**ACADEMIC TASK-4**

**CSD204**

(DATA EXPLORATION AND PREPARATION)

# COMPUTER SCIENCE AND ENGINEERING

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# DECLARATION

We, the students of Bachelor of Technology under CSE discipline at Lovely Professional University, Punjab, hereby declare that all the information furnished in this project report is based on our own work and is genuine.

**Table of Contents**

1. Introduction
2. Objectives of the Project
3. Motivation for the Project
4. Data Collection and Sources
5. Data Analysis and Visualization
   * State-Wise Trends
   * Gender-Wise Trends
   * Age Group Trends
6. Insights and Key Findings
7. Conclusion
8. Recommendations
9. References

**INTRODUCTION**

**Project Title: Analysis of Suicide Trends in India (2010–2022)**

**Background**

Suicide is a complex public health issue that affects individuals, families, and societies worldwide. In India, it is a pressing concern, with suicide rates consistently ranking among the highest globally. Despite the cultural, social, and economic diversity across the country, suicides are often driven by systemic challenges such as mental health stigma, unemployment, academic pressure, domestic violence, and financial instability. Understanding these patterns is crucial for devising targeted interventions and policies to address the issue effectively.

**Objective of the Project**

This project aims to analyse suicide trends in India from 2010 to 2022 by examining state-wise, gender-wise, and age-group data. The primary objectives are:

* To identify regions and demographics with the highest suicide rates.
* To understand gender disparities and the societal factors contributing to these differences.
* To provide actionable insights for policymakers and stakeholders to implement effective prevention strategies.

**Scope**

The analysis covers:

* **Geographical Perspective**: Suicide trends across Indian states and union territories.
* **Demographics**: Distribution by gender (male and female) and age groups (children, adults, and the elderly).
* **Temporal Trends**: Yearly patterns from 2010 to 2022.

**Significance of the Study**

The findings from this study are intended to:

* Highlight the critical areas and populations most affected by suicides.
* Provide evidence-based recommendations for reducing suicide rates through targeted interventions.
* Encourage public discourse on mental health and the urgent need for systemic support at local and national levels.

**Methodology**

The project utilized a combination of data analysis techniques and visualization tools to uncover trends and patterns in suicide data. Python was used for data cleaning, manipulation, and visualization, while insights were extracted from state-wise, gender-wise, and age-wise breakdowns. The results are presented through charts, heatmaps, and statistical summaries for clarity.

**Objectives of the Project**

1. **Understand Suicide Trends**
   * Analyse state-wise, gender-wise, and age group-specific trends in suicides over the years to identify significant patterns.
2. **Identify High-Risk Groups**
   * Highlight demographic groups (e.g., adults, males, or specific states) that are at higher risk of suicides.
3. **Compare State-Wise Data**
   * Examine the variation in suicide rates across different states and union territories in India to determine regions that require immediate attention and policy focus.
4. **Recognize Gender Disparities**
   * Explore gender-based differences in suicide trends to identify how societal and systemic factors impact males and females differently.
5. **Spot Emerging Age Trends**
   * Investigate suicide patterns in various age groups (children, adults, and the elderly) to focus on age-specific interventions.
6. **Provide Actionable Insights**
   * Develop data-driven recommendations and strategies to reduce suicide rates in India by addressing key findings and trends.
7. **Contribute to Mental Health Awareness**
   * Use the analysis to emphasize the importance of addressing mental health issues and reducing the stigma surrounding them

**Motivation for the Project**

The motivation for this project stems from the pressing and often underreported issue of suicide in India, which continues to affect thousands of lives each year. The statistics around suicides in India are alarming, and despite being one of the largest contributors to the global suicide rate, there is still a lack of widespread awareness, understanding, and concrete action toward preventing these deaths. Several factors drive the motivation to take up this project:

**1. Growing Suicide Rates in India**

India has one of the highest suicide rates in the world, with more than 150,000 suicides reported annually. The statistics are especially concerning when broken down by age, gender, and geographical location. With the increasing suicide rates, it has become crucial to understand the underlying causes and patterns in order to develop targeted intervention strategies. Through this project, I aimed to explore the trends in suicides over time, examining the roles played by socio-economic factors, mental health issues, and regional disparities.

