香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

MSc in Big Data Technology

MENTAL HEALTH: A WORLDWIDE OVERVIEW

MSBD5005: Data Visualization

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ABSTRACT

Mental illness is an exponentially growing global problem. More than 4.4% of the world's population (one in four people) suffer from mental health related issues. Such alarming figures reflect the wider prevalence of mental ill-health. Via this project, we aim to get a relation between different factors that affect mental disorders through numerous visualizations.

1. Introduction

According to World Health Organization (WHO), mental health is defined as "a state of well-being in which every individual realizes his or her own potential, can cope with normal stresses of life, can work productively and fruitfully, and is able to contribute to his or her community". Any disparity from this state is regarded as a form of mental illness or disorder.

Globally, mental health disorders are becoming an enormous burden by affecting the functioning and quality of life of its victims. Sadly, most countries turn a blind eye to this inherently perplexed challenge. Due of such stereotypes and prejudice associated with mental health, it is often driven into the shadow of stigma.

In spite of these challenges, recent times have seen significant progress in prioritising mental health on a global scale. In this project, we have represented the prevalence of different mental disorders with respect to the following four tasks:

1. GDP of a nation
2. Employment
3. Suicide
4. Social Media

2. GDP and Mental Health: Does Money Buy Happiness?

Though the prevalence of mental health is related to many factors, one major factor that affects the state of mind is the socio-economic conditions that people reside in. The economic status of a country is a measure of the living conditions of the people in that society. This could also serve as a potential indicator of their mental health quality. By intuition, it is easy to understand that mental health problems are related to poverty and deprivation. But in reality, it is surprisingly seen that even the richest economies in the word suffer very high levels of mental health problems.

2.1. Dataset Description

To visually see the relationship between economic status and mental health, a dataset containing the gross domestic product (GDP) of each country and its percentage of depressed people was created for this project.

2.2. Technology Used

Tableau was utilized to create the visualizations for the specified task.

2.3. Visualizations and Findings

Figure 1 visualizes how the GDP of a nation relates to the number of depressed people within that country. From the visualization, it can easily be inferred that United States, in spite of being the richest nation, also hosts a very high number of depressed people. On the other hand, low GDP countries like Greenland and Lesotho too suffer from extreme rates of depression. Most middle income nations, however, suffer from moderate to low depression.

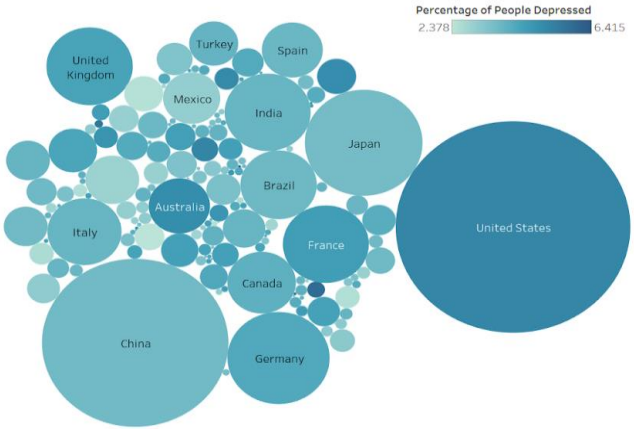

Figure 1: Relationship between a county's GDP and its mental health

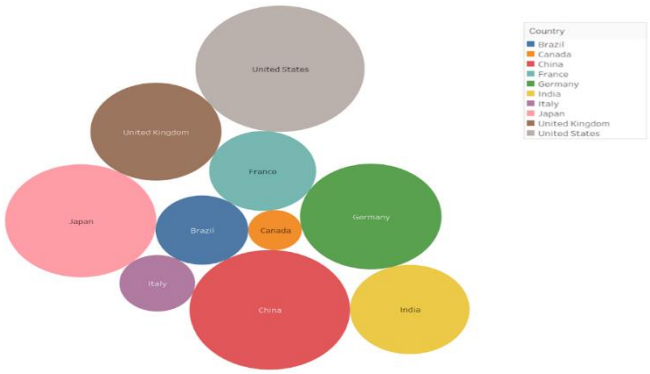

Figure 2: Bubble chart of top ten nations with highest GDP

Figure 2 represents the top ten countries with the highest GDP. The bubble size is proportional to the magnitude of the country's GDP. From the bubble graph, we can infer that United States, China, Japan are nations that have very high GDP. Figure 3 depicts the movement of depression among the top ten nations with highest GDP over the past 30 years.

