

Indian Suicide Rates from 2001-2012

INTRODUCTION

This document summarises the main findings of a project that explores Indian suicide rates and related factors from 2001 to 2012.¹ The data set focuses on the profiles of suicide victims and accidental deaths in India from 2001 to 2012. The source of the data is the National Crime Records Bureau (NCRB), an Indian government agency responsible for collecting and analysing crime data. The dataset is licensed under the Government Open Data License of India.²

KEY FINDINGS

In 2012, there were 136,980 deaths registered as suicides or accidental deaths in India. This equates to 14 deaths per 100,000 of the population. The States/UT's with the highest deaths by accident or suicide per 100,000 of the population in 2012 were Puducherry with 43 deaths, and the Andaman and Nicobar Islands with 32 deaths.

From 2001 to 2012, deaths by suicide or accident increased by 7% in India while taking population growth into account. Most States/UT's (71%) experienced an increase in deaths by suicide or accident. As a proportion of the population, deaths by suicide or accident tend to be lower in the north of India and higher in the south.

From 2001 and 2012, males were almost twice as likely to die from suicide or accidental death than females, and this difference increased over time. Female deaths by suicide or accident are more common at younger ages (29 years and younger), while for male's deaths tends to occur later in life. The majority of female deaths by suicide or accident are housewives.

There is a strong relationship between population size and the number of deaths by suicide or accident for most States/UTS. However, this does not apply to Uttar Pradesh and Bihar which have very large populations and very low death rates.

PRELIMINARIES

Telangana separated from Andhra Pradesh in 2014, and this change is reflected in 2011 and 2012 census data. As a result, Telangana is combined with Andhra Pradesh where census data is used.

A Union Territory is a type of administrative division in India, where unlike the States of India, are federal territories governed, in part or in whole, by the Union Government of India.

For reasons of brevity, 'death rate' is used interchangeably with the number of deaths per 100,000 of the population of a State/UT.

All numbers are rounded off to one decimal place.

¹ For more detailed discussion, consult the associated Jupyter notebook. This includes the python syntax, data cleaning, transformation, and analysis.

² The data set, 'State/UT-wise professional profile of suicide victim during 2001-2012', can be accessed at: https://data.gov.in/catalog/stateut-wise-professional-profile-suicide-victim?filters%5Bfield_catalog_reference%5D=91703&format=json&offset=0&limit=6&sort%5Bcreated%5D=desc.

1 OVERALL TRENDS

Figure 1 shows the total number of deaths by suicide or accident in India from 2001 to 2012. In 2012, there were 136,980 deaths registered as suicides or accidental deaths, a 20.8% increase from 2001. There is a clear and consistent upward trend from 2001 to 2012.

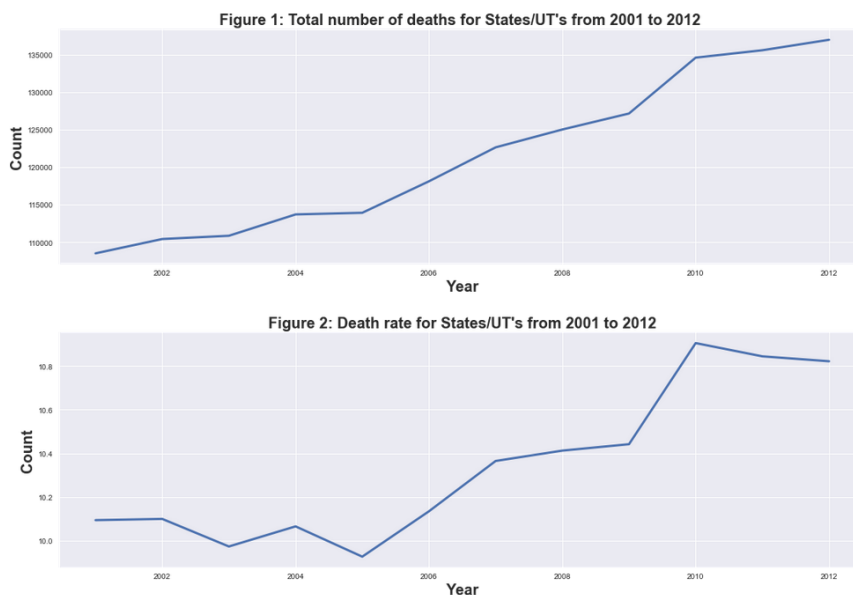
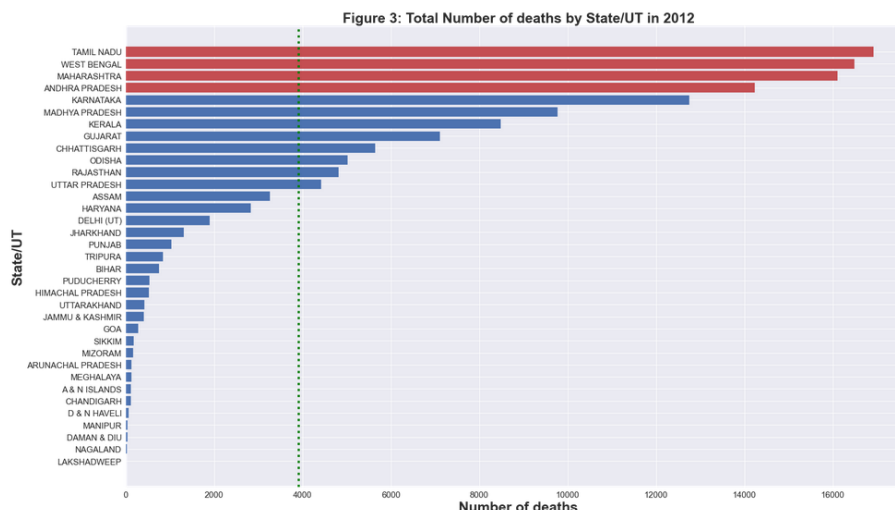


