Project One: An Analysis of Suicide Rate and Several Factors

Overview

- This project focuses on the data of suicide rates as well as mental illness in recent years. The project includes visualizations of the relationship of them with gross national income (GNI), Human Development Index (HDI), generation, and gender.
- These are some of the indicators people might think of when discussing about suicides, but are they consistent throughout the world?
- Questions that we want to address:
  - It is easy to think that financial stress might lead to suicide where the lower the income level, the higher the financial stress, the higher rates of suicide. If this statement is true, the correlation between them would be a negative correlation.
  - If we increase the scale, how developed a country is might also affect the stress of living of its people. It's arguable to say either side, high-developed and low-developed countries, ought to have higher suicide rates. So how does the data say?
  - Generations might also have an effect. People who have lived in a certain time and certain country experienced wars. We usually think this would have a negative effect on people's mental health. Exmaing the global data can give us more insight on this matter.
  - Gender is another common factor to analyze for the prevalence of a disease. Both sides have good arguments as well. Many studies have shown that females tend to have a higher prevalence of certain mental disorders than males. Does this translate to suicide rates?
  - Mental disorders may lead to suicide, but what leads to mental disorders? Are any of the above factors contributing to mental disorders?

Results and Discussions

- **Global Suicide Rates vs. Income:**
  - Our hypothesis is that countries with lower gross national income (GNI) are at a higher risk of suicide than those with higher income because of higher levels of financial stress and limited access to mental health services, increasing the risk of suicide.
  - In this study, the measurement we used to assess the income level of a country is purchasing power parity (PPP) gross national income (GNI). PPP adjusts GNI figures to account for the cost of living, inflation rates, and exchange rates, providing a more meaningful measurement when comparing the income of different countries.
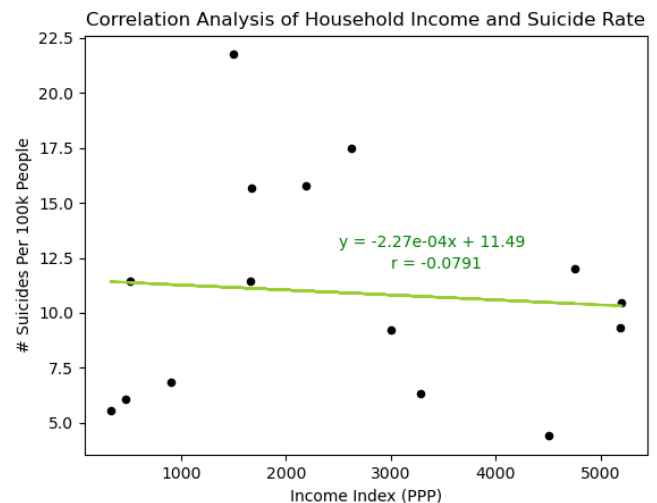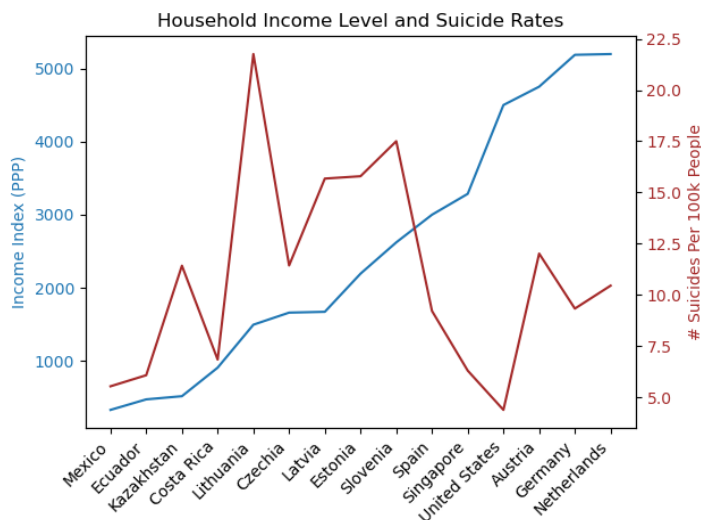
  - From the analysis we made, however, the correlation coefficient (r-value = -0.079) indicated no correlation between household income with the suicide rates of a country (figure on the right). We can also see that the lines of income and suicide rates are completely different without any pattern. While income is raising, suicide rates do not consistently increase or decrease (figure on the left).
  - This suggests that the difference between the suicide rates in different countries is less likely to be caused by different income levels.