**2. Lack of Public Awareness and Mental Health Support**

Mental health issues, such as depression, anxiety, and stress, are often the root causes of suicides. However, in many parts of India, these issues remain stigmatized, and there is a severe lack of mental health resources. Understanding the gender and age group-wise data of suicide victims reveals a pressing need for better mental health education, especially in rural areas, where help is less accessible. This motivated me to delve into the socio-economic conditions and awareness programs (or the lack thereof) that may be contributing to high suicide rates, particularly among vulnerable populations like children and women.

**3. Desire to Contribute to Suicide Prevention Efforts**

The ultimate goal of this project is to contribute towards suicide prevention in India. By analyzing suicide patterns based on gender, age, and state, I hope to provide useful insights that can inform public health strategies, governmental interventions, and mental health awareness campaigns. The findings could help create data-driven policies that focus on the regions and groups most at risk, and recommend preventive measures, such as the establishment of more mental health centers, better suicide helplines, and awareness programs across various platforms.

**4. Impact of Regional Disparities**

One of the key motivations for this project was to examine regional variations in suicide rates. Certain states show alarming rates of suicides, and these regional differences are often linked to local economic conditions, cultural factors, and access to healthcare. By identifying the states with the highest rates, I hope to raise awareness about regional disparities and advocate for tailored interventions that can address local causes more effectively.

**5. Personal Connection and Social Responsibility**

On a personal level, I have witnessed the mental health challenges faced by individuals in my community, and I recognize the profound impact that family, social stigma, and a lack of mental health care can have on individuals struggling with thoughts of suicide. This personal connection motivated me to not only conduct this analysis but also to advocate for meaningful change. I feel a social responsibility to contribute towards a solution that could save lives by raising awareness, reducing stigma, and promoting access to mental health care.

**6. Contributing to Future Research**

Suicide prevention is an area that still lacks comprehensive and robust research in India. This project is an effort to contribute to the growing body of knowledge on this issue. The findings could be useful to researchers, policymakers, and social workers who are working to understand and address the complex causes of suicide. By providing an in-depth analysis of trends, patterns, and socio-economic factors, this project could serve as a reference for further studies in this area.

**7. Hope for a Positive Change**

The ultimate motivation behind this project is to foster hope. While the data on suicides may be disturbing, there is potential for positive change. By shedding light on the factors contributing to suicide rates, this project seeks to inspire action from individuals, communities, and policymakers alike. The data and insights from this project aim to be a starting point for initiatives that will help lower suicide rates, improve mental health support systems, and offer hope to those who need it the most.

**Data Collection and Sources**

**Data Sources**

The data used in this project was collected from credible and authentic sources, including:

1. **National Crime Records Bureau (NCRB)**:
   * Annual reports and statistical data published by the NCRB on suicides in India from 2010 to 2022.
   * The data provided detailed information on suicides categorized by state, gender, and age group.
2. **Government Open Data Portals**:
   * Supplementary data from Indian government portals such as *data.gov.in*, which host publicly available datasets on socio-economic and demographic trends.

**Data Collection Process**

The data was collected and processed as follows:

1. **Data Download**:
   * Suicide-related statistics for the years 2010 to 2022 were downloaded in Report file and then converted into csv and excel files.
2. **Data Cleaning**:
   * Handling of missing or inconsistent values in the dataset.
   * Removal of irrelevant columns and standardization of labels for easier analysis.
3. **Data Segmentation**:
   * The data was segmented based on relevant parameters such as:
     + **State/UT-wise suicides** (e.g., Maharashtra, Tamil Nadu, Karnataka).
     + **Gender** (Male and Female).
     + **Age Groups** (Children: 0–18, Adults: 18–45, Elderly: 45+).

**Tools and Software**

**To facilitate efficient data analysis and visualization, the following tools and software were used:**

1. **Python:**
   * Libraries such as *pandas*, *matplotlib*, *seaborn*, and *numpy* were used for data preprocessing, analysis, and visualization.
2. **Excel:**
   * Used for initial data exploration, formatting, and validation.

**Data Validation**

To ensure the reliability and accuracy of the data:

* Cross-referencing was conducted between multiple sources (e.g., NCRB reports and open data portals).
* Trends and figures were validated against published research studies or official government publications.

**Data Analysis Methodology**

The methodology adopted for analysing the suicide data in India (2010–2022) involved a structured approach to ensure thorough insights and meaningful conclusions. The key steps in the data analysis process are outlined below:

**Data Preprocessing**

Before performing the analysis, the raw data was cleaned and structured for efficient exploration.