Figure 2 takes into account changes in population size over time, by standardizing the data as the death rate per 100,000 people per year.³ In 2012, the death rate was 10.8, a 6.7% increase from 2001. The death rate trended slightly downwards between 2001 and 2005 (a change of 1.7%), followed by an upward trend from 2005 to 2010. Once again, the death rate trended downwards after 2010.

³ This was calculated using the population size for each year from Indian census data (https://censusindia.gov.in/2011census/population_enumeration.html).

2 STATES AND UNION TERRITORIES

Figure 3 shows the total number of deaths in India by suicide or accident in 2012 by State/UT. The green dotted line indicates the mean number of deaths. Total deaths vary greatly between States/UTs with a mean number of deaths of 3,913 per year and a Standard Deviation (SD) of 5,404.4.



The four States/UTs highlighted in red account for 44% of all deaths in 2012. These include Tamil Nadu with the greatest number of deaths (16,927), followed closely by West Bengal (16,492), Andhra Pradesh (14,238), and Karnataka (12,753). Several State/UT's had extremely low number of deaths by suicide or accident including Lakshadweep (1), Nagaland (30), and Daman and Diu (36).

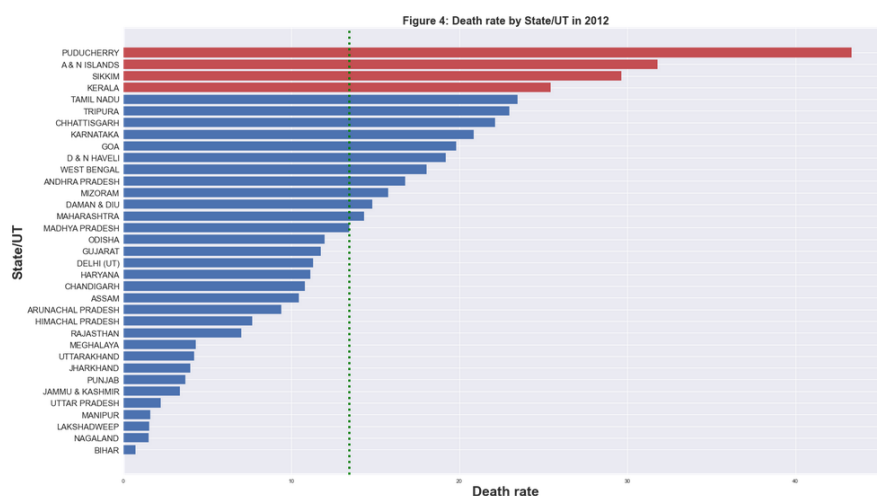
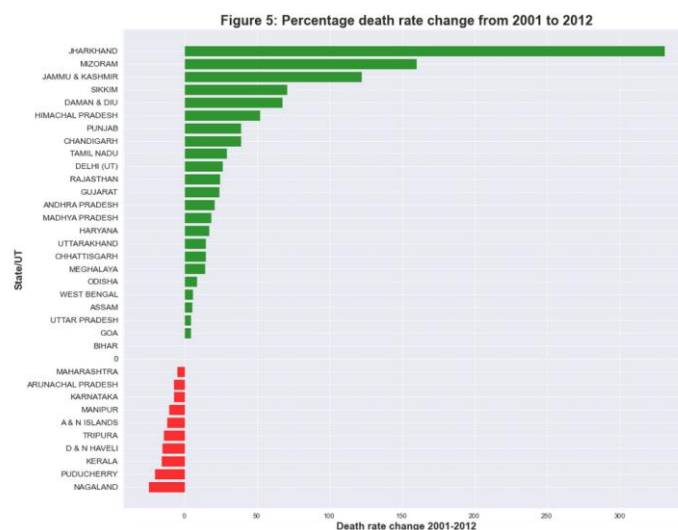


