Visualizing Mental Health: A Power BI Approach to Suicide Data Analysis

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I. INTRODUCTION

Suicide represents a formidable global challenge, with approximately 700,000 lives claimed by this devastating act each year [1]. Its prevalence is felt across all corners of the world, affecting both high- and low-income nations. The World Health Organization (WHO) reports that a significant 78% of suicides occur in low- and middle-income countries (LMICs), underscoring the universal nature of this crisis. Adolescents and young adults, particularly those aged 15 to 29, bear the brunt of this burden, with suicide ranking as the second leading cause of death in this age group. The gender divide in suicide rates is noteworthy, with men being almost twice as likely to complete suicide as women. However, this ratio fluctuates widely across countries. Special groups facing a heightened risk of suicide encompass first-line responders, military personnel, incarcerated individuals, and high-security hospital patients. Vulnerable populations, including minorities, homeless individuals, refugees, asylum seekers, and migrants, exhibit varying degrees of suicide risk, influenced by a complex interplay of sociocultural factors. Moreover, LGBTQ+ individuals, particularly transgender individuals, are confronted with alarmingly high rates of suicide attempts. The intricate fabric of factors contributing to suicide globally necessitates a multifaceted approach to prevention and intervention that acknowledges the unique challenges faced by these demographic groups [2]. The alarming rise in suicide rates has underscored the urgent need for comprehensive data analysis and visualization techniques to inform research, policy, and intervention strategies.

In the era of digital transformation, vast amounts of data are readily available from various online sources, including government agencies, healthcare institutions, research organizations, and online communities. These data repositories house valuable information related to suicide ideation, attempts, associated risk factors, and casualties. However, effectively harnessing this wealth of data for meaningful insights remains a significant challenge.

As suicide prevention and mental health promotion efforts become increasingly data-driven, the integration of Power BI into the research landscape presents an opportunity to empower stakeholders with real-time insights and actionable information. This project aimed to address the issue by raising awareness through utilizing Power BI to conduct an analysis of suicide rates across various countries.

The main objective of this project was to perform data analysis on the dataset using Microsoft Power BI. The specific objectives were: (1) to collect dataset from online resources; (2) to preprocess, clean, and transform the dataset; (3) to visualize the prepared data; (4) and to analyze and interpret the visualized data.

This project was limited to visualizing, analyzing, and forecasting the global suicide mortality rate of various countries, including by gender. The datasets contain data about the suicide mortality rate of 231 countries from 2000-2019.

II. RELATED WORKS

A. Suicide

Suicide is a pressing global concern, with over 700,000 lives lost to it annually [1]. Tragically, for every successful suicide, many more individuals attempt to take their own lives, underscoring the pervasive nature of this issue. Suicide ranks as the fourth leading cause of death among young people aged 15 to 29, highlighting its devastating impact on our youth. What is particularly alarming is that a significant majority of suicides, a staggering 77%, occur in low- and middle-income countries, dispelling the misconception that it is solely a problem of high-income nations. The methods employed for suicide, such as pesticide ingestion, hanging, and firearm use, further underline the global reach of this public health crisis [3]. Every suicide reverberates through families, communities, and entire nations, leaving a lasting impact on those left behind, as such, it underscores the enduring impact, revealing a complex interplay of grief, health reactions, disparities in support, and the arduous journey of rebuilding life after a loved one's suicide [4]. However, it's crucial to acknowledge that suicide is preventable through timely, evidence-based, and cost-effective interventions [5].

B. Data Analytics

Data Analytics involves the application of various efficient analysis methods and computational techniques to manage and analyze large-scale and complex datasets. These methods are designed to accelerate computation time and reduce memory costs during the Knowledge Discovery in Databases (KDD) process. Data analytics encompasses the utilization of mathematical concepts, advanced technologies like distributed computing with GPUs, and problem-specific strategies to enhance the performance of data mining algorithms. It aims to optimize the analysis of extensive datasets by mitigating computational expenses

and addressing the inherent challenges posed by NP-hard problems or large solution spaces [6].

C. *Microsoft Power BI*

Microsoft Power BI, a business intelligence platform, offers a user-friendly interface and robust capabilities to transform disparate data sources into coherent, engaging visuals, and interactive insights [7]. Its versatility makes it an ideal choice for researchers and analysts aiming to unlock the hidden patterns, trends, and relationships within complex datasets related to suicide. This study seeks to bridge the gap between raw data and actionable insights by employing Microsoft Power BI as a powerful tool for data analysis and visualization.

