2.1 Variables and Data Sources:

Due to the sheer number of potential factors associated with suicide and the complex nature of the relationships between them, we wanted to identify those that were best associated with suicide rates at the country level. We chose to limit our study to a small set of factors that could be controlled for and acted upon via policy interventions. The domains from which we drew the factors, had to be broad enough to reasonably represent as many of the potential causes or mitigators of suicide as possible. Among the domains in consideration were lifestyle, medical/mental health, economic, and suicide-focused policy. **Health Expenditure** and **GDP per capita** were chosen to reflect the resources that a country has its disposal to reduce the suicide rate. **Liters of Alcohol per capita** was chosen to account for an aspect of culture (alcohol consumption) that the media often links to mental health outcomes. The **presence of a suicide prevention strategy**, the **number of psychiatrists**, and **the number of mental hospitals** were also chosen to reflect how a country has deployed its resources to improve mental health outcomes. The **female/male labor participation ratio** was also included to control for trends or changes related to gender labor participation rates. See the table below for a detailed breakdown.

Table 1: Data Sources

|  |  |  |
| --- | --- | --- |
| **Input** | **Data Description** | **Source** |
| Current Health Expenditure as a Percentage of GDP | This data provides an indication on the level of resources channeled to health relative to other uses. It shows the importance of the health sector in the whole economy and indicates the societal priority which health is given measured in monetary terms. | World Health Organization [2] |
| Labor force participation rate (female-male ratio) | Ratio of female to male of proportion of a country’s working-age population (ages 15 and older) that engages in the labor market, either by working or actively looking for work, expressed as a percentage of the working-age population. | United Nations Development Programme [1] |
| GDP per capita, PPP | Gross Domestic Product converted to international dollars using purchasing power parity (PPP) rates and divided by total population. This data is in terms of PPP in order to account for differences in the cost of living between countries. | World Bank [1] |
| Liters of Alcohol per capita | Total (sum of recorded and unrecorded alcohol) amount of alcohol consumed per person (15 years of age or older) over a calendar year, in liters of pure alcohol, adjusted for tourist consumption. | World Bank [2] |
| Suicide Prevention Strategy | Countries which are known have a stand-alone national suicide prevention strategy are included as 1s, else 0. Note that the plan must be stand-alone, and may not be integrated into another plan, in order to count in the dataset. | World Health Organization [3] |
| Psychiatrists in mental health, per 100,000 pop. | Number of Psychiatrists working in the mental health sector, per 100,000 population. | World Health Organization [4] |
| Mental hospitals, per 100,000 pop. | Number of hospitals dedicated to mental health per 100,000 population | World Health Organization [5] |

* World Health Organization [1] : <https://apps.who.int/gho/data/node.main.MHSUICIDEASDR?lang=en>
* World Health Organization [2] : <https://www.who.int/data/gho/data/indicators/indicator-details/GHO/current-health-expenditure-(che)-as-percentage-of-gross-domestic-product-(gdp)-(-)>
* World Health Organization [3] : <https://apps.who.int/iris/handle/10665/279765>
* World Health Organization [4] <https://apps.who.int/gho/data/node.main.MHHR?lang=en>
* World Health Organization [5] : <https://apps.who.int/gho/data/node.main.MHFAC?lang=en>
* United Nations Development Programme [1] : <http://hdr.undp.org/en/content/labour-force-participation-rate-female-male-ratio>
* World Bank [1] : <https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>
* World Bank [2] : <https://data.worldbank.org/indicator/SH.ALC.PCAP.LI>

5.0 Reccomendations:

For the selected inputs chosen in the model, there are corresponding recommendations for each input. The following sections go over recommendations for each model input:

5.1 Suicide Prevention Strategy:

Even though countries that have put a national suicide prevention strategy in place, tend to have higher incidence of suicide rates overall, this is in reaction to their already higher suicide rates in general. As such it is still advised to have a national strategy to address suicide. Countries should consider establishing an authoritative agency, tasked with the continued investigating, formulating, and implementing of a National Suicide Prevention Strategy.  This strategy can include, but is not limited to, the establishing of a national suicide crisis line as well as suicide prevention and care services. In addition, it is best to follow recommended practices set forth by UN studies which show and help navigate the intersection of biological, psychological, social, environmental, and cultural factors which influence suicide, as well as successful policies which countries which countries which had national suicide prevention programs had implemented. Devolving countries are recommended to take advantage of online resources for policy planners the WHO's website MiNDbank for recommendations on mental health issues [1]. Follow actions like those below from countries with success in reducing suicide [2]:

* Reduce access to means and methods of suicide
* View suicide as a psychological mistake
* Improve medical, psychological and psychosocial initiatives
* Distribute knowledge about evidence-based methods for reducing suicide
* Raise skill levels among staff and other key individuals in the care services
* Perform “root cause” or event analyses after suicide
* Support voluntary organizations

Strategies should not replace existing frameworks already in place in local government

Promote public awareness campaigns highlighting the prevalence of suicide. By changing public perceptions and reducing the stigmas associated with seeking help, the rate of suicide can be reduced.

[1] <https://www.who.int/mental_health/mindbank/en/>

[2] <https://apps.who.int/iris/rest/bitstreams/1174021/retrieve>

5.2 Alcohol Intake:

Suicide is a complex societal problem with no singular cause. However, harmful use of alcohol is among the major risk factors for suicide. Policy makers should consider implementing measures designed to mitigate the harmful use of alcohol as a means of reducing the rate of suicide. According to the WHO, among the policy interventions that have proven effective at reducing the harmful use of alcohol are varied. One is to increase the price of alcohol via taxation, which is implemented successfully in states such as Utah. Another is to enact and enforce restrictions on alcohol advertising (across multiple types of media), out of sight out of mind. And finally, enact and enforce restrictions on the physical availability of retailed alcohol (via reduced hours of sale), for example many “dry states” do not serve alcohol on Sundays. [1] It is not recommended to remove access to alcohol completely as seen in the disastrous US history lesion in the prohibition era. The increased violence may not have been worth the decrease in suicide. [2]

[1]  "WHO | Global status report on alcohol and health 2018 - World ...." 21 Sep. 2018,

<https://www.who.int/substance_abuse/publications/global_alcohol_report/en/>. Accessed 5 Apr. 2020.

[2] https://academic.oup.com/sf/article-abstract/68/2/513/1927193

5.3 GDP Per Capita:

There is a negative correlation between GDP per capita and suicide rates. While it is unknown why this is, we believe that money should be spent to uncover more about the relationship between income and suicide. An analysis on income of specific income groups would shed more light as to whether low income correlates to higher suicide or not. As such it is recommended Invest in research to better understand potential relationships between income instability, income protection and suicide at the individual level. In addition, governments should pursue measures aimed at poverty reduction and unemployment benefits to support economic well-being.

6.0 Research Limitations:

In any study there are limitations on what is considered in analysis. We only considered a limited set of inputs and analysis measures in the allotted time and would perform more had there been more. A breakdown of the research limitations of scope, what was considered, and methodology, how it was analyzed, are described below.

6.1 Scope:

There were issues with some of our inputs, but when drilling down to just the inputs used in the model, we can see room for improvement in data quality. When we used GDP per Capita as a proxy for income, other measures such as country-level median income should have been considered in the future. This would have given a non-uniform distribution of wealth in the country rather than a uniform distribution which is not the case with income inequality. When measuring the liters of alcohol consumed, we assumed a uniform consumption country-wide consumption rate. This doesn’t consider incidence of substance abuse. For Suicide Policy (NSPS), the effectiveness of organizational response hard per country is hard to gauge since local response vs federal not accounted for in measurement. We did not consider local/cultural/interactional measures making it difficult to make country-specific inferences in some cases.

6.2 Methodology:

For our analysis we chose to use a country level scope, however this cannot drill down to local or individual level, essentially limiting our level of fidelity of reflecting on reality. For each country we only used one year, as such our model assumes effects of each input are fixed rather than temporally differing. When considering our inputs, we cannot completely untangle the effect of variable interactions between another. Higher level interactions and additional factors which may influence suicide rates could be considered in the future. Finally, model formulation limited our analysis strength. We chose to use multiple linear regression for inferential and descriptive reasons, but more complicated / non-linear relationships could be characterized better with more complex approaches.