University Of Maryland, Baltimore County (UMBC)

HIT 750 : Data Analytics

Professor : Dr. Isaac Mativo

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Paper on “Global Trends in Mental Health Disorders”

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Abstract

Around the world, millions of people are quietly battling mental health disorders—conditions that profoundly affect how we live, connect, and work. This study dives into a global dataset to explore how common these conditions are, how they've evolved over time. By analyzing patterns in conditions like depression, anxiety, and substance abuse, this paper offers insights into which region is most affected and where help is most needed. With this knowledge, we hope to support better care, smarter policies, and more open conversations about mental health.

Introduction

Mental health is an essential part of what makes us who we are. It shapes our ability to build relationships, handle stress, and contribute meaningfully to our communities. Despite growing awareness, far too many people still face their mental health struggles in silence. Lack of access to care, stigma, and social inequalities mean that even those with treatable conditions often go without help. This paper focuses on the global state of mental health, drawing on extensive data to understand which conditions are rising, which reagion is at risk, and how we can do better in supporting those in need.

Overview of the topic

Prevalence of Mental Disorders - Approximately 1 in every 8 people worldwide live with a mental disorder, highlighting the widespread impact of these conditions [2].

Mental Health and Society - Mental health is a crucial aspect of overall well-being, influencing people's ability to work, maintain relationships, and engage with their communities [1].

Burden of Untreated Mental Illnesses - Despite the existence of effective prevention and treatment options, a large proportion of affected individuals do not receive proper care due to barriers such as stigma, lack of resources, and poor-quality treatment [1,2] *Nature of*

Mental Disorders - Mental disorders involve significant disturbances in thinking, emotional regulation, and behavior, affecting an individual's daily functioning [2].

The Need for Reliable Data - Comprehensive data collection is crucial to understanding mental health trends, identifying risk factors, and improving access to effective treatments [1].

Variety of Mental Health Conditions - There are numerous types of mental disorders, including depression, anxiety, schizophrenia, and bipolar disorder, each with varying degrees of severity and impact [2].

Gender Disparities in Mental Health - Studies estimate that 1 in 3 women and 1 in 5 men will experience major depression at some point in their lives [1].

Public Perception and Stigma - Many individuals feel uncomfortable discussing their mental health symptoms, which can lead to underreporting and misrepresentation of the true prevalence of mental illnesses [1].

Importance of the Topic

Mental health disorders are a significant public health concern worldwide, affecting individuals' well-being, productivity, and societal engagement. Understanding global trends in these disorders is crucial for developing effective prevention and treatment strategies, allocating resources appropriately, and reducing the stigma associated with mental health issues. The increasing prevalence of mental health conditions necessitates a comprehensive analysis to inform policy-making and healthcare practices.

Dataset Overview

Origin and Authors :

i) The dataset titled "Global Trends in Mental Health Disorder" is available on Kaggle.

ii) Saloni Dattani, Lucas Rodés-Guirao, Hannah Ritchie and Max Roser (2023) - “Mental Health” Published online at OurWorldinData.org. Retrieved from: 'https://ourworldindata.org/mental-health' [Original Online Resource]

Contents of the Dataset :

The dataset provides global statistics on various mental health disorders across different countries and years [05]. It includes the following columns:

- Entity – The country or region being analyzed.
- Code – The standardized country code.
- Year – The year of data collection.
- Schizophrenia (%) – The percentage of the population diagnosed with schizophrenia.
- Bipolar Disorder (%) – The percentage of individuals with bipolar disorder.
- Eating Disorders (%) – The prevalence of eating disorders.
- Anxiety Disorders (%) – The percentage of people experiencing anxiety disorders.
- Drug Use Disorders (%) – The proportion of the population with substance abuse disorders.
- Depression (%) – The prevalence of depression in the population.
- Alcohol Use Disorders (%) – The percentage of individuals affected by alcohol-related disorders.

Relevance to the Topic

This dataset is crucial for analyzing global trends in mental health disorders, as it provides:

Chronological Data – Helping track changes in mental health prevalence over time.

Geographical Comparisons – Allowing insights into how mental health issues vary across different regions.

Multiple Disorders – Covering a range of mental health conditions to examine patterns and co-occurrence.

Policy and Intervention Insights – Supporting decision-making for governments and health organizations to improve mental health care.

Research Questions

This project aims to explore global trends in the prevalence of mental health disorders using a dataset titled "Global Trends in Mental Health Disorders" available on Kaggle. The focus is on identifying patterns of mental disorders such as depression, anxiety, schizophrenia, and substance abuse across various regions and over time.

1. How have the prevalence rates of major mental health disorders (e.g., depression, anxiety, schizophrenia) changed globally over the past decade?

2. Are there notable differences in the prevalence of mental health disorders across geographic regions?

3. What demographic factors contribute to the variation in mental health trends?

Dataset Analysis using "R" Programming Language

Install and Import necessary Libraries :

```
library(readr)        # for reading data files
library(dplyr)        # for data manipulation (filtering, grouping, summarizing)
library(ggplot2)      # for creating data visualizations
library(tidyr)        # for reshaping and tidying data (e.g., pivoting)
```

library(tidyverse) # for loading a collection of data science packages including ggplot2, dplyr, tidyr, etc.

library(corrplot) # for visualizing correlation matrices

library(sf) # for handling and analyzing spatial data

library(rnaturalearth) # for downloading natural earth map data (country boundaries, etc.)

library(rnaturalearthdata) # for providing the actual natural earth datasets used in mapping

library(viridis) # for printer-friendly visualizations

library(gridExtra) # for arranging multiple ggplot plots in a grid layout

library(reshape2) # for reshaping data between wide and long formats (e.g., melt, dcast)

library(patchwork) # for combining multiple ggplot2 plots using a simple and intuitive syntax

library(knitr) # for creating tables from dataframe

library(fmsb) # for creating Radar Chart

Load and Explore the dataset :

```
head(data)
index      Entity Code Year Schizophrenia.... Bipolar.disorder.... Eating.disorders....
    0 Afghanistan  AFG 1990           0.16056             0.697779              0.101855
    1 Afghanistan  AFG 1991          0.160312             0.697961              0.099313
    2 Afghanistan  AFG 1992          0.160135             0.698107              0.096692
    3 Afghanistan  AFG 1993          0.160037             0.698257              0.094336
    4 Afghanistan  AFG 1994          0.160022             0.698469              0.092439
    5 Afghanistan  AFG 1995          0.160076             0.698695               0.09098
Anxiety.disorders.... Drug.use.disorders.... Depression.... Alcohol.use.disorders....
             4.828830              1.677082       4.071831                  0.672404
             4.829740              1.684746       4.079531                  0.671768
             4.831108              1.694334       4.088358                  0.670644
             4.830864              1.705320       4.096190                  0.669738
             4.829423              1.716069       4.099582                  0.669260
             4.828337              1.728112       4.104207                  0.668746
```

Fig 1 : Top 6 rows of the Dataset

```
> str(data)
'data.frame':   6468 obs. of  11 variables:
 $ index                    : int  0 1 2 3 4 5 6 7 8 9 ...
 $ Entity                   : chr  "Afghanistan" "Afghanistan" "Afghanistan" "Afghanistan" ...
 $ Code                     : chr  "AFG" "AFG" "AFG" "AFG" ...
 $ Year                     : int  1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 ...
 $ Schizophrenia....        : num  0.161 0.16 0.16 0.16 0.16 ...
 $ Bipolar.disorder....     : num  0.698 0.698 0.698 0.698 0.698 ...
 $ Eating.disorders....     : num  0.1019 0.0993 0.0967 0.0943 0.0924 ...
 $ Anxiety.disorders....    : num  4.83 4.83 4.83 4.83 4.83 ...
 $ Drug.use.disorders....   : num  1.68 1.68 1.69 1.71 1.72 ...
 $ Depression....           : num  4.07 4.08 4.09 4.1 4.1 ...
 $ Alcohol.use.disorders....: num  0.672 0.672 0.671 0.67 0.669 ...
```

Fig 2 : Structure of the Dataset

Year	avg_depression	avg_anxiety	avg_bipolar	avg_schizophrenia	avg_eating	avg_drug	avg_alcohol
1990	3.506289	3.957269	0.7153922	0.2095478	0.2217740	0.8082830	1.546533
1991	3.510948	3.960009	0.7157397	0.2095864	0.2220757	0.8134662	1.553500
1992	3.515033	3.962778	0.7160909	0.2096338	0.2224809	0.8186920	1.559927
1993	3.518531	3.965405	0.7164302	0.2096901	0.2230327	0.8237798	1.565611
1994	3.521437	3.967976	0.7167552	0.2097508	0.2237100	0.8283886	1.570127
1995	3.523328	3.970051	0.7170366	0.2098097	0.2245139	0.8323908	1.573533
1996	3.524659	3.972869	0.7172930	0.2098770	0.2255810	0.8371238	1.576549
1997	3.525602	3.977437	0.7175644	0.2099663	0.2269802	0.8432169	1.579598
1998	3.525968	3.982739	0.7178432	0.2100751	0.2285810	0.8496641	1.582334
1999	3.525664	3.987662	0.7181169	0.2101995	0.2302642	0.8552107	1.584450
2000	3.524262	3.990991	0.7183706	0.2103350	0.2318384	0.8588487	1.585654
2001	3.522087	3.993043	0.7185775	0.2105296	0.2335096	0.8611829	1.585276
2002	3.519421	3.995073	0.7187576	0.2108082	0.2354974	0.8632400	1.583544
2003	3.516446	3.997061	0.7189386	0.2111250	0.2376357	0.8651759	1.581495
2004	3.513080	3.998890	0.7191385	0.2114301	0.2397504	0.8668751	1.580094
2005	3.509253	4.000271	0.7193662	0.2116707	0.2416567	0.8683891	1.580366
2006	3.502707	4.001204	0.7196410	0.2119313	0.2436224	0.8705484	1.584365
2007	3.492855	4.001978	0.7199654	0.2122912	0.2459341	0.8737386	1.591870
2008	3.482217	4.002786	0.7203141	0.2126851	0.2483867	0.8773293	1.600392
2009	3.472895	4.003497	0.7206438	0.2130459	0.2506371	0.8809204	1.607415
2010	3.467328	4.004008	0.7209067	0.2133062	0.2525020	0.8837475	1.610462
2011	3.464513	4.004142	0.7211227	0.2134968	0.2540155	0.8862160	1.610315
2012	3.461950	4.004037	0.7213507	0.2136963	0.2555805	0.8890148	1.609455
2013	3.459763	4.004003	0.7216035	0.2139001	0.2571507	0.8918197	1.607668
2014	3.458056	4.003861	0.7218661	0.2141051	0.2587049	0.8946646	1.604898
2015	3.456916	4.003509	0.7221378	0.2143100	0.2601982	0.8976226	1.601098
2016	3.456299	4.002900	0.7224088	0.2145112	0.2615346	0.9006604	1.596272
2017	3.456795	4.002347	0.7226935	0.2147051	0.2628057	0.9035755	1.590201