Figure 4 shows the death rate by State/UT's in 2012. The death rate refers to the number of deaths by suicide or accident per 100,000 of the population of a State/UT.⁴ When population size is considered, there is still a substantial difference between States/UT's with a mean death rate of 13.5 and a SD of 9.9. The States/UTs highlighted in red have particularly high death rates, including Puducherry (43.4), Andaman and Nicobar Islands (31.8), Sikkim (29.6) and Kerala (25.4). It is notable that none of the states/UT's with the highest total deaths also have the highest death rates.

⁴ The death rate was calculated using population estimates for each State/UT from 2011 Indian census data (https://censusindia.gov.in/2011census/population_enumeration.html).

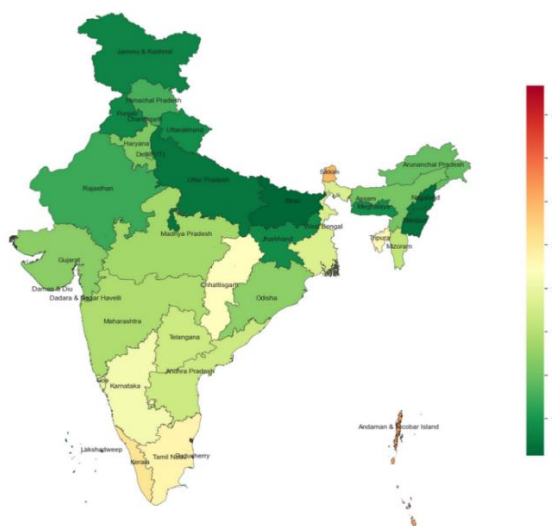
Figure 5 shows the percentage death rate change of total deaths per 100,000 of the population for states/UTs from 2001 to 2012.⁵



The majority (71%) of States/UTs experienced an increase in the death rate from 2001 to 2012. Jharkhand experienced the largest (331%) increase; however, this was partly due to a low starting base of 0.9 deaths per 100,000 people. Mizoram experienced the second highest increase of 159.78%, followed by Jammu and Kashmir (122.1%). Nagaland experienced the greatest decrease, dropping by 24.6%.⁶

Figure 7 is a choropleth of the death rate of States/UTs. There is a trend of States/UTs in the north of India having lower death rates compared to States/UTs in the south. Note that Puducherry (which has the highest death rate) is a city situated in Tamil Nadu, but can be difficult to see on this choropleth. Sikkim has an unusually high death rate for its geographic location.

Figure 7: Choropleth of the death rate for States/UTs



⁵ This was calculated using the percentage death rate difference between 2001 and 2012 while taking into account changes in population size. This is as such a death rate comparison of 2001 and 2012, and there may well have been variations in the years between 2002 and 2011 that are not reflected.

⁶ Note that because of the method used to calculate rate change, Lakshadweep is excluded from the above chart. As Lakshadweep's death rate was 0 in 2001, it mathematically experienced an infinitely large death rate increase to its 2012 rate of 1.6.

3 STATES VS UNION TERRITORIES

India is composed of States and Union Territories (UTs). States have their own governments, while Union Territories are territories that are partly or wholly governed by the Union Government of India.⁷ In 2012, UTs composed 2% of the total population of India, with a population of 32,390,050. The majority (90%) of the population of UTs are situated in two territories: Delhi, with 16,787,941 people or 52% of the population of UTs, and Jammu and Kashmir with 12,267,032 people, or 37.9% of the population of UTs.