- **Global Suicide Rates vs. HDI (Human Development Index)**
  - HDI, or Human Development Index, is a scaling system between 0 to 1 that takes the life expectancy, education, and per capita income to measure how developed a country is. This index is used by the UN to rank nations on their development. Because of the factors the scale takes into account, countries with a higher HDI are more developed than those with lower scores.
  - Due to the calculation of HDI, it is reasonable to believe that countries with higher HDI will effectively have lower suicide rates. These countries may have better access to mental health programs, overall happier populations, and safer, more stress-free environments.
  - Looking at the data, the r-value (r-value = 0.47) indicates a weak positive correlation. This means it is more likely that as HDI rises, so do suicide rates, despite not much. Because of this, HDI seemingly has an adverse effect on suicide rates than what was proposed (figure below).

Correlation Analysis Between HDI and Suicide Rate

$y = 2.61e+01x + -12.17$

$r = 0.4675$
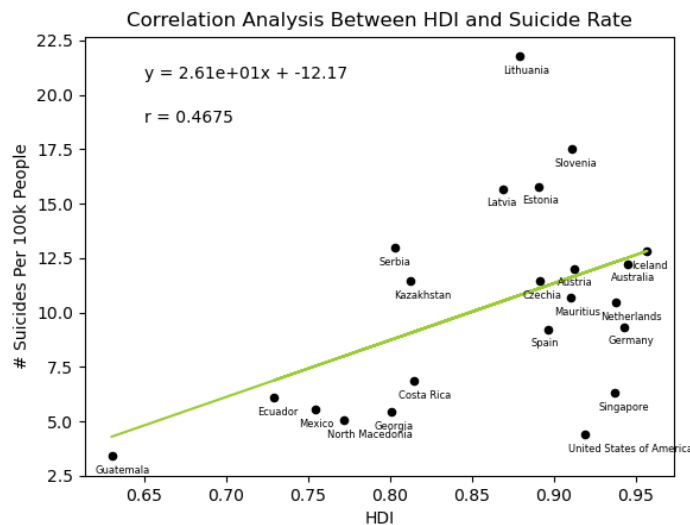
  - Based on the data, suicide rates do not decrease as a country becomes more developed, despite the higher life expectancy, education, and per capita income. Instead, it has some level of negative effect. There may be some reasons for that. People in higher-developed countries have higher workloads and increased social pressures because of higher expectations.
  - This also means that the difference in suicide rates among countries could be due to their development levels, with higher developments somewhat hindering the

well-being of their people.

- ○ Note, the data may behave differently without the inclusion of Soviet Bloc countries as they have a higher-than-normal suicide rate compared to other countries. With a wider dataset, we may see a different correlation between HDI and suicide rates.

- **Global Suicide Rate vs. Generation**
  - ○ People who live in different times have different stressors. If these differences do make a difference in suicide rates, we should be able to tell from the graphs.
  - ○ It is reasonable to believe that people born in earlier generations are at a higher risk for suicide than those born later, more so in nations with lower standards of living than those that are more developed. Individuals born in earlier generations have endured many hardships such as war and financial instability over the course of their life. It was common advice to "man up" and take whatever happens to them and go on about their life. It was generally looked down upon to express your emotions and talk about your feelings in their time, which may lead many to take their own life.
  - ○ This project looks at suicide rates in 2020 between 4 generations: The GI Generation born from 1901 to 1927, the Silent Generation from 1928 to 1945, the Baby Boomers from 1946 to 1964, and Gen X from 1965 to 1980:

Suicide Rates by Country (Baby Boomers) — Mean: 1.47

Suicide Rates by Country (Gen X) — Mean: 1.21
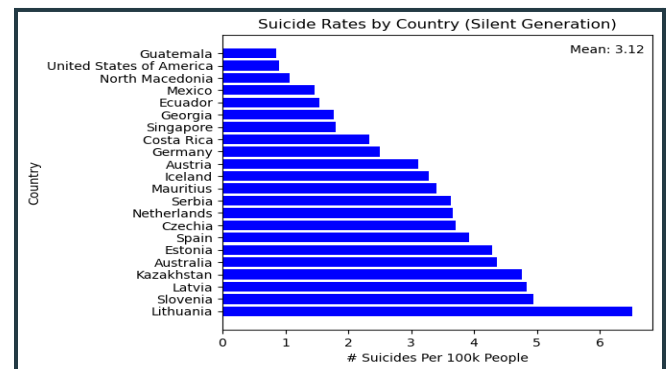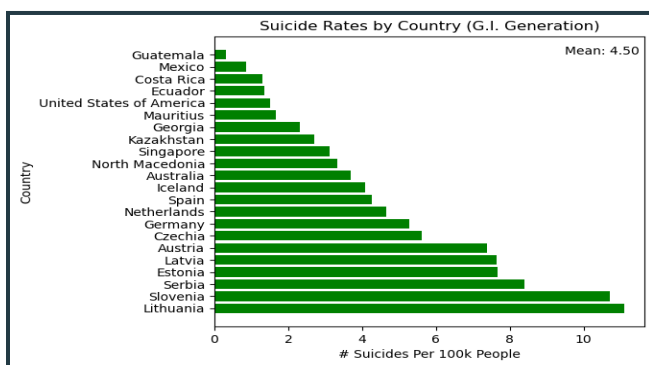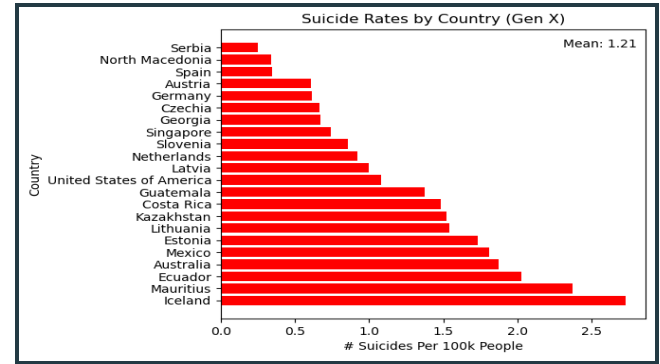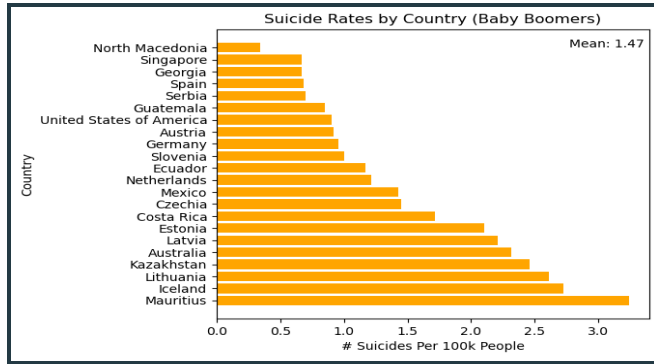
- ○ From the data, we see that as generations pass, the average suicide rates drop. There is a very high rate of suicides for the GI generation (mean: 4.5/100k people) and the Silent generation (mean: 3.12/100k people). Both of the two generations served in WW1 and WW2. It was proposed that this could be because of the lower standards of living and generational mindset, but the data shows otherwise. There is a diverse mix of nations that are more developed and less developed scattered throughout the data.