Fig 3 : Average Global Mental Disorder Rates (%) by year

Table: Average Disorder Rates in the United States by Year

Year	avg_depression	avg_anxiety	avg_bipolar	avg_schizophrenia	avg_eating	avg_drug	avg_alcohol
1990	4.677591	6.576884	0.653706	0.340897	0.468676	2.367794	2.173751
1991	4.660871	6.553351	0.653953	0.338913	0.473575	2.345466	2.139292
1992	4.651949	6.536143	0.654205	0.337343	0.478610	2.339515	2.107931
1993	4.648701	6.525536	0.654431	0.336207	0.483539	2.347095	2.080669
1994	4.649294	6.522278	0.654620	0.335536	0.488235	2.365738	2.058632
1995	4.650869	6.526489	0.654721	0.335363	0.492368	2.392582	2.042931
1996	4.662902	6.578023	0.654749	0.335806	0.496752	2.456048	2.033987
1997	4.689154	6.688847	0.654720	0.336797	0.501560	2.564591	2.030590
1998	4.720716	6.818473	0.654658	0.338085	0.506483	2.688823	2.031176
1999	4.749991	6.926351	0.654564	0.339410	0.511072	2.800595	2.034175
2000	4.766992	6.971563	0.654443	0.340512	0.514863	2.869426	2.038026
2001	4.774031	6.971995	0.654371	0.341186	0.518306	2.905605	2.043577
2002	4.778244	6.971891	0.654349	0.341483	0.522170	2.936109	2.051480
2003	4.781680	6.970935	0.654343	0.341535	0.526130	2.962640	2.059815
2004	4.785232	6.968875	0.654313	0.341472	0.529332	2.983414	2.066706
2005	4.791258	6.965249	0.654228	0.341427	0.531157	2.998771	2.070251
2006	4.793213	6.937038	0.654080	0.341031	0.532178	3.000826	2.063498
2007	4.786623	6.875454	0.653896	0.340069	0.533067	2.989141	2.045624
2008	4.776402	6.801899	0.653691	0.338901	0.533768	2.974336	2.023935
2009	4.765950	6.737790	0.653468	0.337887	0.534175	2.966808	2.005749
2010	4.761551	6.704455	0.653247	0.337390	0.534076	2.977144	1.998437
2011	4.762322	6.693384	0.653008	0.337190	0.533199	3.007049	1.999569
2012	4.765481	6.682107	0.652748	0.336852	0.531514	3.052340	2.001951
2013	4.772422	6.671047	0.652479	0.336404	0.528946	3.110712	2.005814
2014	4.782222	6.660473	0.652195	0.335860	0.525990	3.181115	2.011345
2015	4.795954	6.650662	0.651890	0.335243	0.522109	3.262674	2.018738
2016	4.813114	6.642099	0.651569	0.334578	0.517728	3.353142	2.028263
2017	4.835610	6.635055	0.651236	0.333890	0.512844	3.452476	2.040087

Fig 4 : Average Mental Disorder Rates (%) by year in United States

Data Cleaning :

```
> str(data)
'data.frame':   6468 obs. of  11 variables:
 $ index                    : int  0 1 2 3 4 5 6 7 8 9 ...
 $ Entity                   : chr  "Afghanistan" "Afghanistan" "Afghanistan" "Afghanistan" ...
 $ Code                     : chr  "AFG" "AFG" "AFG" "AFG" ...
 $ Year                     : num  1990 1991 1992 1993 1994 ...
 $ Schizophrenia....        : num  0.161 0.16 0.16 0.16 0.16 ...
 $ Bipolar.disorder....     : num  0.698 0.698 0.698 0.698 0.698 ...
 $ Eating.disorders....     : num  0.1019 0.0993 0.0967 0.0943 0.0924 ...
 $ Anxiety.disorders....    : num  4.83 4.83 4.83 4.83 4.83 ...
 $ Drug.use.disorders....   : num  1.68 1.68 1.69 1.71 1.72 ...
 $ Depression....           : num  4.07 4.08 4.09 4.1 4.1 ...
 $ Alcohol.use.disorders....: num  0.672 0.672 0.671 0.67 0.669 ...
```

Fig 5 : Datatype Conversion

```
> summary(data)
     index          Entity              Code                Year      Schizophrenia....
 Min.   :   0   Length:6468        Length:6468        Min.   :1990   Min.   :0.1469
 1st Qu.:1617   Class :character   Class :character   1st Qu.:1997   1st Qu.:0.1815
 Median :3234   Mode  :character   Mode  :character   Median :2004   Median :0.1996
 Mean   :3234                                         Mean   :2004   Mean   :0.2116
 3rd Qu.:4850                                         3rd Qu.:2010   3rd Qu.:0.2364
 Max.   :6467                                         Max.   :2017   Max.   :0.3751
 Bipolar.disorder.... Eating.disorders.... Anxiety.disorders.... Drug.use.disorders.... Depression....
 Min.   :0.3145       Min.   :0.07391      Min.   :2.023         Min.   :0.3836         Min.   :2.140
 1st Qu.:0.6155       1st Qu.:0.12239      1st Qu.:3.189         1st Qu.:0.5351         1st Qu.:3.006
 Median :0.6931       Median :0.18252      Median :3.554         Median :0.7264         Median :3.500
 Mean   :0.7191       Mean   :0.24000      Mean   :3.990         Mean   :0.8623         Mean   :3.498
 3rd Qu.:0.8351       3rd Qu.:0.29267      3rd Qu.:4.682         3rd Qu.:0.9402         3rd Qu.:3.912
 Max.   :1.2066       Max.   :0.94399      Max.   :8.967         Max.   :3.4525         Max.   :6.603
 Alcohol.use.disorders....
 Min.   :0.4469
 1st Qu.:0.9937
 Median :1.4799
 Mean   :1.5858
 3rd Qu.:1.8678
 Max.   :5.4747
```