III. MATERIALS AND METHODS

Datasets were imported in Microsoft Power BI to prepare the data for visualization. The datasets were cleaned by removing duplicates, errors, and missing values. Columns were also renamed to properly label the data. Some columns' data type was also changed to its necessary type. For visualization, various charts and graphs were used to illustrate the data.

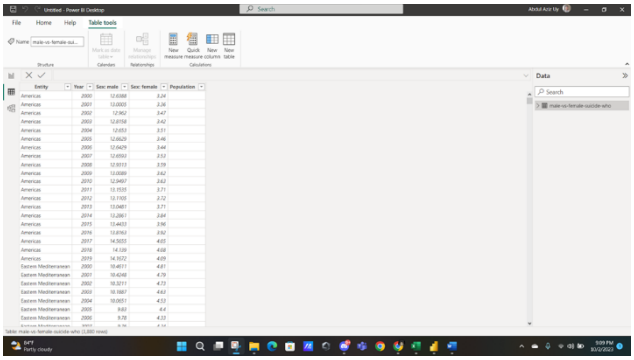

Figure 3.1 Import Data

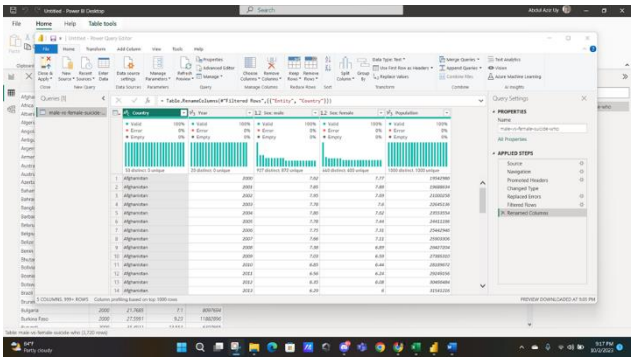

Figure 3.2 Clean and Transform Data of Gender Table

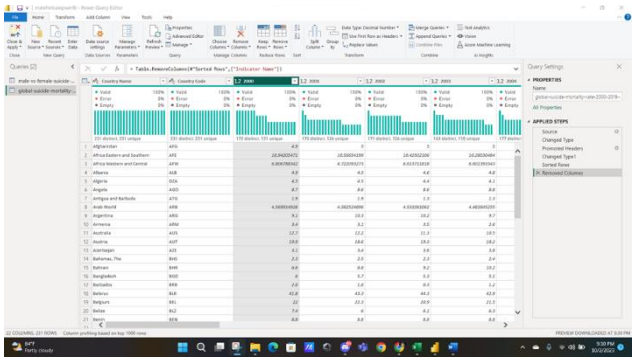

Figure 3.3 Clean and Transform Data of Year Table

To visualize the suicide mortality rate by gender, a pie graph and bar graph were used to clearly see the difference between the two variables. A map chart was used to fit and highlight the suicide mortality rate of each country in the years 2000 and 2019. For total and by gender global suicide mortality rate, a line graph was used to illustrate and predict the data. Visualizations and forecasting were grouped by different dashboards to avoid cluttering.

The datasets this project used contain data on the suicide mortality rate of various countries from 2000-2019. These datasets were downloaded from The World Bank's [8] and Our World Data's websites [9].

IV. RESULTS AND DISCUSSON

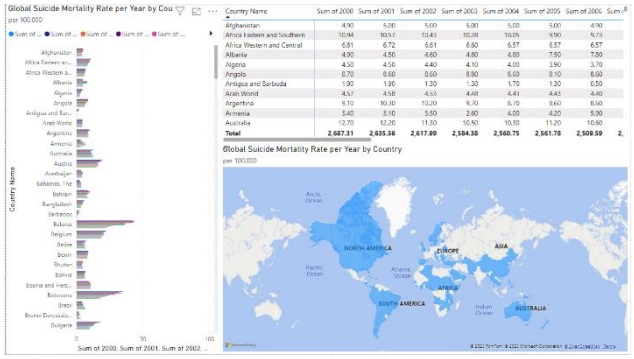

Figure 4.1 Visualization of Global Suicide Mortality Rate from 2000-2019

Figure 4.1 above shows the visualization of global suicide rate over the years from 2000-2019. In the year 2000, there was a total of 2687.31 per 100,000 suicide mortality. In the year 2019, the suicide mortality rate was 2154.21 per 100,000. Based on the bar chart, the highest mortality rate in all years combined comes from the Russian Federation while the country of Lesotho had the highest peak suicide mortality rate of 92.40 per 100,000 in a single year in 2015. Philippines ranks the third lowest overall while the lowest overall is the country of Sao Tome and Principe.