- ○ Despite this, there is one consistency between the GI Generation and the Silent Generation being that the high rate of suicides in Latvia, Estonia, Serbia, Slovenia, Lithuania, and Kazakhstan. All of which are post-Soviet Bloc countries. This is most likely due to the terrible living conditions of the early Soviet Union and the trauma faced during WWI and WWII as both men and women were forced to serve in the war.

- ○ This is evident when looking at the Baby Boomers and Gen X in the same countries, and their suicide rates substantially drop. These generations grew up in a time of no physical war and in a more developed Soviet Union.

- ○ From the graphs for Baby Boomers and Gen X, we can see that countries that are highly developed still experience high rates of suicide. These are Iceland, Mauritius, and Australia as an example. This proves that high standards of living do not diminish suicide rates.

- ○ Based on the data found, suicide rates are not dependent on the country's standard of living but rather the factors and events that the generation experienced. As previously mentioned, generations that grew up in the Soviet Bloc have substantially higher suicide rates than newer generations living in post-war

modern states. This may be attributed to low quality of life and trauma from war. On the contrary, nations with high standards of living still experience high suicide rates as seen with earlier generations in Iceland and Australia. This data may also be skewed by COVID-19 as this data was sampled in 2020.

- **Global Suicide Rate vs. Gender**
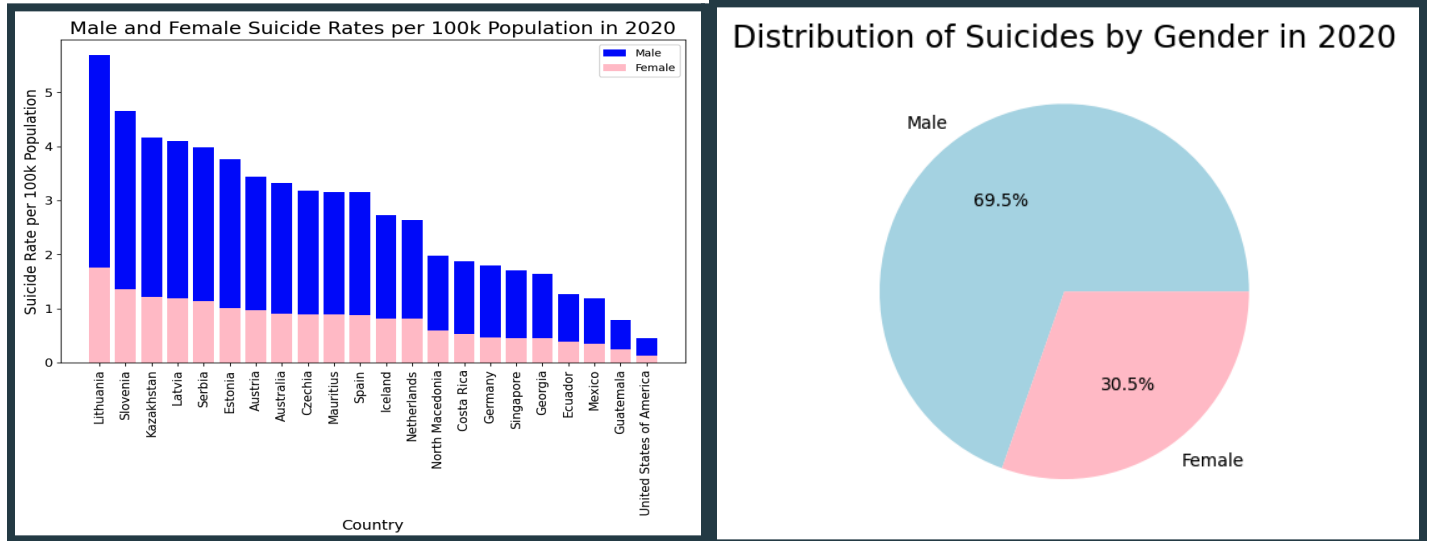
- From the analysis data, we see that males have a higher average suicide rate compared to their female counterparts, and this is consistent in all of the countries analyzed. Some potential factors that contribute to higher suicide rates among males than females are listed below.
  - Societal Expectations: Many societies have traditional gender roles and expectations that place a greater emphasis on men to display strength, resilience, and self-reliance. This can create pressure on men to suppress their emotions and display limited help-seeking behavior, leading to feelings of isolation, emotional distress, and an increased risk of suicide.
  - Mental Health Stigma: There is often a stigma surrounding mental health issues, particularly for men. Societal perceptions that seeking help for mental health concerns is a sign of weakness or vulnerability can prevent men from seeking support and treatment when they are experiencing

distress or facing emotional challenges, discouraging males from seeking help for mental health issues or expressing their emotions.