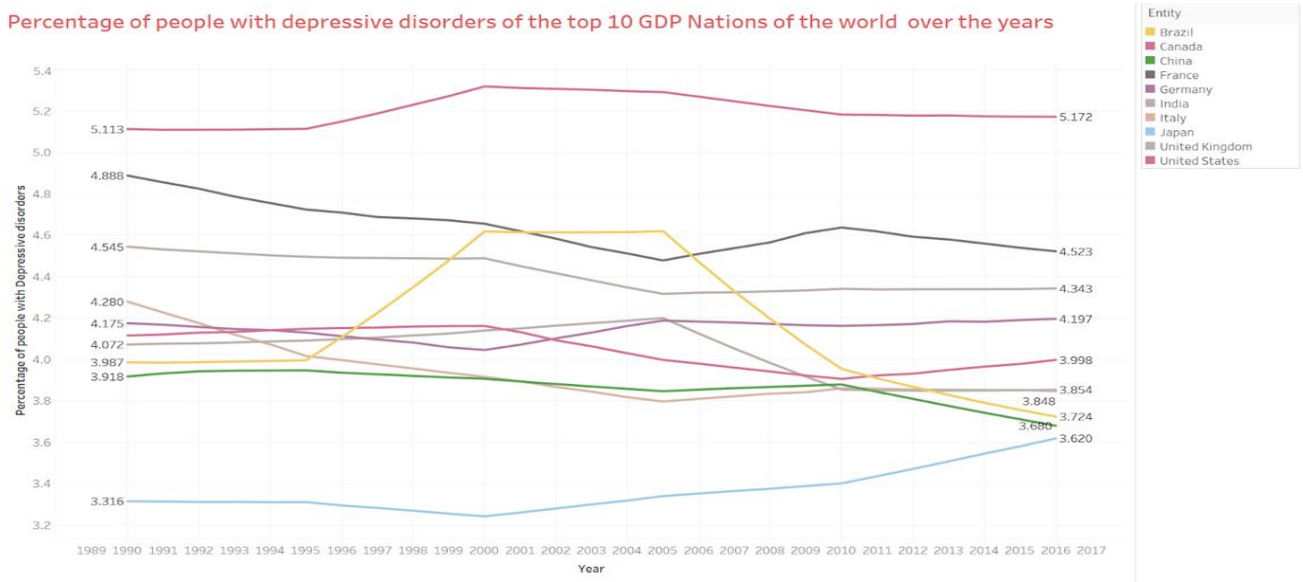

Figure 3: Change in mental health conditions for the top ten GDP nations over the past 30 years

3. Mental Health and Employment

Age is yet another factor that holds a major influence over the state of a person's mind. Figure 4 shows that people who suffer from mental health issues are usually aged between early twenties and late fifties. This age group roughly denotes the working-class population. Hence, people falling within this age group might be more prone to mental health issues due to the stress from managing careers and families, in this highly competitive world.

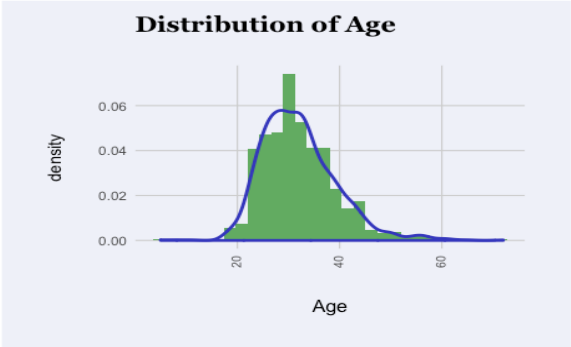

Figure 4: Distribution of mental health issues over age

3.1. Dataset Description

To visualize the above mentioned task, we have used data from a survey of mental health in technical companies available on Kaggle. Specifically, the survey measures attitudes towards mental health and frequency of mental health disorders in technological workplaces.

3.2. Technology Used

R programming language was utilized to create the following visualizations.

3.3. Visualizations and Findings

Looking closer at the situation within a workplace, there are some interesting findings. From figure 5, it is seen that majority of the people suffering from mental health issues tend to work in technology related companies. This could be explained by the extremely demanding and sedentary lifestyles of people working in the technology sector.