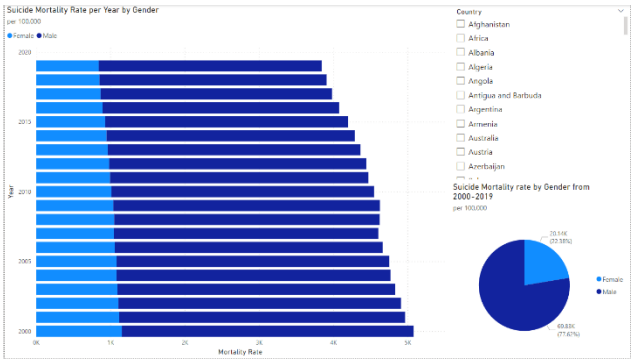

Figure 4.2 Visualization of Suicide Mortality Rate per Gender by Year

Figure 4.2 above illustrates the visualization for each gender every year from 2000-2019. Based on the Pie chart, the population is dominated by Male compared to Female. The Male population comprises of 77.62% of the total while the Female comprise 22.38% overall. There is also a downward trend according to the bar graph as it shows that suicide rate has lessened through the progression of the years.

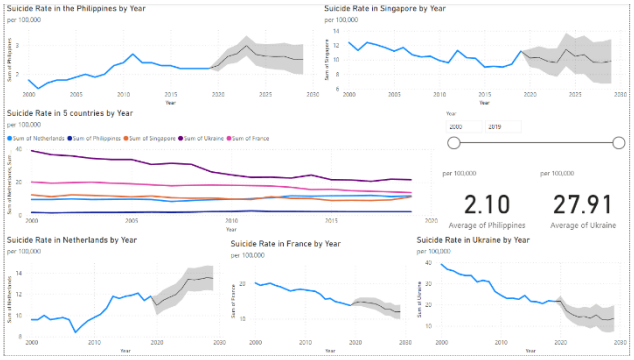

Figure 4.3 Forecasting of Suicide Mortality Rate from 5 Countries by Year

Figure 4.3 above illustrates the visualization and forecasting of the suicide mortality rate of Philippines, Singapore, Netherlands, France, and Ukraine by year. The line graph in the middle shows the suicide mortality rate visualization of the five countries mentioned from 2000-2019. Philippines has the lowest mortality rate compared to the other four, with an average of 2.10 deaths per 100,000 from 2000-2019. However, Ukraine had one of the highest mortality rates from 2000-2019, with an average of 27.91 deaths per 100,000. Singapore, Netherlands, and France were some of the countries having an average mortality rate between 10-18 deaths per 100,000.

Based on the forecast shown in figure 4.3, Ukraine and France had a downward trend of suicide mortality rate, and Singapore's forecast shows a neutral trend after 10 years. However, Philippines and Netherlands have an upward trend on the suicide mortality rate.

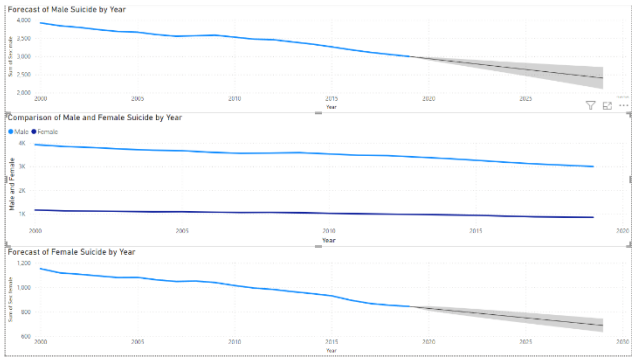

Figure 4.4 Forecasting of Global Suicide Mortality Rate by Gender from 2000-2019

Figure 4.4 above illustrates the visualization and forecasting of the global suicide mortality rate by gender from 2000-2019. A downward trend was observed from both female and male graphs. Although there were significantly more male deaths, its forecast shows that it also has a downward trend similar with the female graph.