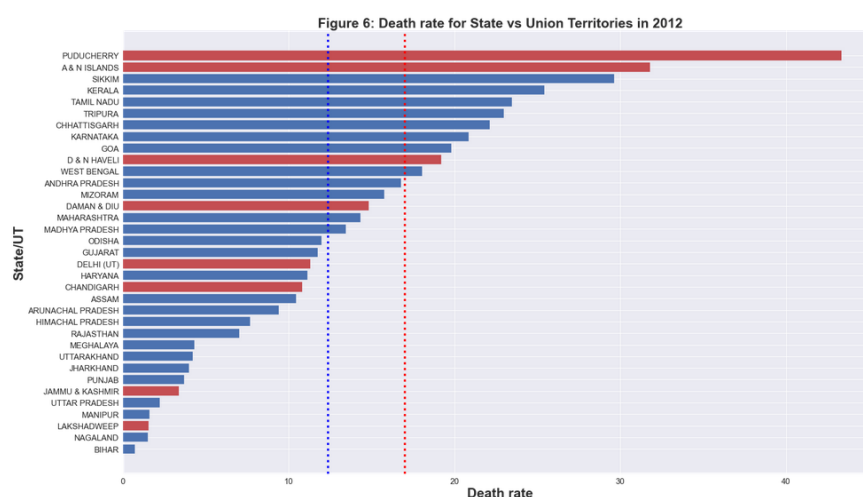


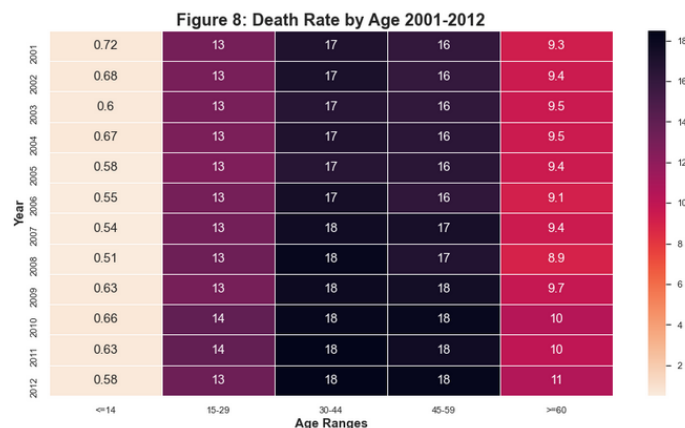
Figure 6 presents the death rate for States and UTs. The red bars indicate UTs, and the red dotted line indicates the mean death rate for UTs, while the blue bars and blue dotted line are for States. In 2012, States had a mean death rate of 12.4, while UTs had a mean death rate of 17, 27% higher than States. The mean death rate for UTs is however skewed by two states with unusually high death rates, namely Puducherry (43.4) and the Andaman and Nicobar Islands (31.8). If these two territories are excluded, the mean death rate for Union territories falls to 10, below the mean death rate for States.

4 AGE AND GENDER

Figure 8 presents the death rate by age group from 2001 to 2012.⁸ The death rate for all age groups experienced a relatively stable upward trend from 2001 to 2012, the only exception being for those 14 years and younger who experienced a decline of 13.8%. For 15–29-year-olds, the trend was very slightly upwards: a 2% increase from 2001 to 2012.

⁷ In 2012, there were eight Union Territories. However, as the data set treats Dadra and Nagar Haveli, and Daman and Diu as separate territories, they are treated as such in this analysis. In addition, Ladakh is missing from the data set, likely treated as part of Jammu and Kashmir.

⁸ It is assumed the relative proportions of age groups in comparison to the total population did not change from 2001 to 2012. Age group proportions were calculated using age group data from https://nhm.gov.in/New_Updates_2018/Report_Population_Projection_2019.pdf.



Those between the ages of 30-44 and 45-59 have consistently higher death rates than other age groups. In addition, from 2001 to 2012, the death rate increased by 8.2% for 30–44-year-olds, and 12% for 45–59-year-olds. The greatest change over time was for those 60 years and older, for whom death rates increased by 12.4%.