* **Data Cleaning**:
  + Removed missing or duplicate entries.
  + Standardized inconsistent labels for states, gender, and age groups.
* **Feature Engineering**:
  + Created additional columns, such as the percentage contribution of suicides by each state and gender.
  + Segmented the data into time periods for trend analysis.

**Exploratory Data Analysis (EDA)**

EDA was performed to identify patterns, trends, and anomalies in the dataset. Key techniques used include:

* **Descriptive Statistics**:
  + Summarized the total suicides for each year, state, gender, and age group.
  + Calculated averages and growth rates over the years.
* **Trend Analysis**:
  + Analysed annual changes in suicides and compared state-wise trends to identify regions with rising or declining rates.
* **Correlation Analysis**:
  + Examined the relationship between population and suicide numbers.

**Data Visualization**

Visualizations played a critical role in uncovering trends and communicating findings effectively. The following tools and visual formats were employed:

* **Heatmaps**:
  + Used for visualizing state-wise suicides over time to identify high-burden regions.
* **Line Graphs**:
  + Showed trends in suicide rates by gender and age group across the years.
* **Bar Charts**:
  + Highlighted annual suicide counts for individual states.
* **Area Charts**:
  + Illustrated the contribution of various demographic groups to total suicides.

**Key Metrics and Calculations**

To derive actionable insights, several metrics were computed:

* **Year-on-Year Growth Rate**:
  + Measured the annual increase or decrease in suicide rates.
* **State Contribution to National Total**:
  + Calculated the percentage of suicides contributed by each state.
* **Gender and Age Group Proportions**:
  + Analysed demographic disparities to identify high-risk groups.

**Tools and Technologies**

The analysis was conducted using the following tools:

* **Python Libraries**:
  + *pandas* for data manipulation.
  + *matplotlib* and *seaborn* for visualization.
  + *NumPy* for statistical calculations.
* **Jupyter Notebook**:
  + Served as the primary environment for coding and visualization.
* **Excel**:
  + Used for initial exploration and cross-validation of data.

**Key Insights and Findings**

Based on the detailed analysis of suicide data in India (2010–2022), several critical insights were identified. These findings highlight patterns across states, gender, and age groups, as well as annual trends. Below is a summary of the key observations:

**State-Wise Insights**

* **Maharashtra, Tamil Nadu, and Karnataka** consistently reported the highest number of suicides across the years. Maharashtra accounted for the largest share of total suicides in the country.
* States like **Kerala, West Bengal, and Madhya Pradesh** also reported significant numbers, indicating the need for targeted interventions in these regions.
* Union Territories such as **Lakshadweep and Ladakh** reported the lowest numbers, possibly due to smaller populations.

**Gender-Based Insights**

* **Male suicides** were consistently higher than female suicides across all years. On average, men accounted for nearly **70%** of all suicides annually.
* This disparity suggests that societal and economic pressures disproportionately affect men, possibly leading to mental health crises.
* While the overall number of suicides among **females** was lower, women may face unique stressors such as domestic violence, lack of education, and financial dependence.

**Age Group Insights**

* **Adults (18–45 years)** were the most affected age group, contributing to the majority of suicides annually. This could be linked to factors such as employment stress, family responsibilities, and social expectations.
* **Older adults (45+ years)** showed a moderate but steadily increasing trend in suicides, indicating the need for mental health support for this group.
* **Children and adolescents (below 18 years)** showed relatively lower numbers but still require attention due to pressures related to education and early socialization.

**Annual Trends**

* A steady increase in the total number of suicides was observed over the 13-year period, with a significant spike after 2018.
* Factors such as economic downturns, the COVID-19 pandemic, and social changes likely contributed to this rise in recent years.

**Contribution by Regions**

* States in the **southern and western regions** (Maharashtra, Tamil Nadu, Karnataka) showed persistently high numbers, while the **northeastern region** reported comparatively lower figures.
* States like **Uttar Pradesh and Bihar**, despite having large populations, reported lower suicide numbers, which may require further exploration to understand reporting practices and regional dynamics.

**Vulnerable Groups**

* **Working professionals**, **students**, and individuals facing **financial stress** emerged as vulnerable groups based on qualitative information from additional sources.
* Suicide prevention programs need to address stress related to employment, education, and family life.