- ○ Additionally, notice the large number of men suicides in Russian Allied countries. This can be a result of political issues such as the tensions between Russia and Ukraine that started to build in 2020.

- ○ Note that this is not to say females do not face challenges that could lead to suicide. The reasons above are only considering what males are more likely to face than females.

- ○ This disparity is also consistent throughout the generations.
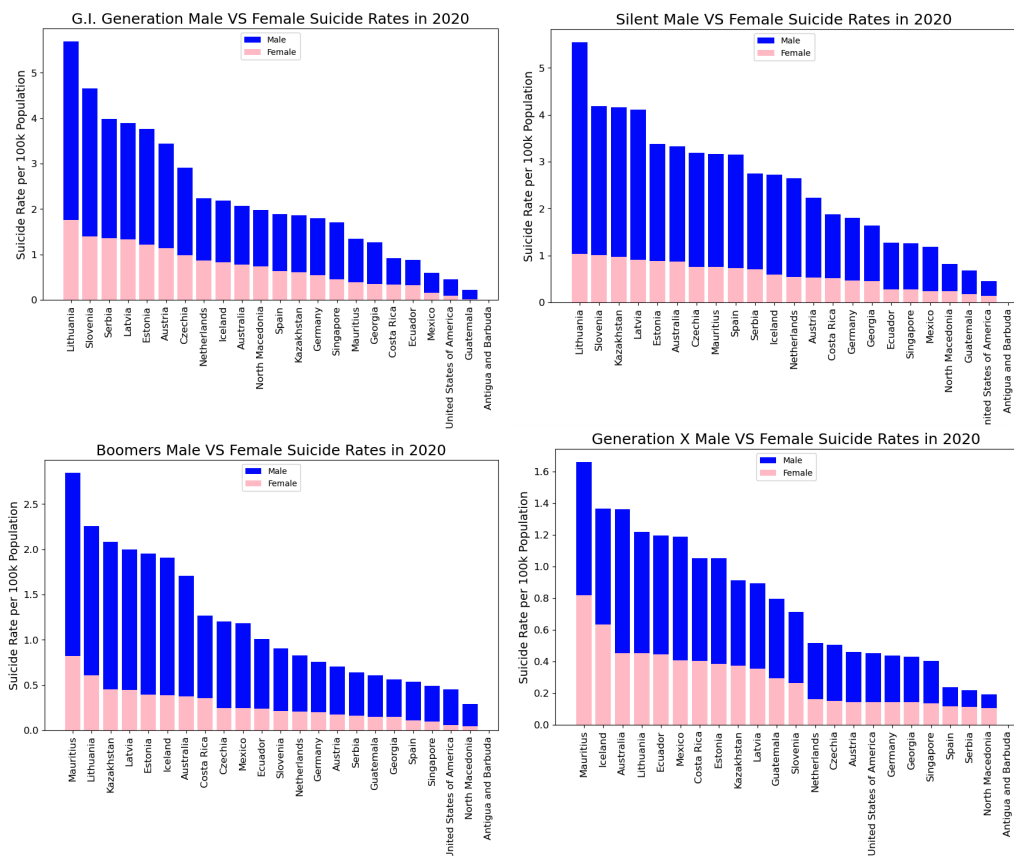

- ○ With this consistency among different countries and throughout generations, we can safely conclude that gender does have a significant influence on suicide rates.