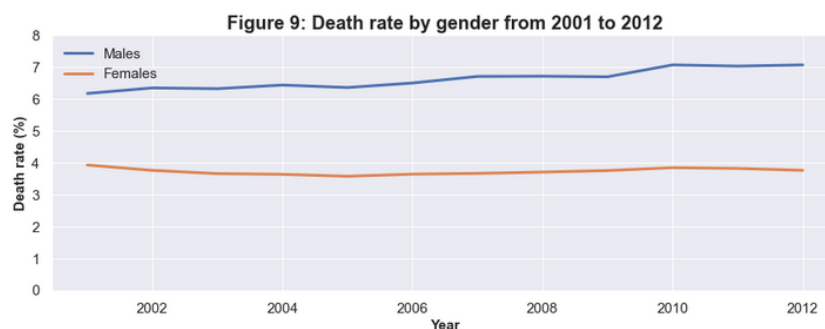


Figure 9 presents the death rate by gender from 2001 to 2012. Between 2001 and 2012, males were almost twice as likely to die from suicide or accidental death than females, with an average death rate of 6.6 compared to 3.7 for females. While female deaths rates declined by 9% between 2001 and 2012, for males the death rate increased by 12.7%. Thus, the difference in death rates between males and females increased over time.

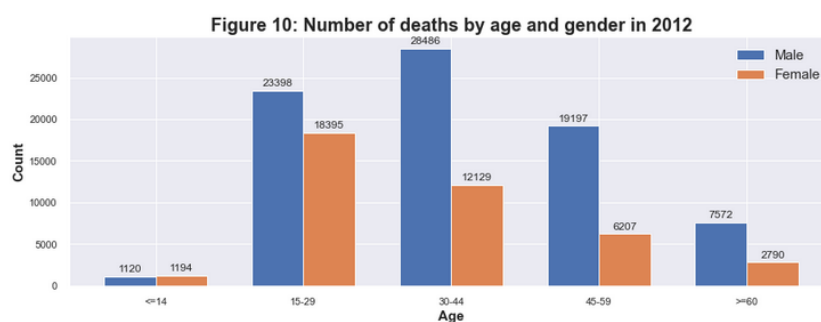


Figure 10 presents total deaths by age and gender in 2012. Males have higher deaths by suicide or accident in each age category besides 14 years and younger, where females compose 51% of the age bracket. Female peak suicide rates occur at 15-29 years of age, while for males it occurs at an older age of 30-44. As age increases, so too does the proportion of deaths that are male. In the 30-44 age group, 70% of deaths are male, and for the 45-59 age group, 77% of deaths are male. For those 60 years or greater, 75% are male.

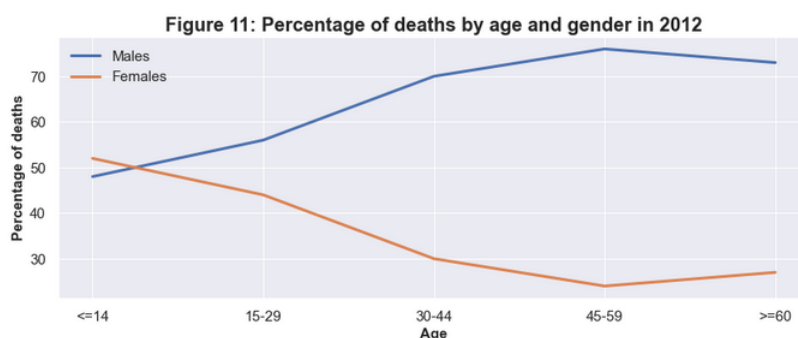
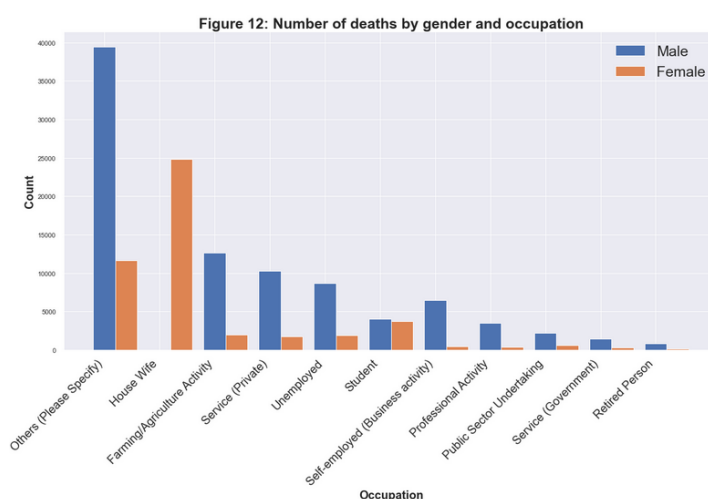


Figure 11 presents the percentage of deaths that are either male or female, by age group. This chart more clearly shows the trend that at younger ages, deaths by suicide or accident are more gender neutral, but as age increases, so too does the proportion of deaths that are male.

