nevertheless the present analysis indicates human development index alone cannot indicate or reflect individual misery/unhappiness. One Indian study found per capita income is a significant and positive determinant of suicide¹¹. Likewise another analysis found inflation, per capita real GDP and industrial growth encourages the incidences of suicides¹². The betterment in the basic components can be contributing factors to abatement to suicide, paradoxically. Increased life expectancy is attendant with diseases, treatment of which is beyond the reach of most. Increasing educational avenues fuel aspirations of employment and quality life, the reality being different. HDI is a quantitative measure and may not reflect qualitative aspect of life. All the development comes with a heavy cost. Development per se may not be suicide prompting, but the effect of it at the societal and individual level-changing social equations, pace of life, inter-personal relationship, etc., may be conducive to suicide.

CONCLUSION

The finding of a positive correlation between suicide rates and HDI values requires further probing with individual components.

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