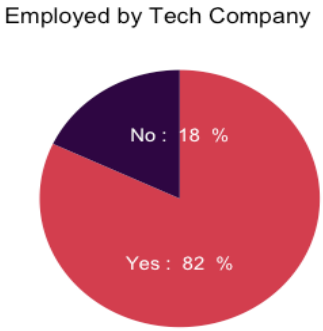

Figure 5: Distribution of occupation among work class people suffering from mental health issues

Surprisingly, it is seen that the support and awareness for mental health is low in the workplace. Figure 6 shows that only less than 40% of the companies provide mental health benefits. Figure 7 portrays that 70% of the companies do not even discuss mental health as part of welfare for their employees while only 40% of the employees are aware of the mental health scheme in their company (Figure 8).

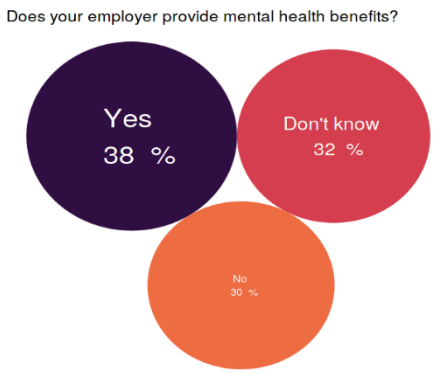

Figure 6: Breakdown of companies that provide mental health benefits

These statistics confirm the lack of awareness and assistance required at the workplace. In the recent time that has seen an alarming increase in mental health problems, it is essential to

bring awareness and education among the employees on how to maintain a sound mental health. This awareness will aid in addressing the problem at an early stage while at the same time help in eradicating the social stigma attached with it.

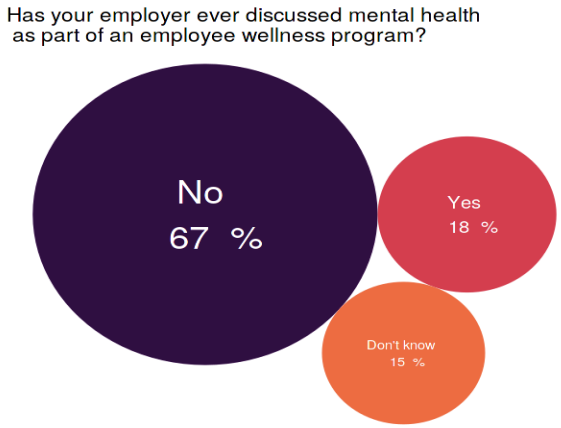

Figure 7: Breakdown of companies that discuss mental health

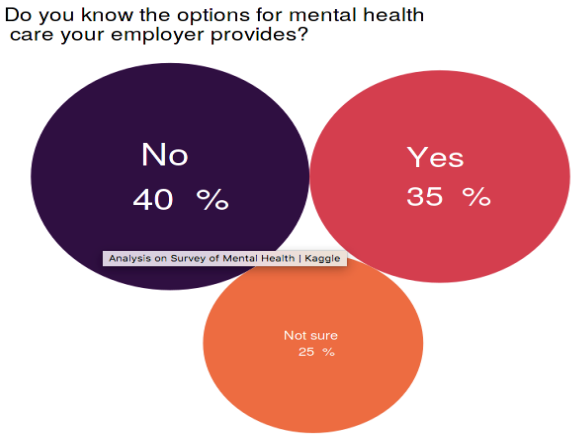

Figure 8: Breakdown of awareness of mental health benefits amongst employees of a company

4. Suicide: A comorbidity of Mental Health

Suicide is one of the most common co-occuring disease of any mental health disorder. Though there is no well documented relationship between them, mental health disorder has an inherently strong association with suicide attempts. However, not all suicide attempts can be attributed to mental health issues. In this task, we visualized the suicide rates due to mental health issues for the year 2016 to get an insight about the prevalence of this comorbidity across different countries (Figure 9).

