Gender Differences in Developed and Underdeveloped Nations and the Impact on Suicide Rates

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*Abstract*

Today, suicide constitutes one of the leading causes of death in the world. Suicide represents a significant cause of death globally, claiming the lives of hundreds of thousands of people annually. While there are more advanced resources and preventative measures available in developed nations, the topic of suicide in underdeveloped nations is one that requires more study. The United Nations (UN) designates forty-seven least developed nations (LDC). Due to the availability of both resources and data, there are sparse studies on the effect and prevalence of suicide in these nations. Furthermore, there is a documented discrepancy in the rate of suicide between biological males and females. This study explores a variety of datapoints related to these topics. First, this study explores the relationship between suicide rate and whether or not a country is developed or underdeveloped. Second, this study explores the relationship between male and female suicide rates in developed and underdeveloped nations. Finally, this study explores treatment and preventative measures, including medical facilities and human personnel, and how their strategic deployment can aide in alleviating the problems caused by death by suicide.

*Introduction*

Globally, suicide represents a significant cause of death. It is a cause of death experienced in every nation, although global suicide rates can differ greatly from one nation to the next. For example, in the United States over 45,000 people died by suicide in the year 2020, according to data compiled by the CDC [1]. While this is a staggering number, the CDC estimates that there was a total of 1.2 million suicide attempts in the United States in that same year. Suicide as a cause of death is becoming increasingly prevalent. Moreover, this problem is not limited to the United States. In fact, in other, underdeveloped nations, the problem death by suicide represents may be worse. The International Association for Suicide Prevention reports that an estimated 703,000 people die by suicide on average each year [2]. When adjusting for population, this implies that the United States represents only a portion of the global annual suicide deaths. Furthermore, the World Health Organization (WHO) reports that suicide is the fourth leading cause of death globally amongst 15–29-year-olds [8]. While the method of suicide varies from case to case, the most widely used methods include the ingestion of pesticide, hanging, and firearms [8].

While there is a wealth of data regarding suicide in developed nations, the need for more advanced data collection methodologies in underdeveloped nations is readily apparent. As such, data on suicide is not available for 53% of the countries in the world, accounting for 27% of the global population [8]. Furthermore, there is evidence to suggest that suicidal precursors and tendencies differ between underdeveloped and developed nations [8]. These disparities include differences between suicide according to gender, suicide according to socioeconomic status, suicide according to marital status, and suicide according to age. This should inform suicide prevention strategies in these nations and gives key insight into the demographics of those who may experience suicidal ideation at some point in their life.

In accordance with this idea, the WHO developed a Mental Health Action Plan aimed at preventing the occurrence of suicide globally. Specifically, this plan allocated resources to the discovery of biological, psychological, social, environmental, and cultural factors affecting suicide across the globe [8]. As such, the global effort to combat death by suicide is a cross sectional mission aimed at mitigating a number of factors beyond just psychological well-being.

In addition to a continuously growing illustration that death by suicide represents in underdeveloped nations, there is a great deal of research that has been performed regarding the role that gender plays in suicide rates. One paradox surrounding this factor is the widely reported phenomenon that females attempt suicide at a higher rate than males, however; males die by suicide at a higher rate than females do [3]. Given this paradox, and the knowledge that death by suicide is a more common occurrence among males, developing a better understanding of the relationship between gender and suicidal tendencies is imperative.

*Materials and Methods*

The data for this study is aggregated from the Kaggle URL https://www.kaggle.com/datasets/twinkle0705/mental-health-and-suicide-rates?select=Human+Resources.csv. This archive consists of three total datasets which are utilized for comparison and analysis. Each file is formatted as a .csv file. The first file contains age standardized suicide rates for each country where data is available, expressed as deaths per 100,000 of the population. Further classification is made between males, females, and the aggregation of both genders. Data is reported for the years 2016, 2015, 2010, and 2000. The file is further augmented by designated by labeling each column as either “Developed” or “Underdeveloped”. The nations that are designated “Underdeveloped” are those that feature on the UN’s list of LDCs [4].

The second file contains data pertaining to mental health facilities, including mental hospitals, health units, outpatient facilities, day treatment facilities, and residential facilities each country featured in the year 2016. The number of facilities each country features is expressed in terms of units per 100,000 of the population in order to normalize the data. This data is augmented by importing the age standardized suicide rate from the first file. This is done so that comparisons can be made between a country’s deployment of mental health facilities and suicide rate.

The third and final file contains data regarding mental health practitioners, including psychiatrists, nurses, social workers, and psychologists, each country employed in the year 2016. Again, this value is expressed as a ration of practitioners per 100,000 of the population to normalize the data. Similar to the facilities dataset, the age standardized suicide rate is imported as well to compare the effect of mental health practitioners on suicide rate in various countries.

*Results*

First, consider the overall distribution of global suicide rate independent of national development level or gender distinctions. This will give a baseline value to consider when comparing to other subsets of the population. Figure one displays the distribution of annualized suicide rate by year, expressed in terms of deaths per 100,000 of the population.