- **Household Income vs. Mental Disorders:**
  - Mental disorders are strongly associated with suicide rates, and it may be worthwhile to know their correlations with factors we've investigated above.
  - In this section, we analyze the correlation between gross national income (GNI) and the rates of mental disorders across countries.
  - The hypothesis is that individuals with lower household incomes may be at higher risk of experiencing mental disorders because of financial and housing insecurity, as well as limited access to healthcare.
  - What we found (graphs on next page), however, is that schizophrenia (r-value=0.79), eating disorders (r-value=0.68), anxiety disorder (r-value=0.85), depression (r-value=0.55), and drug use disorder (r-value=0.41) have a positive correlation with household income. This indicates that the higher the income, the more likelihood of having the mental disorder. On the contrary, the higher the income, the lower the rates of alcohol use disorder, with an r-value of -0.37. In the meantime, bipolar disorder does not have a correlation with household income (r-value=0.23).
  - One possible explanation for this relationship is that higher-income individuals may experience other kinds of stressors, such as high work demands, long work hours, and pressure to maintain their social status and meet certain expectations. These stressors may contribute to stress and mental health issues such as anxiety, depression, and burnout.
  - Higher-income individuals may also have more access to substances such as certain drugs, which can increase the risk of mental health issues such as addiction and mood disorders. We suspect that it may be because of this reason that higher-income people have lower rates of alcohol since they have the ability to access higher-priced substances, for example, cocaine.
  - Another possible reason would be that lower-income individuals might have lower awareness of mental health and/or less access to healthcare resources, leading to their mental illness going unnoticed and undocumented.