**Conclusion**

The analysis of suicide data in India from 2010 to 2022 reveals alarming trends and identifies critical areas that require immediate attention. The increasing number of suicides, especially among adults, the significant gender disparity, and the regional differences highlight the multifaceted nature of this issue. Despite considerable efforts, the suicide rates continue to rise, particularly in states like Maharashtra, Tamil Nadu, and Karnataka, with a notable concentration of suicides among males and adults in the 18-45 age group. These trends reflect a growing mental health crisis exacerbated by factors such as socio-economic pressures, educational stress, unemployment, and societal norms.

The findings also indicate that while the overall number of suicides is rising, certain regions and groups remain disproportionately affected. The data points to the need for more comprehensive and targeted interventions, including mental health services, community outreach programs, and better educational support systems, particularly in high-risk states and age groups.

**Recommendations for Improvement**

1. **Gender-Specific Interventions:**
   * Given the disproportionate number of male suicides, it is crucial to design gender-sensitive programs that address the unique mental health challenges faced by men, particularly in dealing with emotional expression, societal expectations, and stress.
   * For women, especially in rural or economically disadvantaged areas, initiatives focusing on empowerment, education, and protection from domestic violence can significantly reduce suicide risk.
2. **Targeted Regional and State-Level Policies:**
   * States with high suicide rates such as Maharashtra, Tamil Nadu, and Karnataka require region-specific strategies that focus on local issues, including economic stress, unemployment, and lack of mental health resources.
   * In states with relatively low suicide numbers, maintaining vigilance through data monitoring and proactive programs can prevent any future surge in suicide rates.
3. **Support for Vulnerable Age Groups:**
   * **For adults (18-45 years)**: Programs should focus on career counseling, stress management, and emotional support for individuals facing high-pressure work environments, relationship issues, or financial stress.
   * **For children and adolescents**: Introducing school-based mental health programs, focusing on stress management and emotional resilience, can help address early signs of mental health distress and prevent future suicides.
4. **Improved Mental Health Infrastructure:**
   * There is a critical need to expand mental health services across the country, particularly in rural and underdeveloped regions. This includes increasing access to counseling, psychiatric care, and hotlines for immediate support.
   * Government collaboration with NGOs and mental health organizations can ensure that resources are effectively distributed.
5. **Public Awareness Campaigns:**
   * Mental health stigma remains a significant barrier to seeking help. Public awareness campaigns should be launched to educate the population on the importance of mental well-being and the resources available.
   * These campaigns should focus on breaking the stigma surrounding mental health issues and suicide, encouraging individuals to seek help without fear of judgment.
6. **Prevention and Intervention Strategies:**
   * Implementing nationwide suicide prevention programs, including outreach efforts in high-risk areas and among vulnerable populations, can help reduce the overall suicide rate.
   * Training for community leaders, teachers, and local healthcare providers to identify warning signs and offer support can be an effective first line of defense.
7. **Use of Technology for Monitoring and Support:**
   * Leveraging technology to monitor trends in suicide rates and mental health issues can help identify emerging problems in real-time. Mobile applications, online counseling services, and mental health chatbots can serve as valuable tools for reaching people in need, especially in remote areas.
   * Data-driven tools could also be used for better resource allocation and targeted intervention planning.

**Final Thoughts**

Suicide is a complex and multifaceted issue, deeply intertwined with social, economic, and psychological factors. Through comprehensive and integrated approaches, addressing both preventive and supportive measures, it is possible to make significant progress in reducing suicide rates in India. By focusing on regional disparities, gender-specific needs, and age-group vulnerabilities, and enhancing mental health services, India can move towards a future with reduced suicide rates and improved mental well-being for all its citizens.

The project serves as an important step toward understanding the broader patterns of suicide and its impact on different groups. However, the recommendations put forth must be seen as part of a continuous effort, one that requires collaboration between government bodies, healthcare providers, communities, and individuals to make meaningful change.

**References**

Below is a list of the sources and references used in the research and analysis of suicide data in India for this project:

1. **National Crime Records Bureau (NCRB) Reports**
   * The primary data source for suicide statistics in India is the National Crime Records Bureau (NCRB), which provides annual reports on crime and suicide trends in India. The data has been instrumental in understanding the national, state-wise, and demographic breakdown of suicides.
   * **Source**: NCRB, Ministry of Home Affairs, Government of India.
2. **World Health Organization (WHO) Reports**
   * WHO reports on global suicide rates, mental health, and well-being were used to contextualize India’s situation within a global framework.
   * **Source**: World Health Organization (WHO), Mental Health and Substance Use Unit.

**Acknowledgement**

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