Fig 6 : Statistical Summary of the dataset

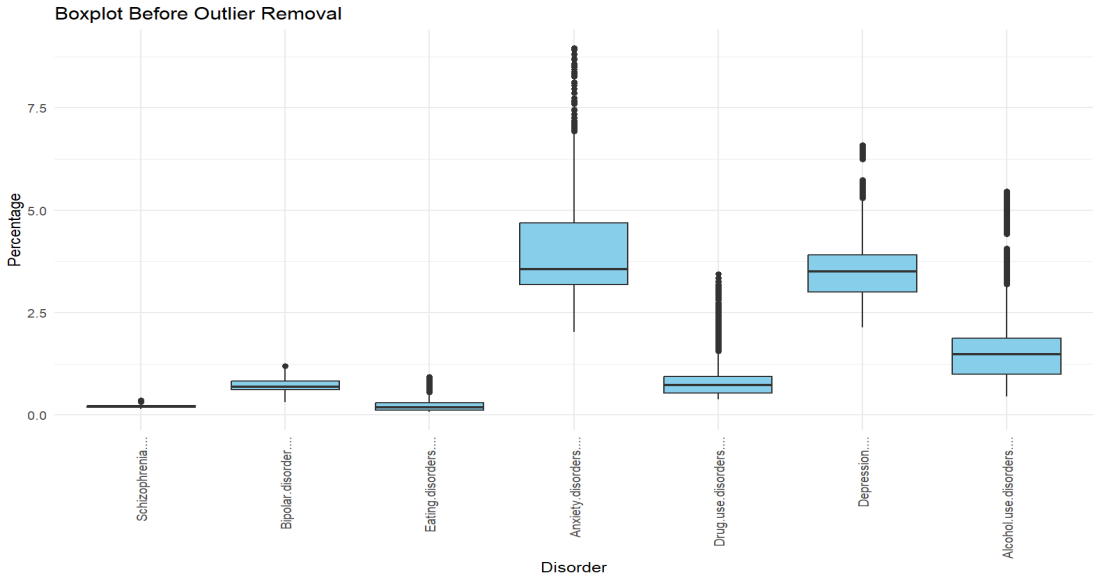

Fig 7 : Boxplots before Outliers Removal

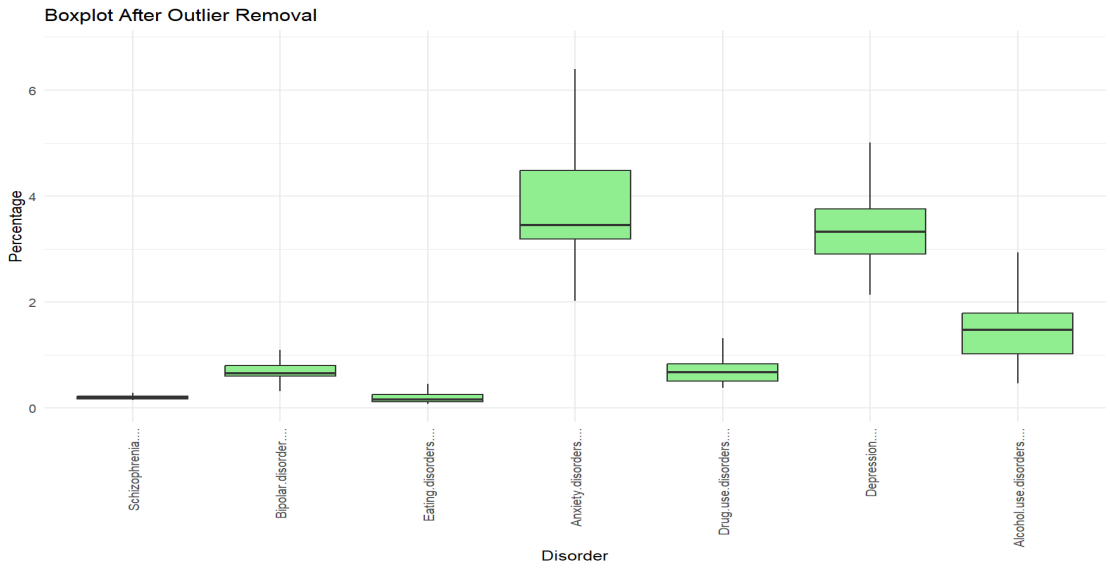

Fig 8 : Boxplots after Outliers Removal

Exploratory Data Analysis :

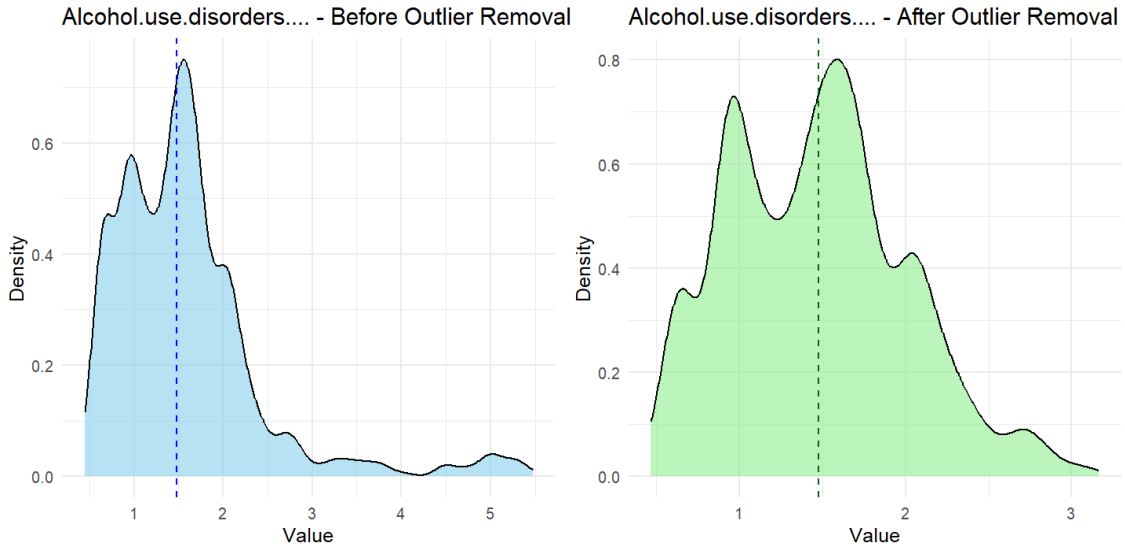

Fig 9 : Density Plot for Alcohol use disorder rate, before and after Outliers Removal

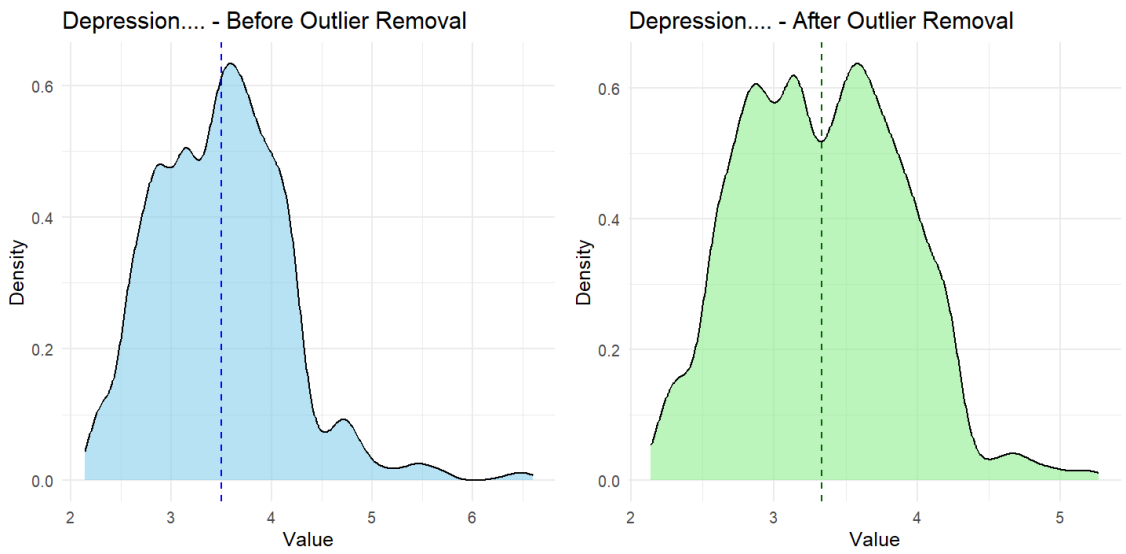

Fig 10 : Density Plot for Depression rate, before and after Outliers Removal

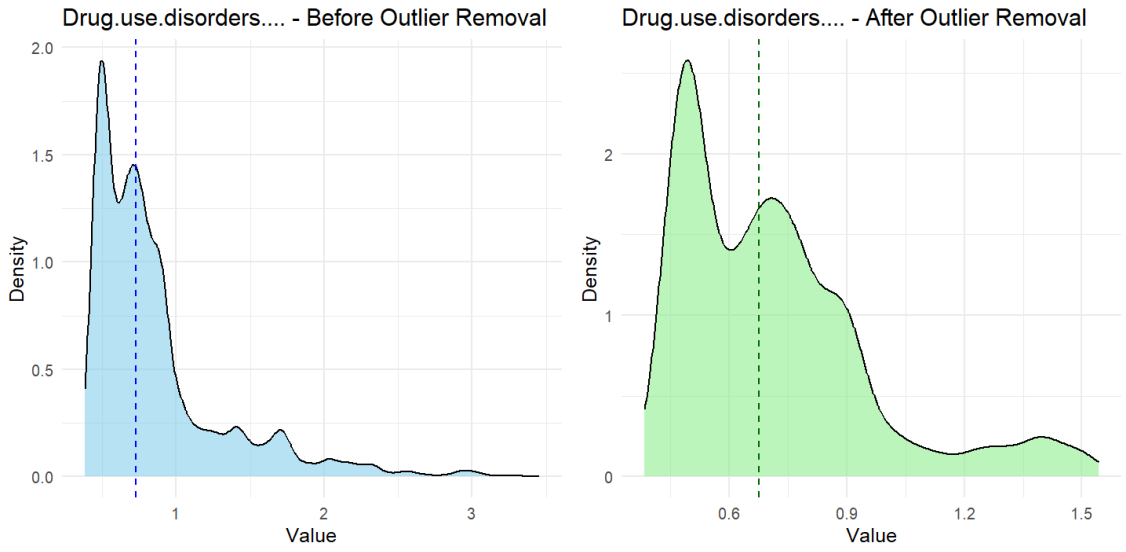

Fig 11 : Density Plot for Drug use disorder rate, before and after Outliers Removal

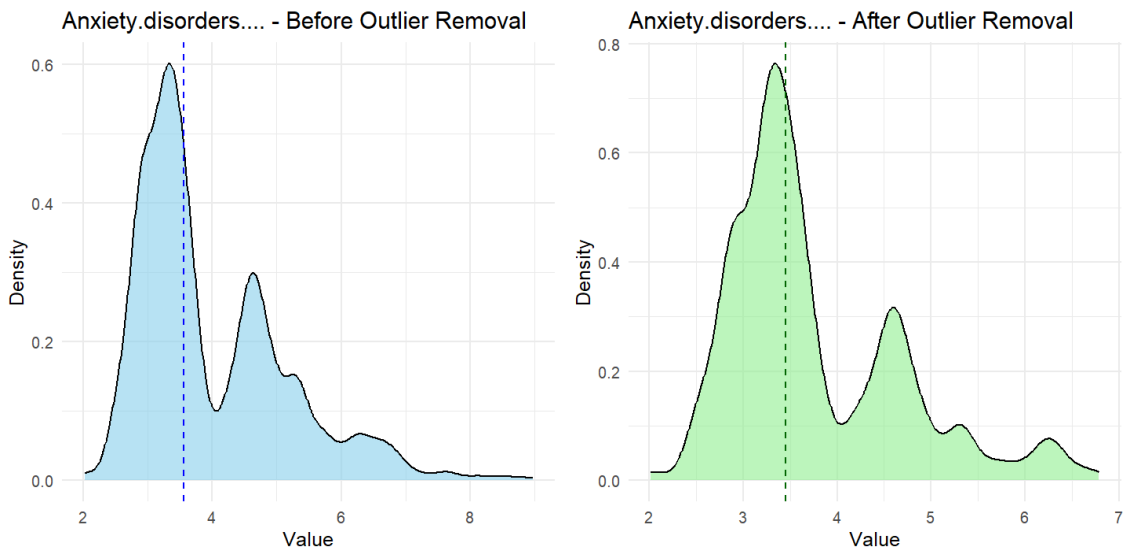

Fig 12 : Density Plot for Anxiety disorder rate, before and after Outliers Removal