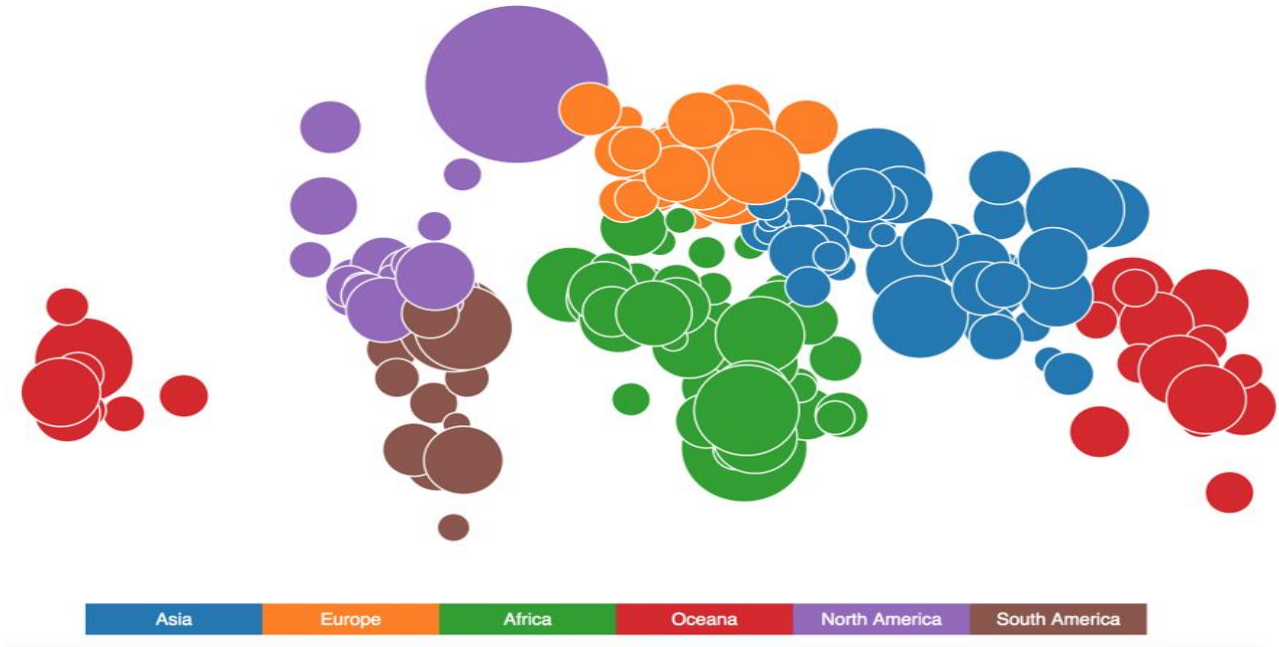

Figure 9: Suicides caused due to mental health issues across different countries in 2016

4.1. Dataset Description

The data utilized to visualize this task was obtained from the 'Mental Health Survey' data published by *Our World in Data*. The data had three main features, i.e., name of the country, its suicide rate due to mental health issues, and population of the country.

4.2. Technology Used

D3.js was used to create the visuals in this task. It is a javascript library which makes use of SVG, HTML5 and CSS standards for producing dynamic, interactive data visualizations in web browsers.

4.3. Visualizations and Findings

The three dimensional data is represented using bubble chart where the size of the bubble denotes the number of suicides due to mental health issue in a country, while its colour signifies different continents (Figure 9).

Figure 10 shows the suicide rate within each continent. It is evident from the visual that Sri Lanka in Asia, Romania in Europe, Lesotho in Africa, Kiribati in Oceania, Greenland in North America and Guyana in South America have the highest suicide rates due to mental health issues. It is also noted that all of these countries are low GDP nations. This highlights the correlation between GDP and mental health issues.