Household Income Level and Mental Disorders
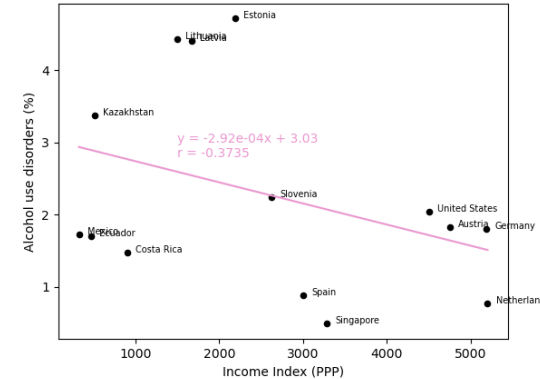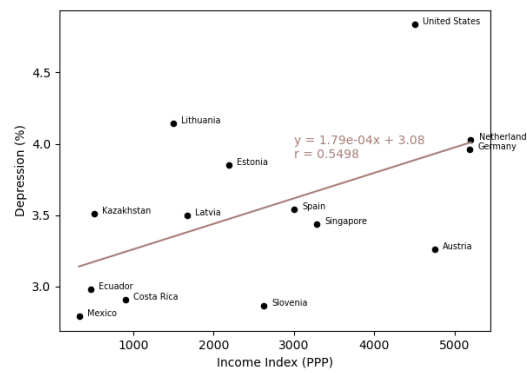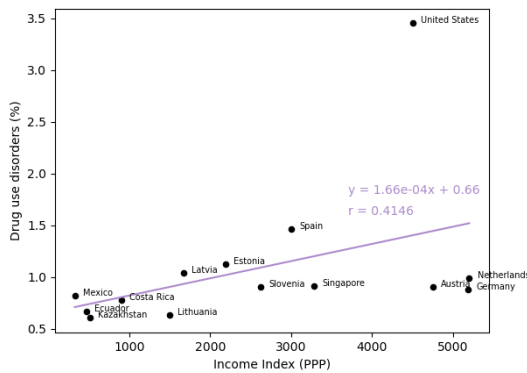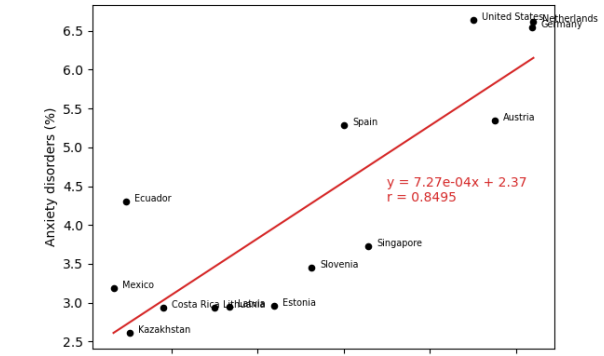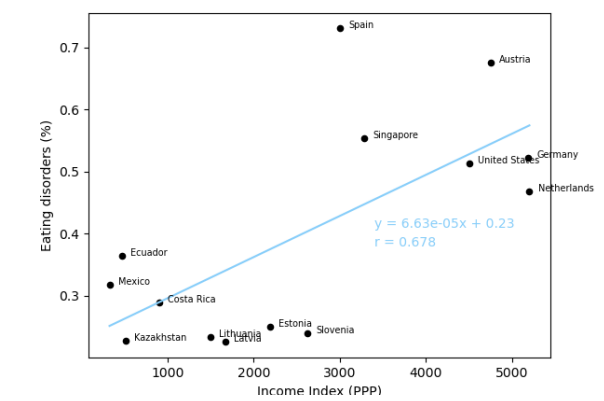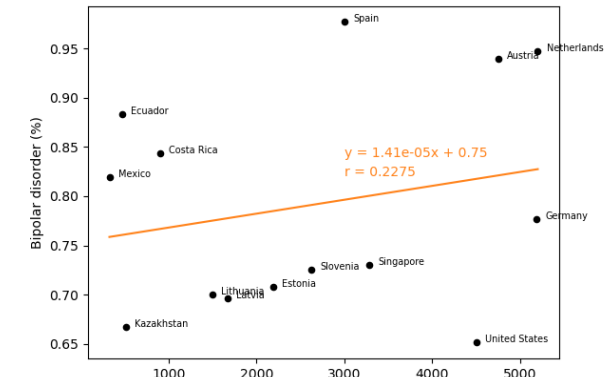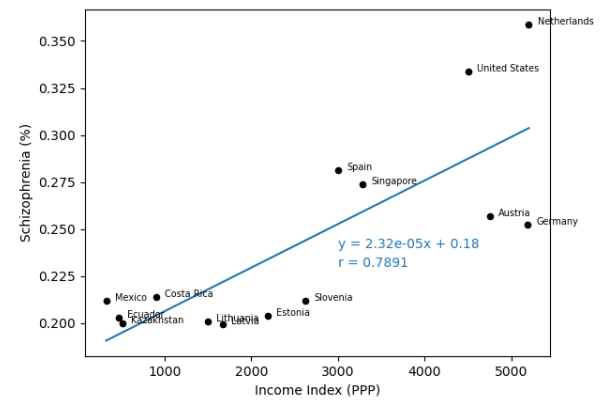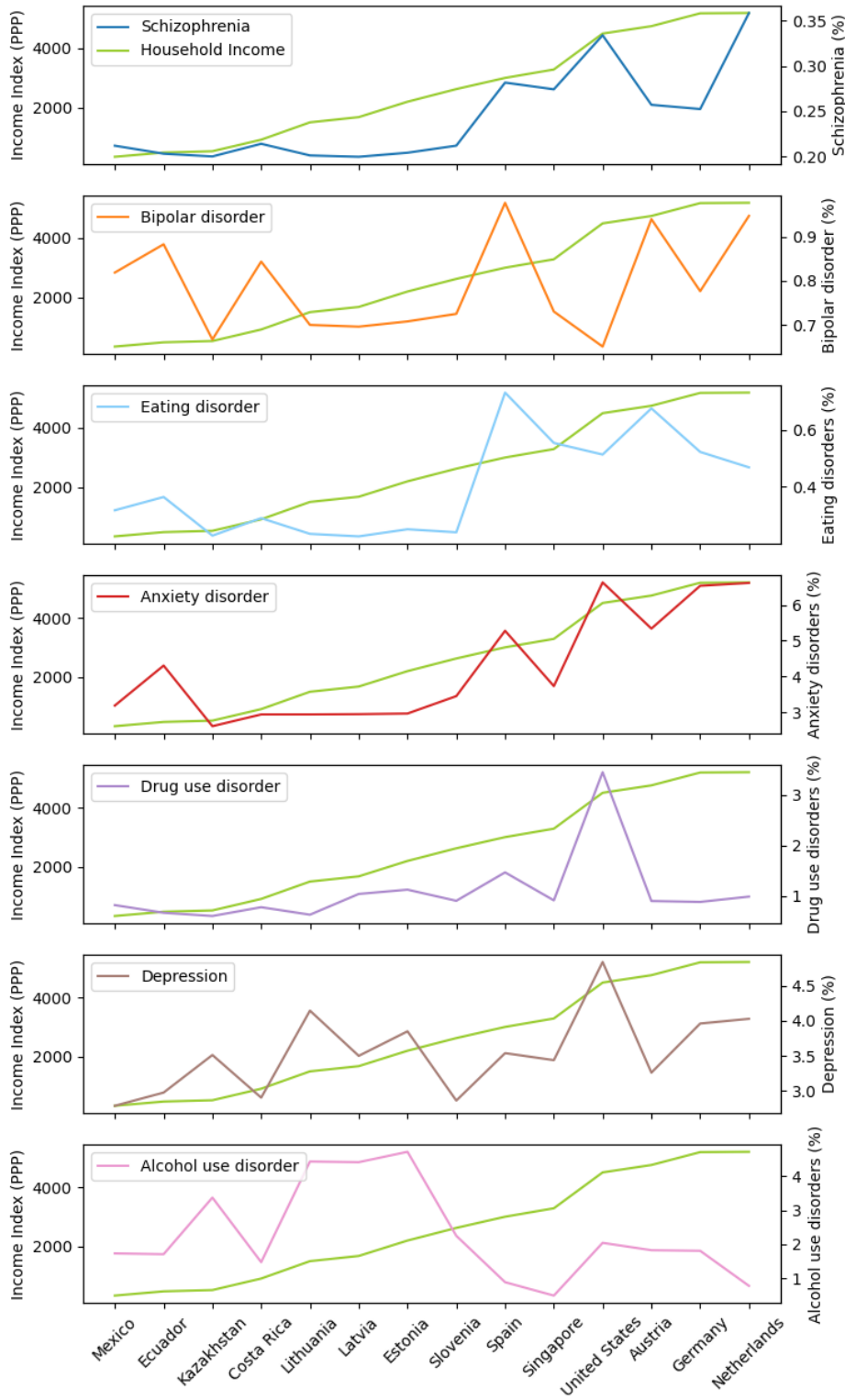
Limitation of this analysis

- Most of the data we analyzed is from only one year during the Covid times and should not be representative of the other years.
- There are many countries that do not have complete data for every variable we are comparing and they get dropped in our analysis. The data we are left with might include sampling bias and might not show the true trend of the world.

Potential future research

- It would be better if we could do an outlier analysis for the factors we discussed, and exclude the outliers in the correlation analysis.
- In the analysis of suicide rates and generation, a t-test could be done to see if the difference in the means of the four generations is statistically significant. This could be a piece of future information that will be added in.

Summary

- Suicide rates are likely dependent on the events that the generation experienced. Especially if there is a dramatic event such as a war, it's likely that the suicide rates will be high, as evident by the GI generation and the silent generation having higher suicide rates than the baby boomers and the generation X.
- Gender significantly affects the rates of suicide, with male being more susceptible across countries.
- A country's HDI score has a weak negative effect on its suicide rates.
- There is no correlation of gross national income (GNI) with the suicide rates of a country.
- The higher the GNI, the higher the rates of schizophrenia, eating disorders , anxiety disorder, depression, and drug use disorder. On the contrary, the higher the GNI, the lower the rates of alcohol use disorder. In the meantime, bipolar disorder does not have a correlation with GNI.