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Figure 1: Distribution of Standardized Suicide Rates Over Time

There are a few key observations regarding this plot. First, note that the overall trend over time is a decrease in suicides. As time progresses, the outlier values become less extreme, and by 2016 the highest standardized suicide rate is around 50 deaths per 100,000 of the population. Additionally, while not as drastic, it also appears as if there is a slight decline in the median value over time. This hypothesis can quantified: in 2000 the median value was 9.05, in 2010 the median value was 7.7, in 2015 the median value was 6.95, and in 2016 the median value was 7.05. Thus, from the years 2000 to 2016, the global standardized suicide rate declined by 2 deaths per 100,000 of the population. Finally, note that the outliers on the low end are constant and approaching zero. No country is without suicide, but there are countries featuring a standardized suicide rate near zero.

Now, consider the differences in whether a country is classified as developed or underdeveloped in terms of annualized suicide rate. Figure 2 depicts developed vs underdeveloped annualized suicide rate by year.

A graph of suicide rates

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Figure 2: Annualized Suicide Rate Classified by Developed and Underdeveloped Nations

First, a note on data collection. Recall that data regarding death by suicide is not available for 53% of the countries in the world, representing 27% of the world’s population [7]. As such, best attempts are made to quantify the state of suicide in the world with the data available. The assumption is made that data collection efforts were done with best intentions and that the data available represents the most accurate that can be obtained.

With regards to Figure 2, note first how the issue of suicide appears to be worsening in underdeveloped nations. While in 2020 underdeveloped nations tended to cluster around or under 20 deaths per 100,000, by 2016 these values appear to be more dispersed and of higher value. Additionally, there appears to be no correlation between a nation’s status as an LDC and suicide deaths per 100,000. In fact, many developed nations feature suicide rates far exceeding those exhibited by LDCs. However, this plot also illustrates that certain developed nations exhibit the lowest suicide rates, and that these rates are not approached by LDCs.

In order to gain a better understanding of the state of death by suicide in LDCs, we isolate the LDCs from the above plot to obtain Figure 3.

A graph of suicide rate by year

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Figure 3: Suicide Rate by Year in Underdeveloped Nations

From Figure 3, there are a few noteworthy points. We note a wide distribution of values for suicide rate, indicating varying levels of success by country. Maximum values for suicide deaths per 100,000 of the population are 30.5 in 2000, 31 in 2010, 32.1 in 2015, and 32.6 in 2016. Note the upward trend. It appears as if the LDCs who experience high suicide rates are worsening over time. However, if we take the median values for all LDCs in these years, we see the opposite effect. In 2000, the median number of deaths per 100,000 was 11, 10 in 2010, 9.39 in 2015, and 9.35 in 2016. This is a decrease of 1.65 deaths per 100,000 over the six years for which data is available. This suggests that LDCs, on the whole, are mitigating suicide more effectively, but that the LDCs who experience higher rates are not enjoying the same success.

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Figure 4: Male Suicide Rates by Developed vs Underdeveloped Nations

A graph of suicide rates by developed and underdeveloped nations

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Figure 5: Female Suicide Rates by Developed vs Underdeveloped Nations

A graph of suicide rates by gender

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Figure 6: Suicide Rate by Gender

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Figure 7: Male Suicide Rates

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Figure 8: Female Suicide Rates

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Figure 9: Mental Hospital vs Suicide Rate in Developed vs Underdeveloped Nations

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Figure 10: Outpatient Facilities vs Suicide Rate in Developed vs Underdeveloped Nations

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Figure 11: Psychiatrists vs Suicide Rate in Developed vs Underdeveloped Nations

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Figure 12: Psychologists vs Suicide Rate in Developed vs Underdeveloped Nations

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Figure 13: Social Workers vs Suicide Rate in Developed vs Underdeveloped Nations

*Discussion*

*Summary*

References

[1] - American Foundation for Suicide Prevention. (2023, February 17). *Suicide statistics*. American Foundation for Suicide Prevention. https://afsp.org/suicide-statistics/

[2] - *Global suicide statistics*. IASP. (2021, August 24). https://www.iasp.info/references/

[3] - Sara Canetto, S., & Sakinofsky, I. (n.d.). *The gender paradox in suicide - researchgate*. ResearchGate. https://www.researchgate.net/profile/Silvia- Canetto/publication/13720598\_The\_Gender\_Paradox\_in\_Suicide/links/59dd78c20f7e9b5 3c1979730/The-Gender-Paradox-in-Suicide.pdf

[4] - United Nations. (n.d.). *LDCs at a glance | Department of Economic and Social Affairs*. United Nations. https://www.un.org/development/desa/dpad/least-developed-country- category/ldcs-at-a-glance.html

[5] - Vijayakumar, L. (2004, October). *Suicide prevention: The urgent need in developing countries*. World psychiatry : official journal of the World Psychiatric Association (WPA). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1414701/#:~:text=There%20are%20mar ked%20differences%20in,a%20higher%20risk%20of%20suicide.

[6] - World Health Organization. (n.d.). Progress, examples and indicators - world health organization. https://apps.who.int/iris/bitstream/handle/10665/279765/9789241515016-eng.pdf

[7] - World Health Organization. (n.d.-a). *Suicide*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/suicide

[8] - World Health Organization. (n.d.-b). *Suicide worldwide in 2019*. World Health Organization. https://www.who.int/publications/i/item/9789240026643