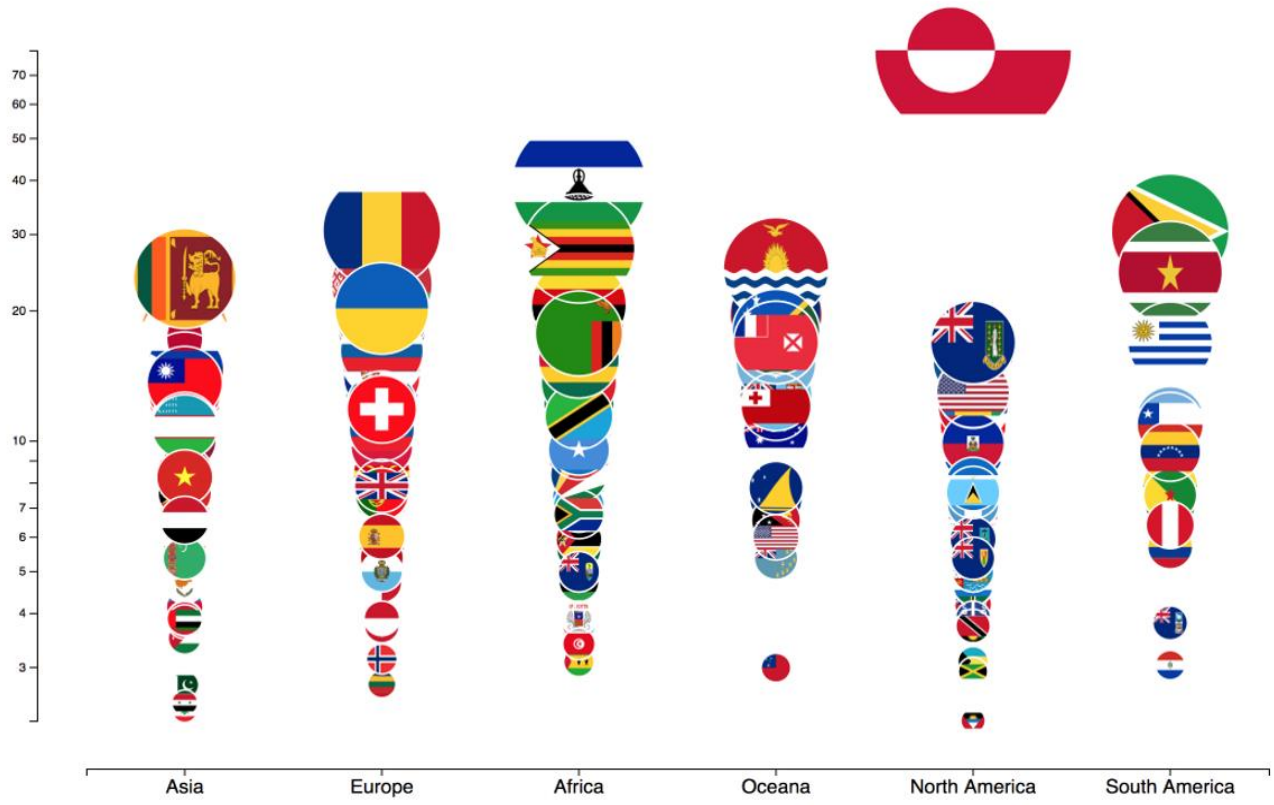

Figure 10: Continent based suicide rate caused due to depression (size of the flag depicts suicide rates)

5. #BreakTheStigma: A Social Media Delusion?

Most societies perceive the symptoms of mental health disorders as threatening and uncomfortable. This frequently strengthens the stigma and discrimination towards people with mental health problems. Such reactions are common when people are brave enough to admit their mental health problems, and they can often lead on to various forms of exclusion or discrimination. Through this task we tried to get an insight on whether social media platforms help in breaking the stigma associated with mental health, or whether the platform is just another form of delusion.

5.1. Dataset Description

Twitter data was crawled for about 10 days and tweets containing keywords like panic attack, depression, anxiety, bipolar disorder , #breakthestigma etc. was extracted.

5.2. Technology Used

Python libraries (Matplotlib and Plotly) were mainly used to create the visualizations for this task. Matplotlib and Plotly are used to create high quality visualizations in Python.

5.3. Visualizations and Findings

Figure 11 shows the word cloud created from the sentiments of the crawled tweets. The size of the word defines its frequency of occurrence while the colour denotes the sentiment – blue and purple indicating positive sentiment, and light green and yellow indicating negative sentiment. As very few tweets were available with location parameters, the words in the word cloud does not specify its origin. From the visualization, it is clearly seen that there are a greater number of negative tweets.