Based on the results, Ukraine is one of the countries with the highest success of suicide, while Philippines is one of the countries with the lowest mortality rate. It was determined that most of them are male. An underlying factor is with the gender disparity leaning towards the male gender. Issues with gender stereotyping may still be prevalent during the course of the years. With this case, there may be a need for suicide prevention measures, programs, and activities for these parts of the country as well as worldwide in terms of the male gender.

The findings of this study have important implications for suicide prevention efforts in Ukraine. For example, public awareness campaigns should be launched to challenge gender stereotypes and promote mental health awareness among men.

Although France, Netherlands, Singapore, and Philippines have significantly lower mortality rates than Ukraine, there are several more factors as to why those countries have lower results. This could be because of sufficient support for people with mental illness, resulting to less suicide attempts, or there are fewer reported cases of suicide in those countries.

Overall, the findings of this study highlight the importance of suicide prevention efforts in Ukraine and other countries with high suicide rates. By addressing the underlying factors that contribute to suicide, such as gender stereotypes, we can help to reduce the number of suicides worldwide.

V. Conclusion

The use of Power BI to visualize and forecast suicide data from the World Bank and WHO has provided valuable insights into the global burden of suicide and the factors that contribute to it. The results of this study suggest that the following conclusions can be drawn:

- Suicide is a major global public health problem. In 2019, there were an estimated 703,000 suicides worldwide, making suicide the 10th leading cause of death.
- Suicide rates vary widely between countries. The highest suicide rates are found in high-income countries, while the lowest suicide rates are found in low-income countries.
- Male suicide rates are higher than female suicide rates in most countries. However, the gender gap in suicide rates is narrowing in some countries.

The findings of this study can be used to inform suicide prevention efforts at the global, national, and local levels. By identifying the countries and populations at highest risk for suicide, governments and other stakeholders can develop targeted and effective suicide prevention programs.

Additionally, the findings of this study highlight the importance of addressing the underlying factors that contribute to suicide, such as mental health problems, substance abuse, and social isolation. By investing in mental health services, reducing access to lethal means, and promoting social inclusion, we can help to reduce the number of suicides worldwide.

REFERENCES

[1] World Health Organization. (2021, June. 16*). Suicide Worldwide in 2019 [Online]*. *Available:* www.who.int/publications/i/item/9789240026643

[2] S. Bachmann. (2018, July). "Epidemiology of suicide and the Psychiatric Perspective." *International Journal of Environmental Research and Public Health [Online]*, vol. 15, no. 7, 2018, p. 1425. Available: https://doi.org/10.3390/ijerph15071425

[3] N. G. Choi, C. Nathan Marti, B. Y. Choi. (2022, November). "Three leading suicide methods in the United States, 2017–2019: Associations with decedents' demographic and clinical characteristics." *Frontiers in Public Health [Online]*, vol. 10, 2022. Available: https://doi.org/10.3389/fpubh.2022.955008

[4] A. Spillane, K. Matvienko-Sikar, C. Larkin, P. Corcoran, E. Arensman. (2018, January). "What are the physical and psychological health effects of suicide bereavement on family members? an observational and interview mixed-methods study in Ireland." *BMJ Open [Online]*, vol. 8, no. 1, 2018. Available: https://doi.org/10.1136/bmjopen-2017-019472

[5] World Health Organization. (2023, Aug. 28). *Suicide [Online]*. Available: www.who.int/news-room/fact-sheets/detail/suicide#:~:text=Suicide%20does%20not%20just%20occur,all%20regions%20of%20the%20world.

[6] C. W. Tsai, C. F. Lai, H. C. Chao, A. V. Vasilakos. "Big Data Analytics: A survey." *Journal of Big Data [Online]*, vol. 2, no. 1, 2015. Available: https://doi.org/10.1186/s40537-015-0030-3

[7] IT@Cornell. (2022, Nov. 21). *Microsoft Power Bi [Online]*. Available: it.cornell.edu/office-365-productivity/microsoft-power-bi

[8] The World Bank. (n.d.). Available: data.worldbank.org/indicator/SH.STA.SUIC.P5.

[9] Our World in Data. (2022). Male vs. female suicide rate, 2019 [Online]. Available: Male vs. female suicide rate, 2019 (ourworldindata.org)