Fig 13 : Density Plot for Eating disorder rate, before and after Outliers Removal

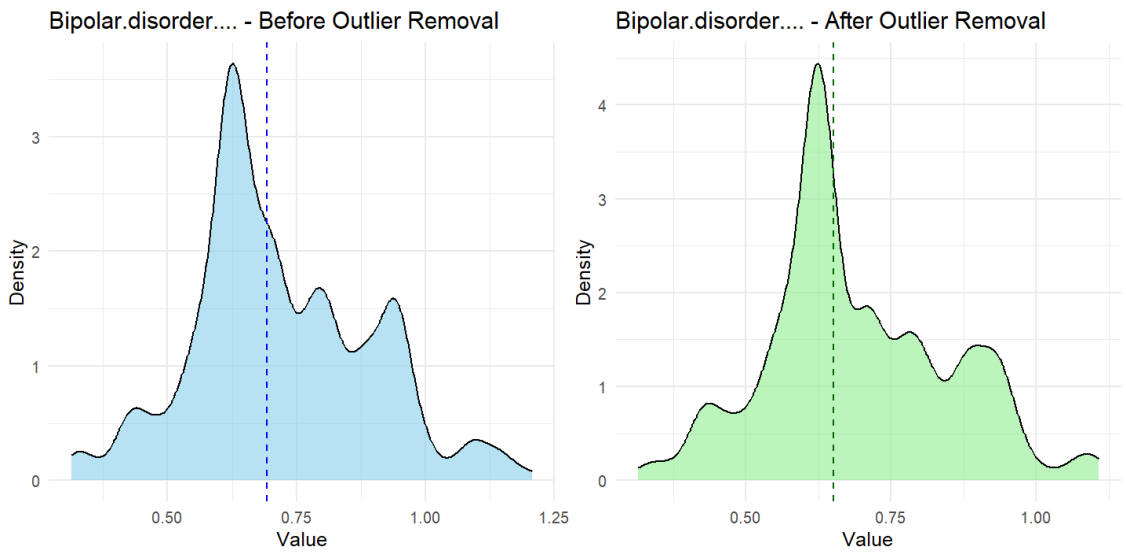

Fig 14 : Density Plot for Bipolar disorder rate, before and after Outliers Removal

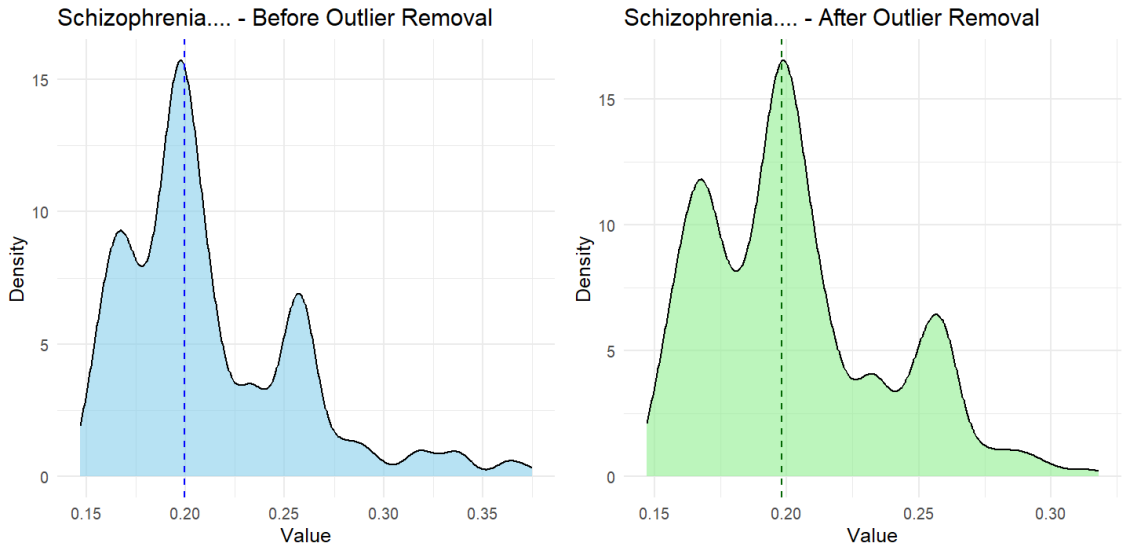

Fig 15 : Density Plot for Schizophrenia rate, before and after Outliers Removal

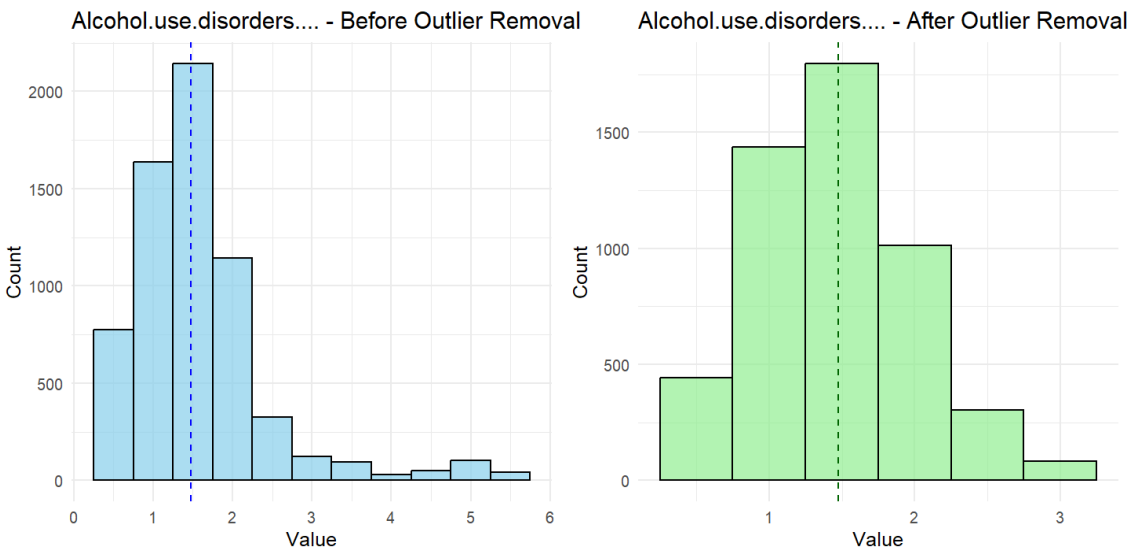

Fig 16 : Histogram Distribution Plot for Alcohol use disorder rate, before and after Outliers Removal

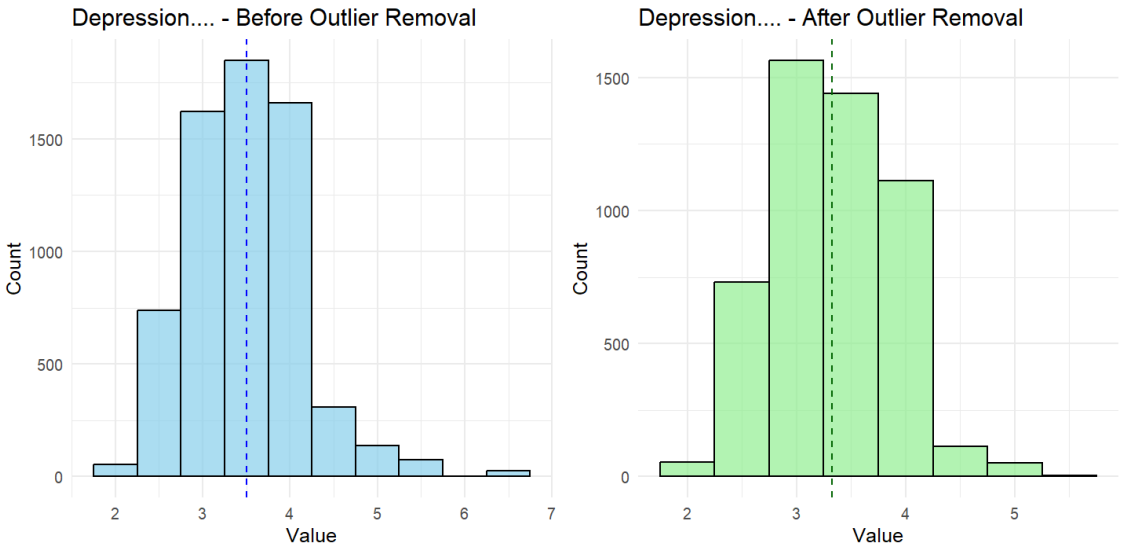

Fig 17 : Histogram Distribution Plot for Depression rate, before and after Outliers Removal