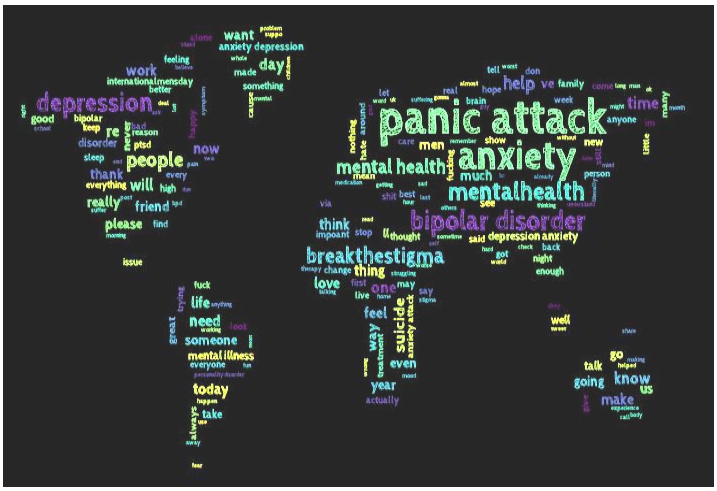

Figure 11: Sentiment encoded word cloud of crawled tweets

The visual in figure 12 ascertains that most tweets related to mental health occurs either in the early morning or in the late night indicating that higher number of people are sad during that time of the day. And there is also a sudden negative peak in the evening depicting evening sickness. Figure 13 shows that there are very few self-help books that actually have contents related to bipolar disorder, and that majority of these books talk about topics to life and help in general.

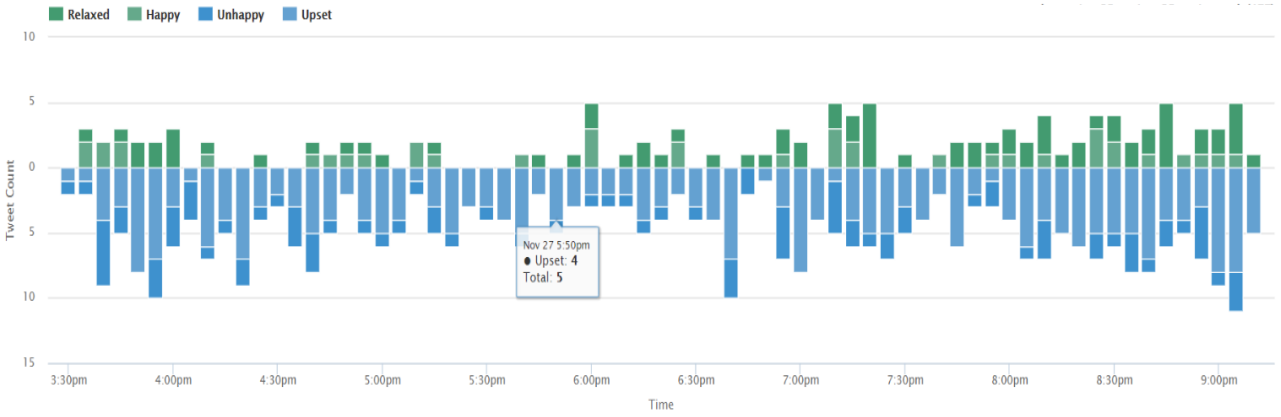

Figure 12: Sentiment stacked bar graph of showing the number of positive and negative tweets over a part of the day

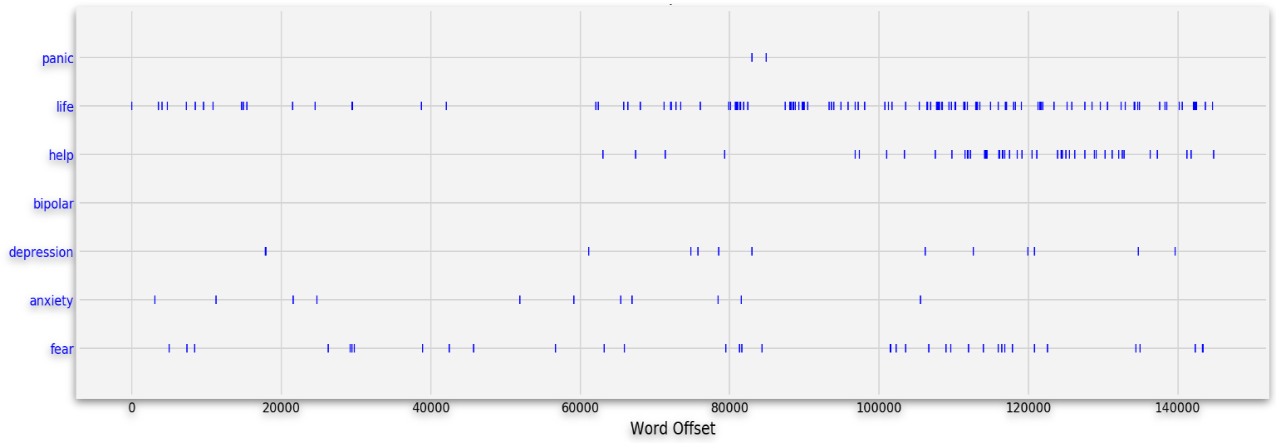

Figure 13: Lexical dispersion plot showing the frequency of books talking about certain mental health related keywords

6. Mental Health: An Overall View

The overall visualizations of the aforementioned four tasks have been holistically summarised using parallel coordinates. In the visualization, the colour encoding represents different continents (Figure 14).