5 OCCUPATION AND GENDER

Figure 12 presents the number of deaths by gender and occupation in 2012. By far the most common category is the 'other' category, with males constituting the majority (77%). The second largest category is housewife, which is dominated by females (100%).

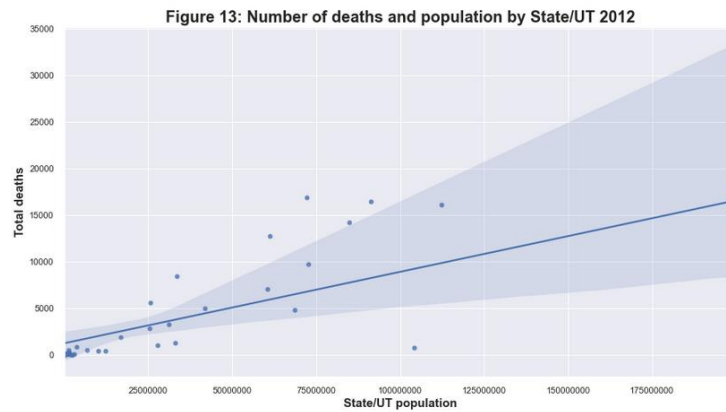


For all other occupational categories, males form the majority. The self-employed have more than three time more absolute deaths (51,901) than salaried individuals (15,482), and both occupational categories have the same gender ratio (83% male).

6 NUMBER OF DEATHS AND POPULATION SIZE

Figure 13 is a regression plot showing the relationship between number of deaths and population for States/UTs.⁹

⁹ The Jupyter Notebook for this project provides an in-depth discussion of how the analysis was conducted including understanding, selecting and excluding outliers, analysis of residuals, tests for homoscedasticity, qq-plots, and the process of fitting the best model.



There is a moderately strong positive relationship between population size and number of deaths by suicide or accident, Pearson's $r(35) = 0.6$, $P = .000$. There are however two observations that do not fit the model well. These observations are Uttar Pradesh on the extreme right of the plot, and Bihar on the lower centre. Both observations have very large populations (Uttar Pradesh: 199,812,341 people, Bihar: 104,099,452), and very low death rates (Uttar Pradesh: 2.21, Bihar: 0.72). Without Bihar and Uttar Pradesh, the model performs much better, with a strong positive relationship between population size and number of deaths by suicide or accident, Pearson's $r(35) = 0.92$, $P = .000$.

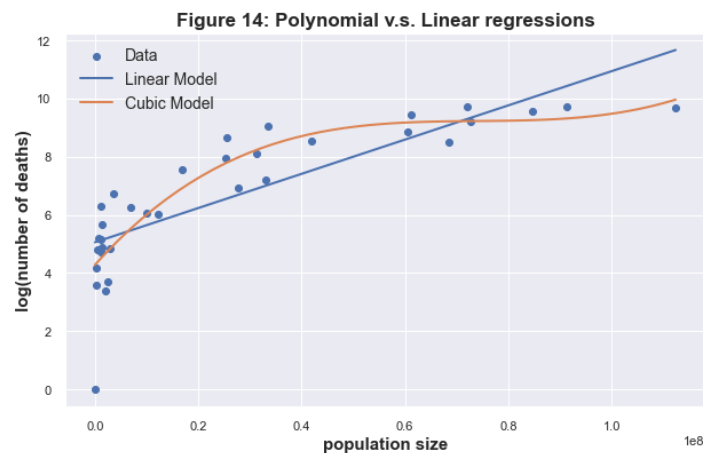


Figure 14 displays a comparison of a cubic model with a linear model for State/UT population size and the logarithm¹⁰ of number of deaths. The cubic model is superior as it visually fits the data better and explains more of the variance (80%) than the linear model. It can thus be concluded that for the vast majority of States/UT's, population size explains 80% of the variance of the number of deaths by suicide or accident. However, this model does not apply to Uttar Pradesh and Bihar, which have very large populations and very low deaths by accident or suicide.

¹⁰ Heteroscedasticity was found to be present in the model, and thus a transformation was required.