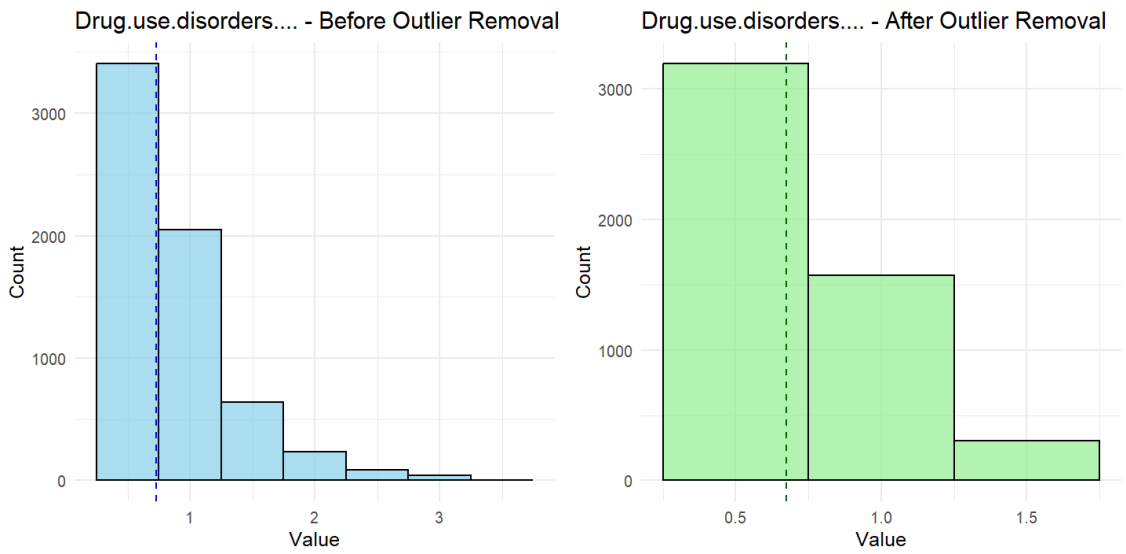

Fig 18 : Histogram Distribution Plot for Drug use disorder rate, before and after Outliers Removal

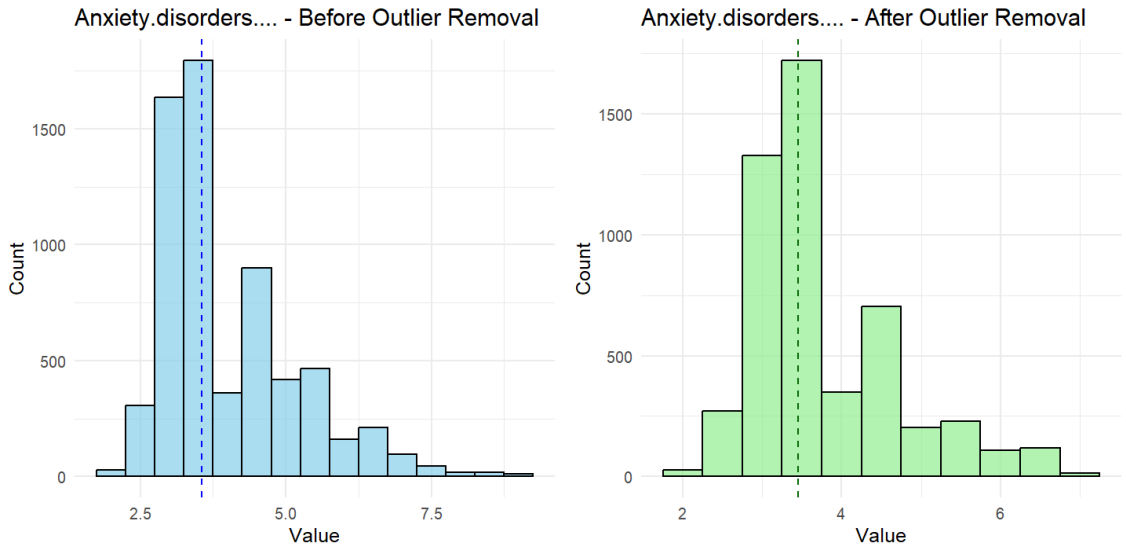

Fig 19 : Histogram Distribution Plot for Anxiety disorder rate, before and after Outliers Removal

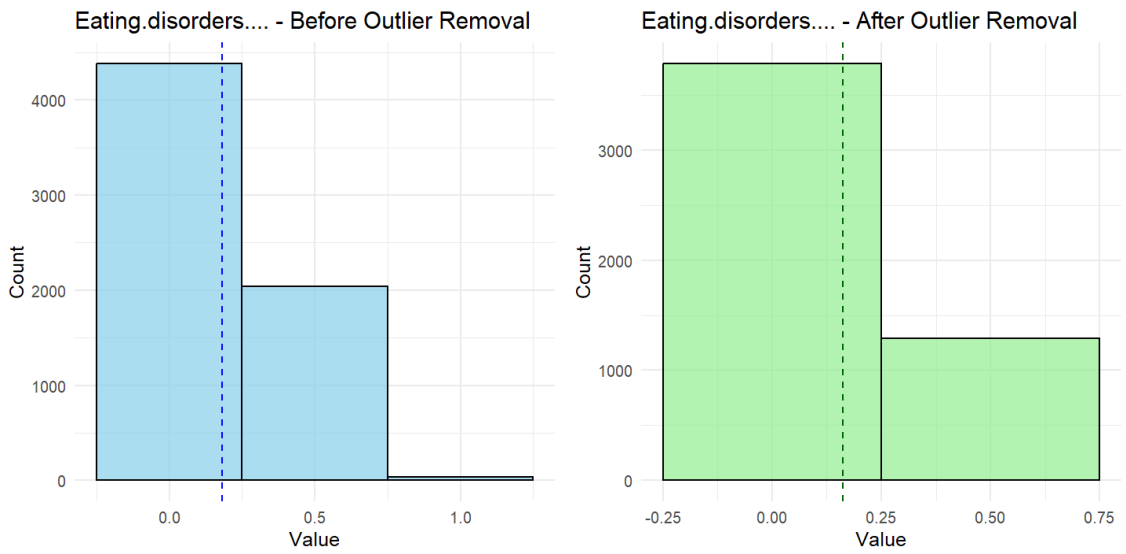

Fig 20 : Histogram Distribution Plot for Eating disorder rate, before and after Outliers Removal

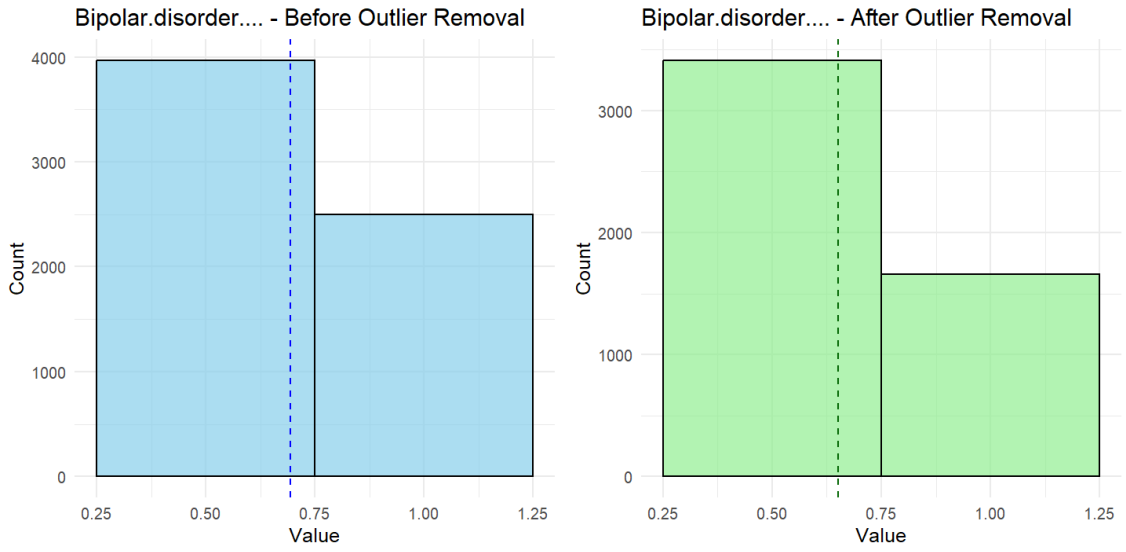

Fig 21 : Histogram Distribution Plot for Bipolar disorder rate, before and after Outliers Removal

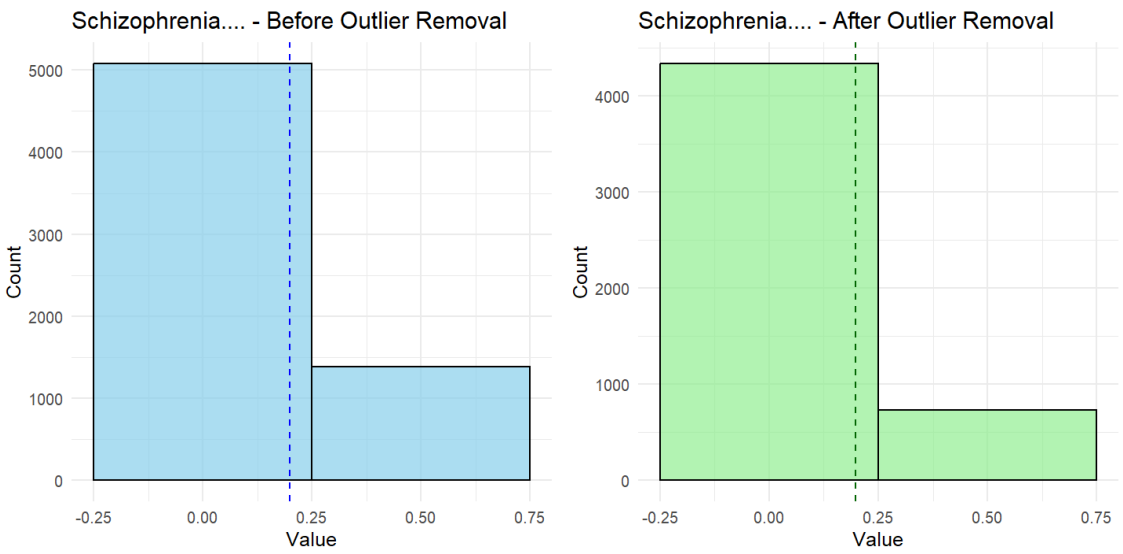

Fig 22 : Histogram Distribution Plot for Schizophrenia rate, before and after Outliers Removal