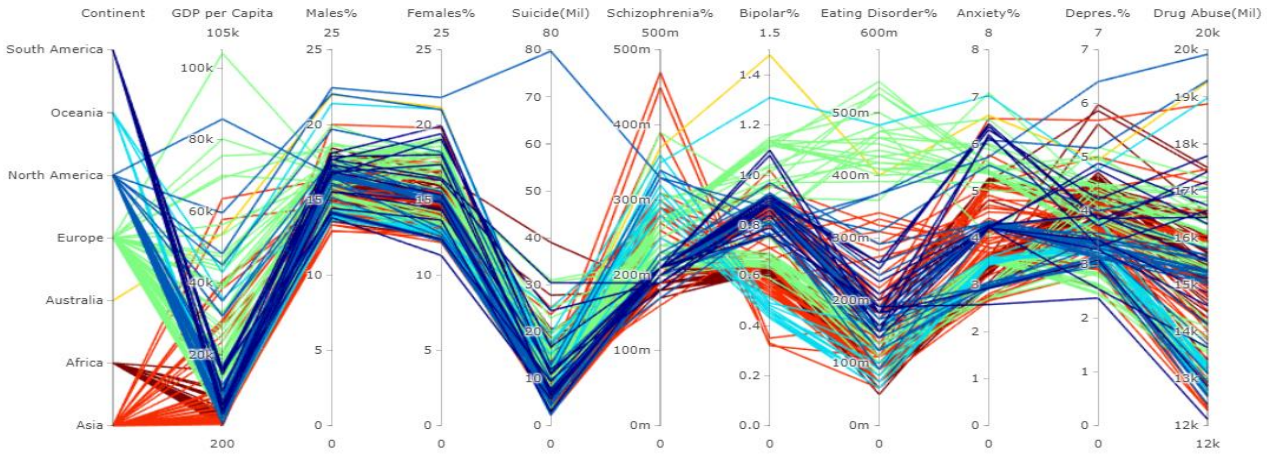

Figure 14: Parallel coordinates depicting the overall view of factors affecting mental health

Figure 15 provides looks into the nuances of the parallel coordinate visualization shown in figure 14. It can be inferred from the visual that Greenland has the highest suicide, Australia has the highest bipolar disorder and that most European countries suffer from eating disorder. It is also seen that countries with low GDP seldom commits suicide. This can be probably be due to high number of dependent family members.

Figure 16 takes a deeper look into the relation between depression, substance abuse and GDP. It is seen that though depression has a clear cut positive correlation with substance abuse, it does not have a relation with GDP. In the visualization, the size of the bubble denotes GDP and colour indicates the continent.