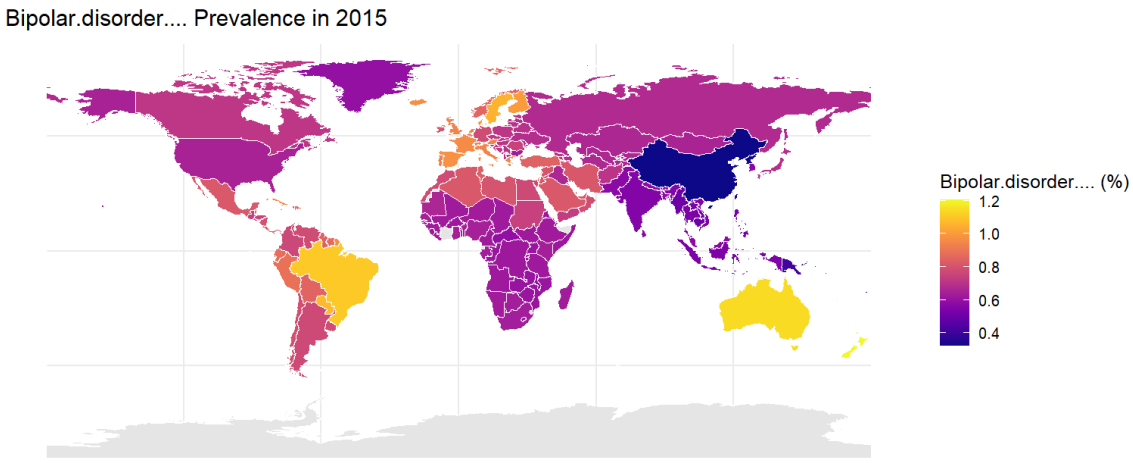

Fig 23 : Global Distribution for Bipolar disorder rate in 2015

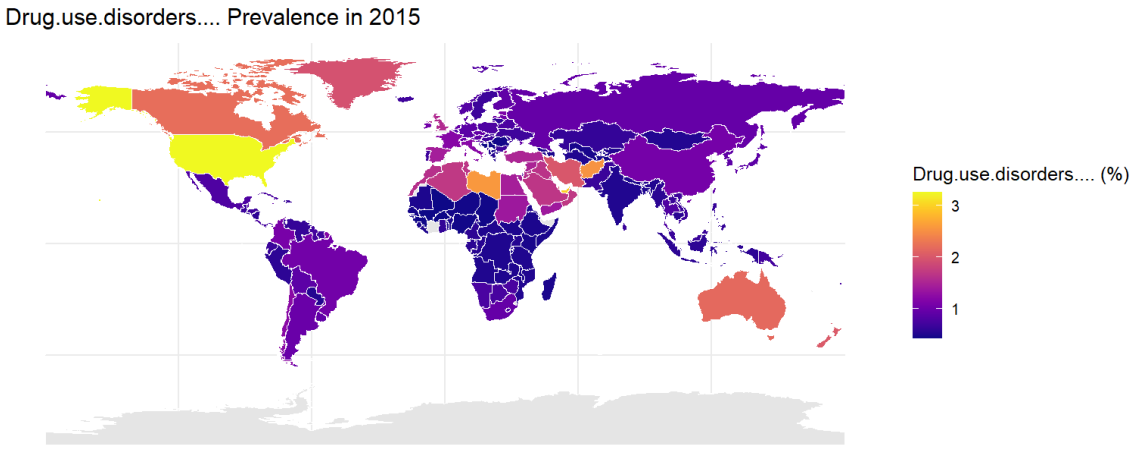

Fig 24 : Global Distribution for Drug use disorder rate in 2015

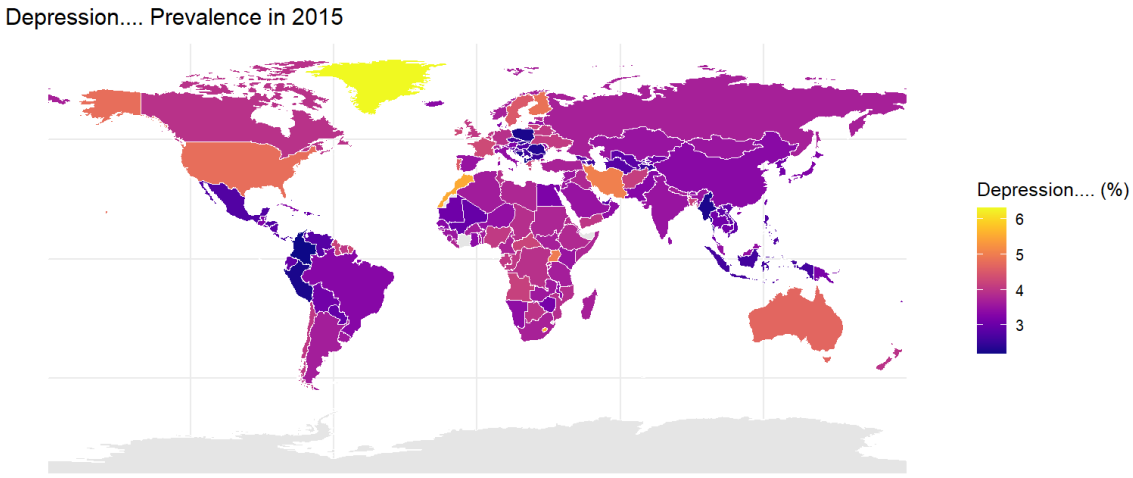

Fig 25 : Global Distribution for Depression rate in 2015

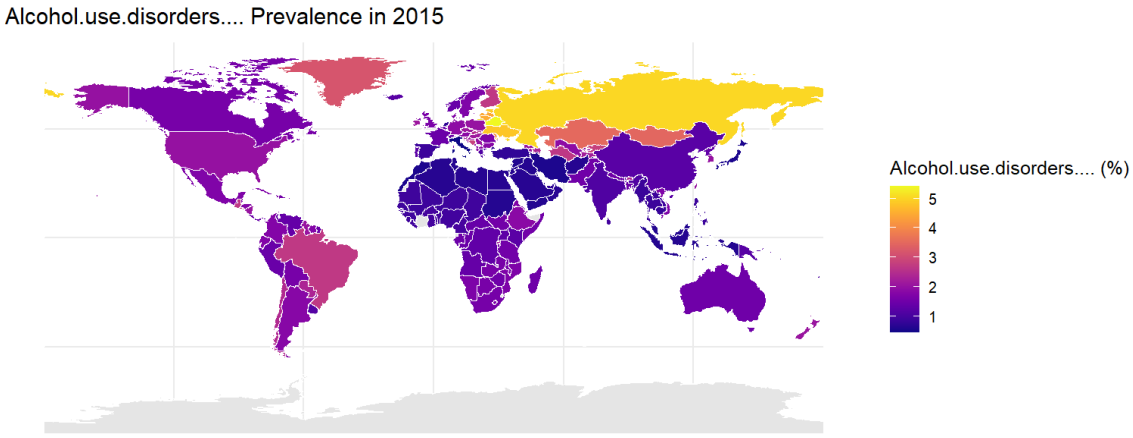

Fig 26 : Global Distribution for Alcohol use disorder rate in 2015

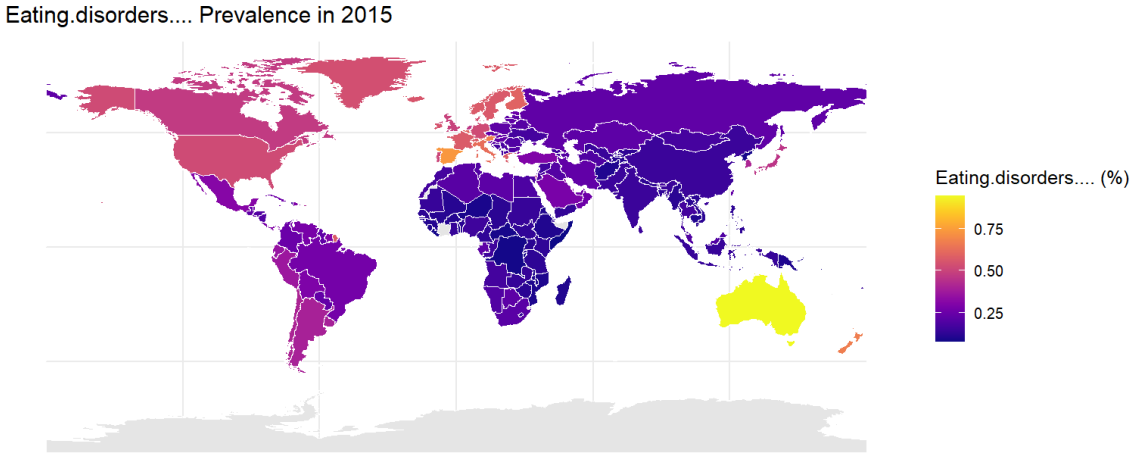

Fig 27 : Global Distribution for Eating disorder rate in 2015

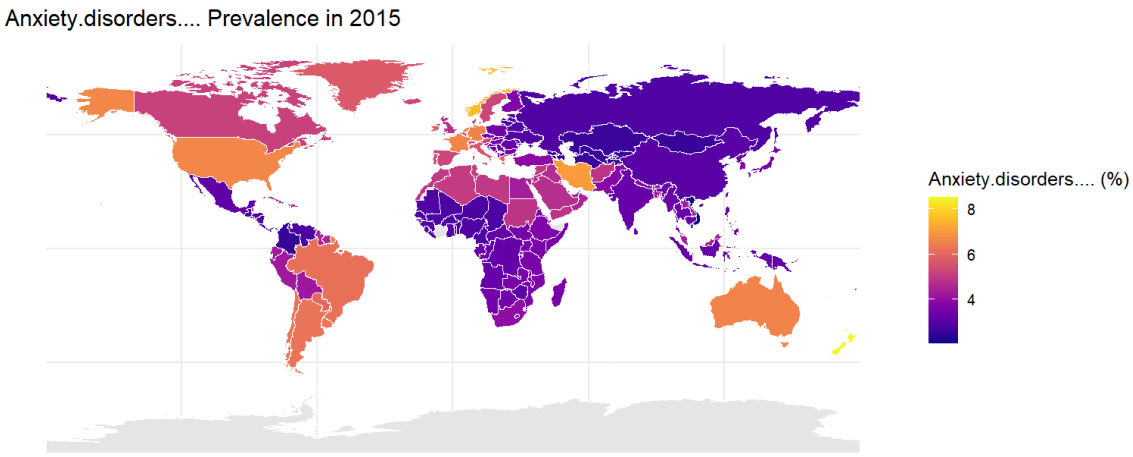

Fig 28 : Global Distribution for Anxiety disorder rate in 2015

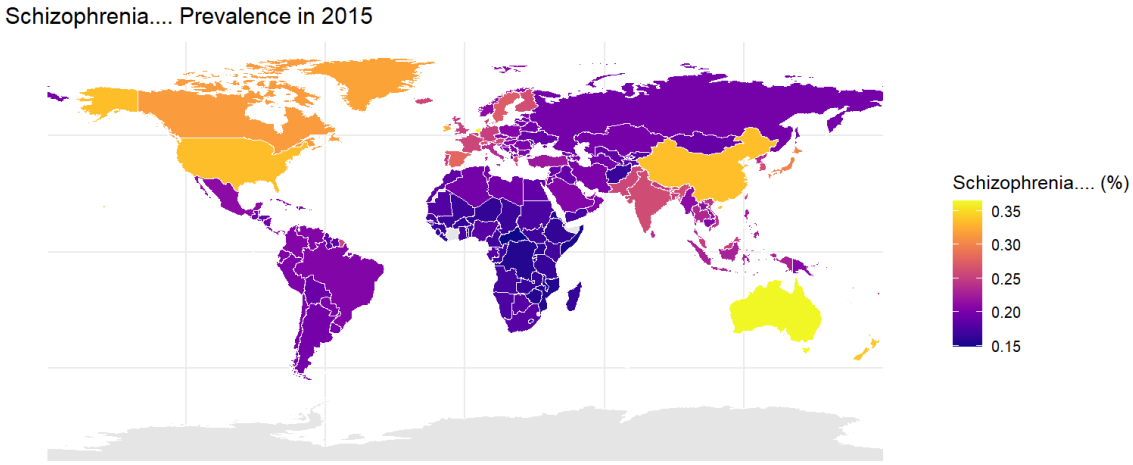

Fig 29 : Global Distribution for Schizophrenia rate in 2015

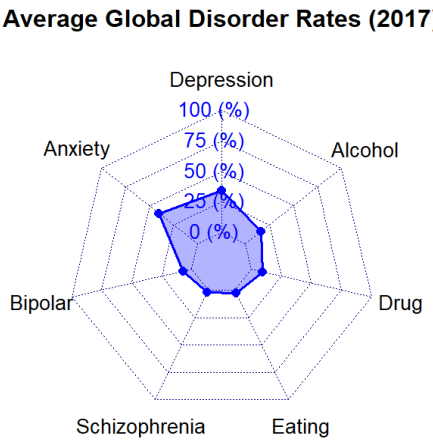

Fig 30 : Radar Chart for Average Mental Global Disorder rates in 2017

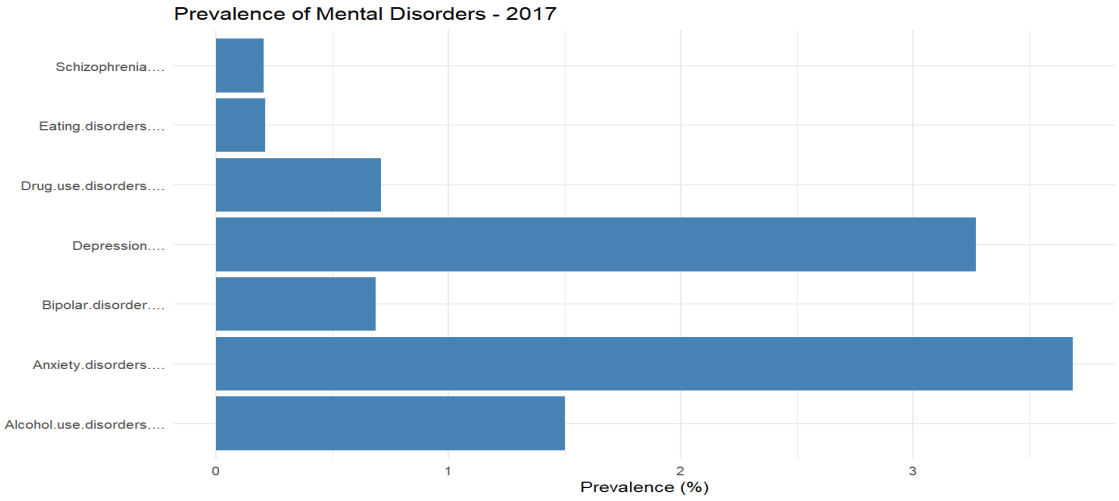

Fig 31 : Bar Graph for Average Global Mental Disorder rates in 2017

Time Series Analysis to identify trends and patterns:

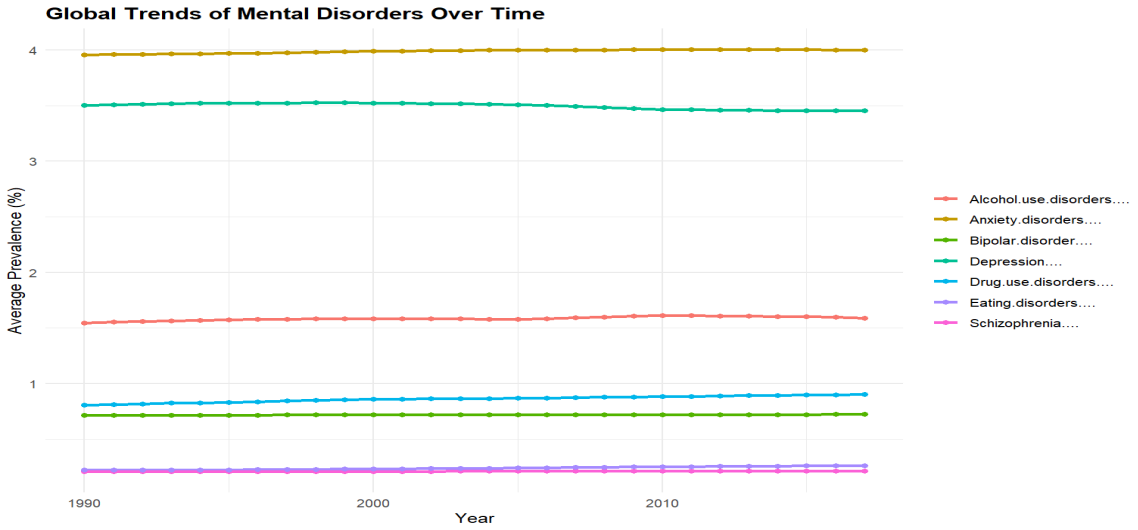

Fig 32 : Line Plot for the distribution of Average Global Mental Disorder rates over time

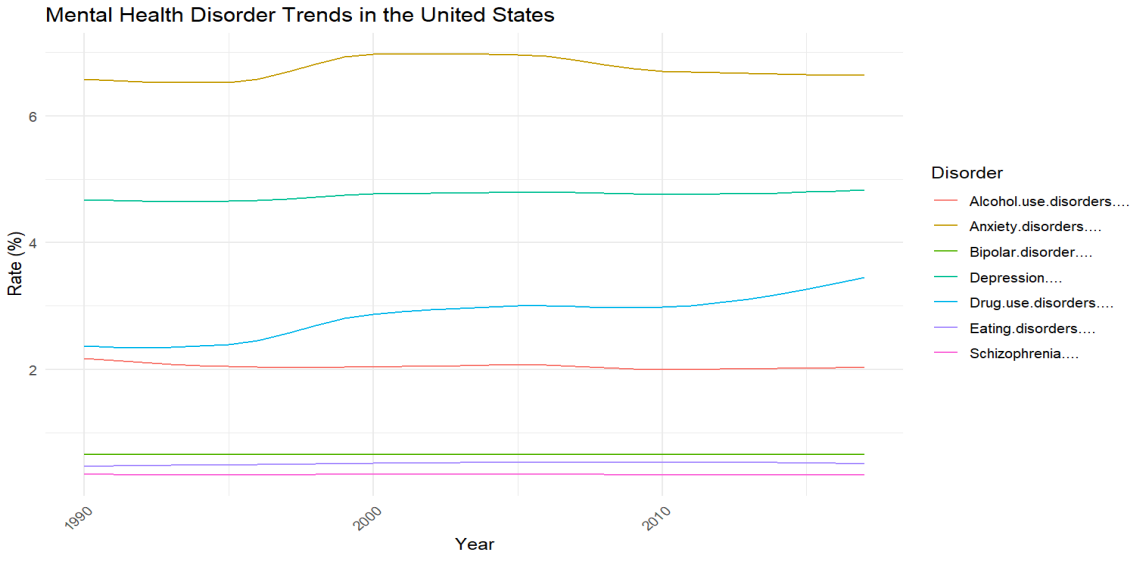

Fig 33 : Line Plot for the distribution of Mental Disorder rates over time in United States