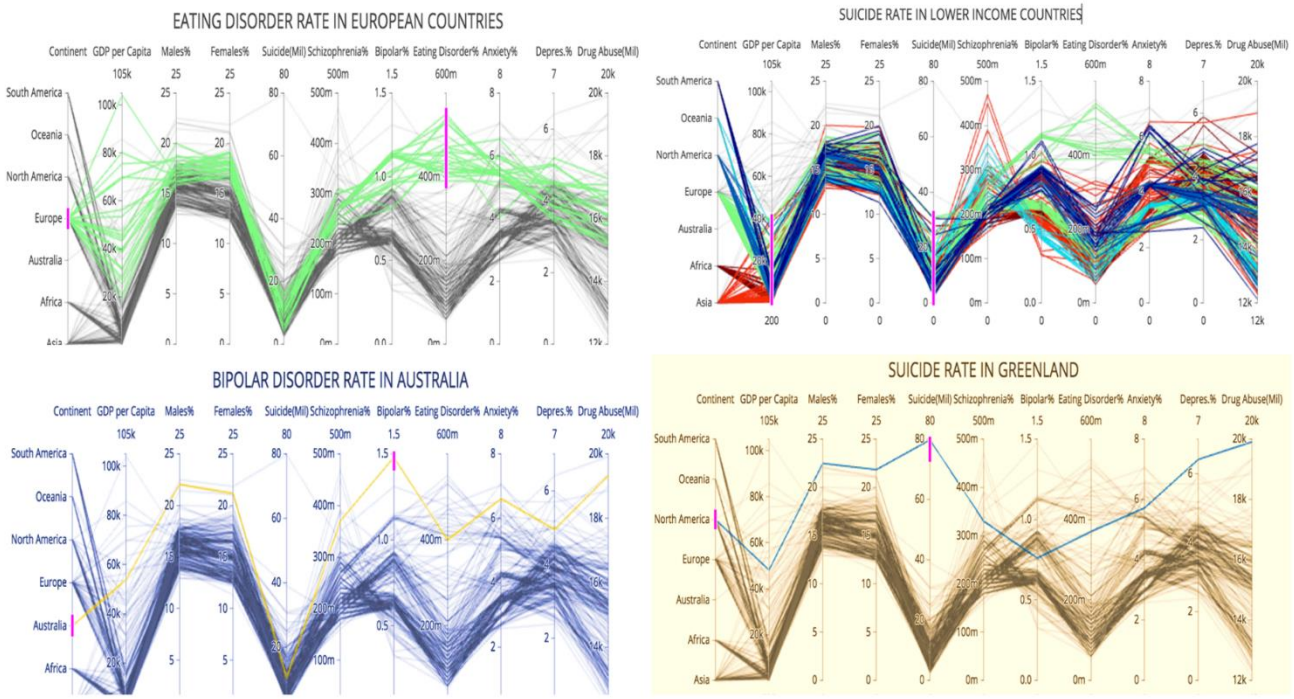

Figure 15: Inferences made from the parallel coordinates plot

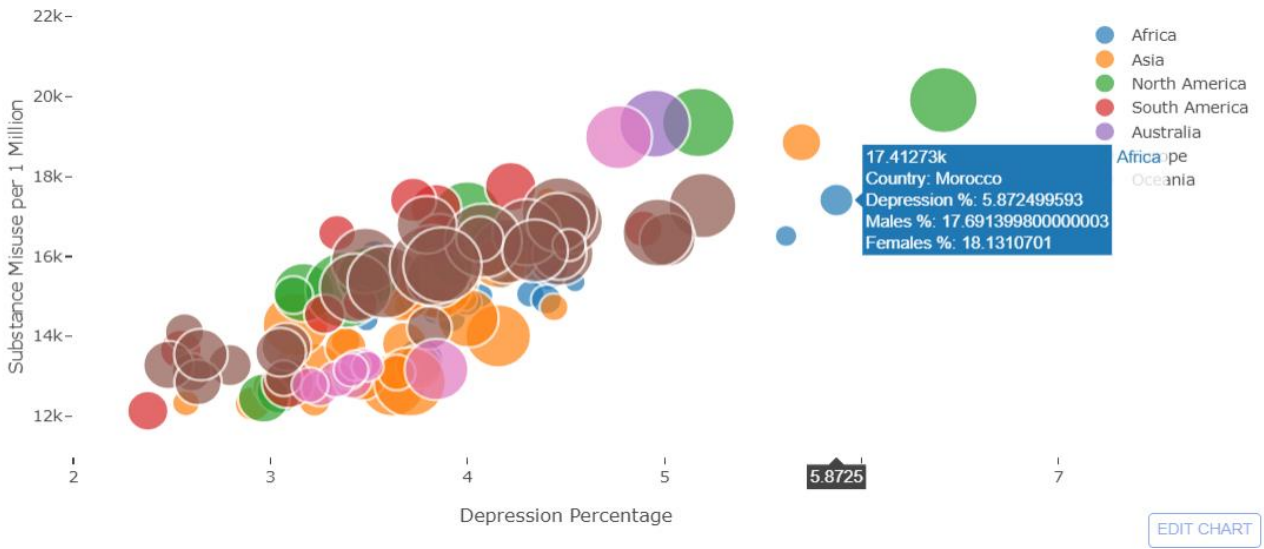

Figure 16: Relation between substance abuse, depression and GDP

7. Conclusion

Mental health is an integral part of one's overall health and well-being. It can be stimulated due to individual characteristics as well as economic, social, cultural and environmental reasons. The rise of mental health issues around the world is a major concern as it directly affects the cognitive abilities of its victims which, in turn, can affect the working-class population. Instead of holding a stigma towards mental health, it is the responsibility of the individuals and the governments to address this issue and take suitable measures to reduce, and completely eradicate this problem.