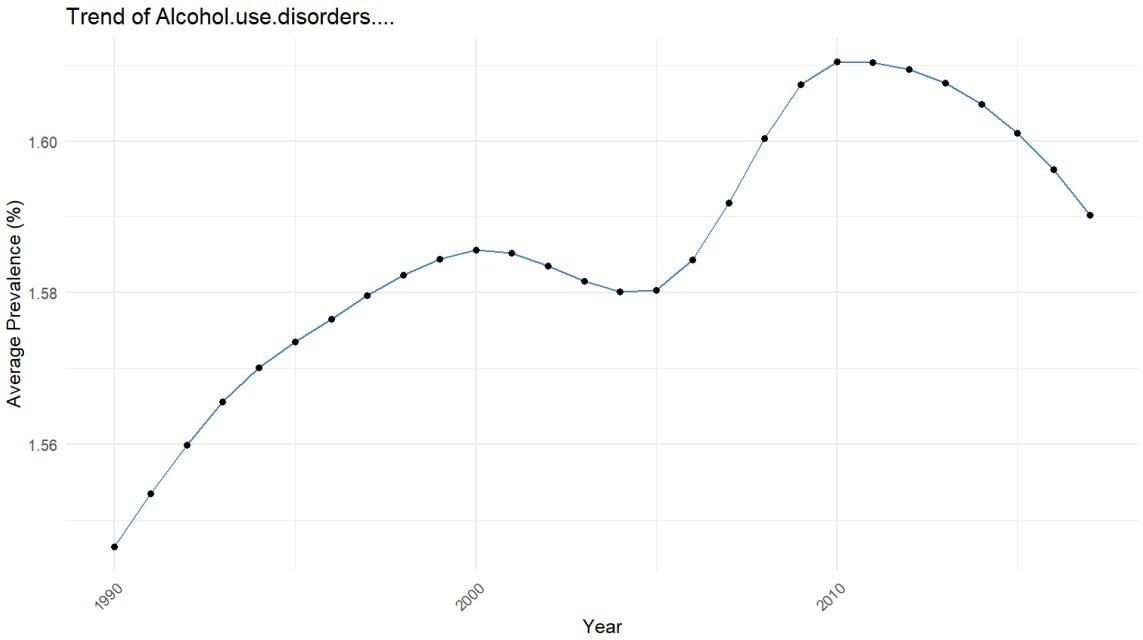

Fig 34 : Time Series Analysis on Global Alcohol use disorder rates

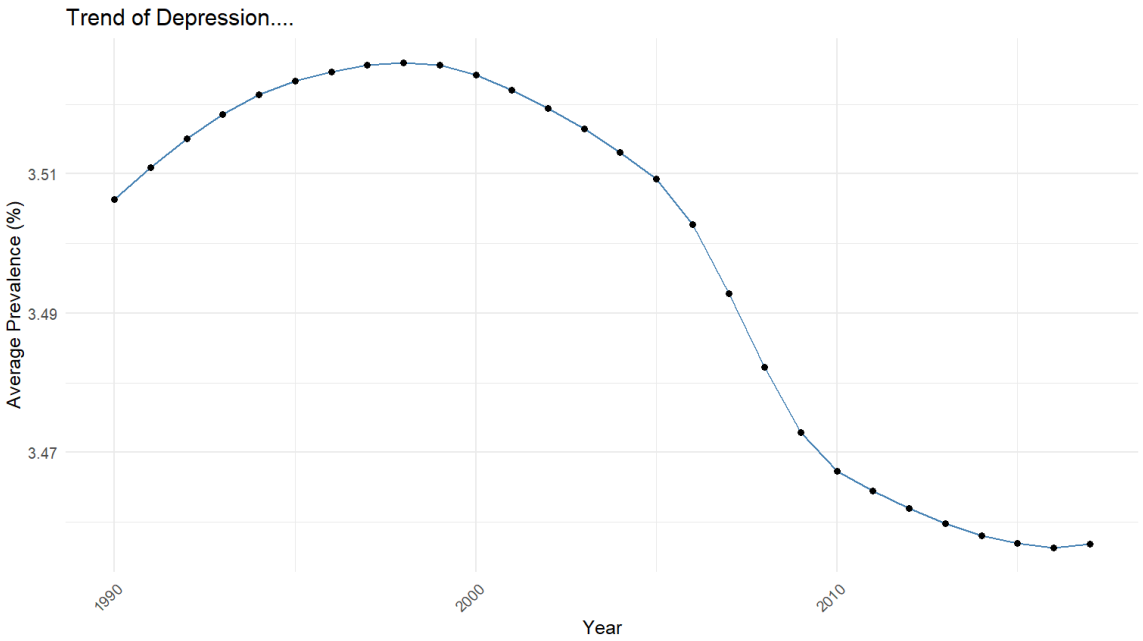

Fig 35 : Time Series Analysis on Global Depression rates

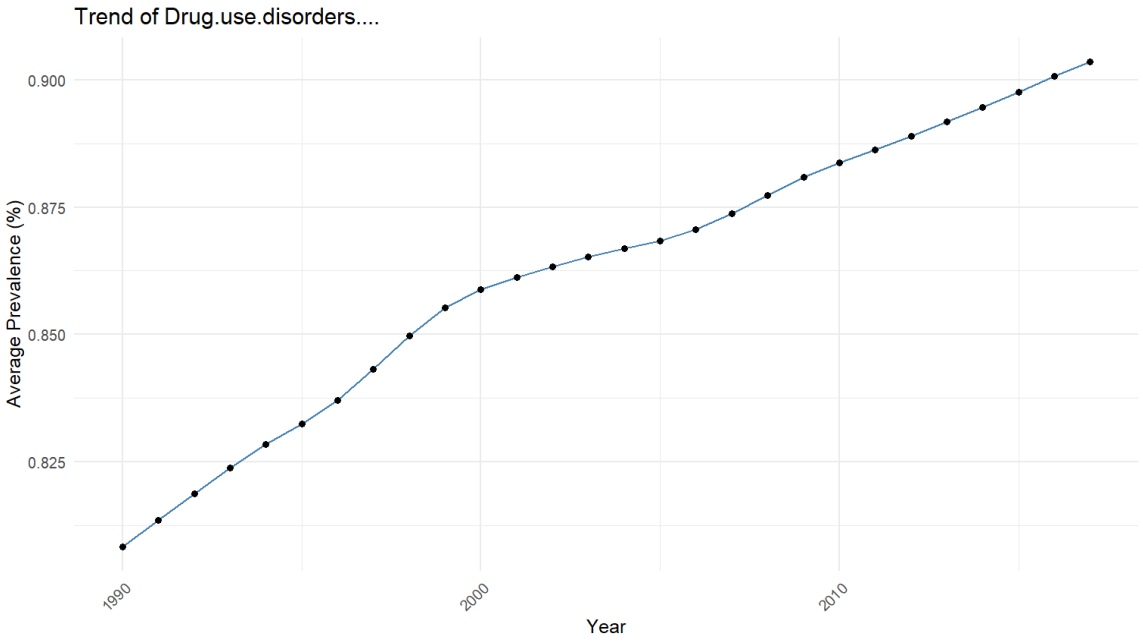

Fig 36 : Time Series Analysis on Global Drug use disorder rates

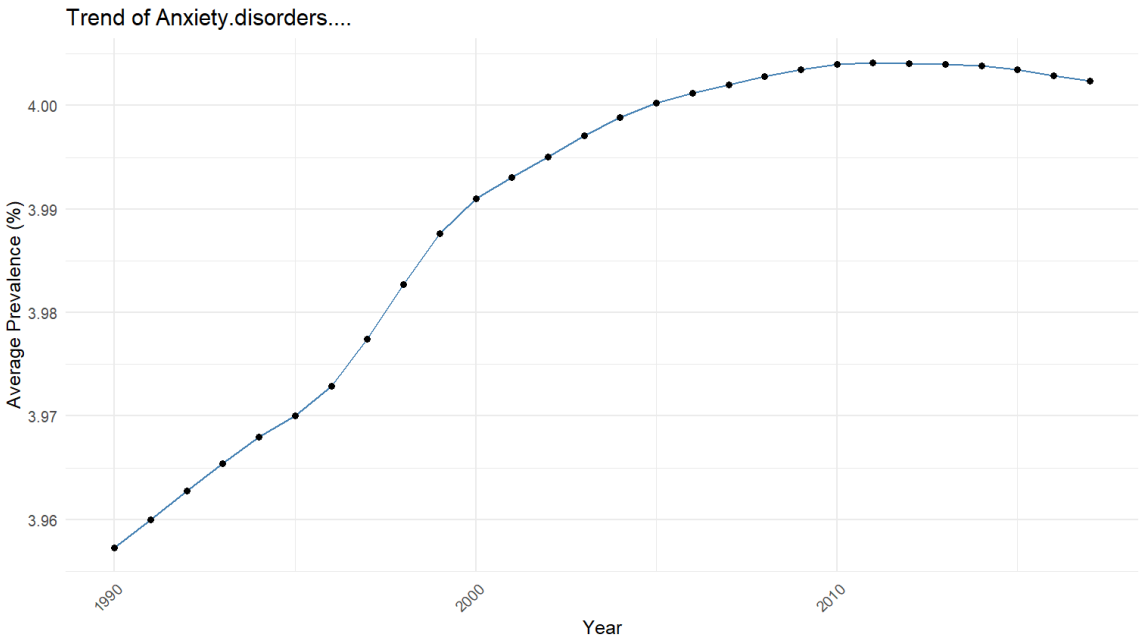

Fig 37 : Time Series Analysis on Global Anxiety disorder rates

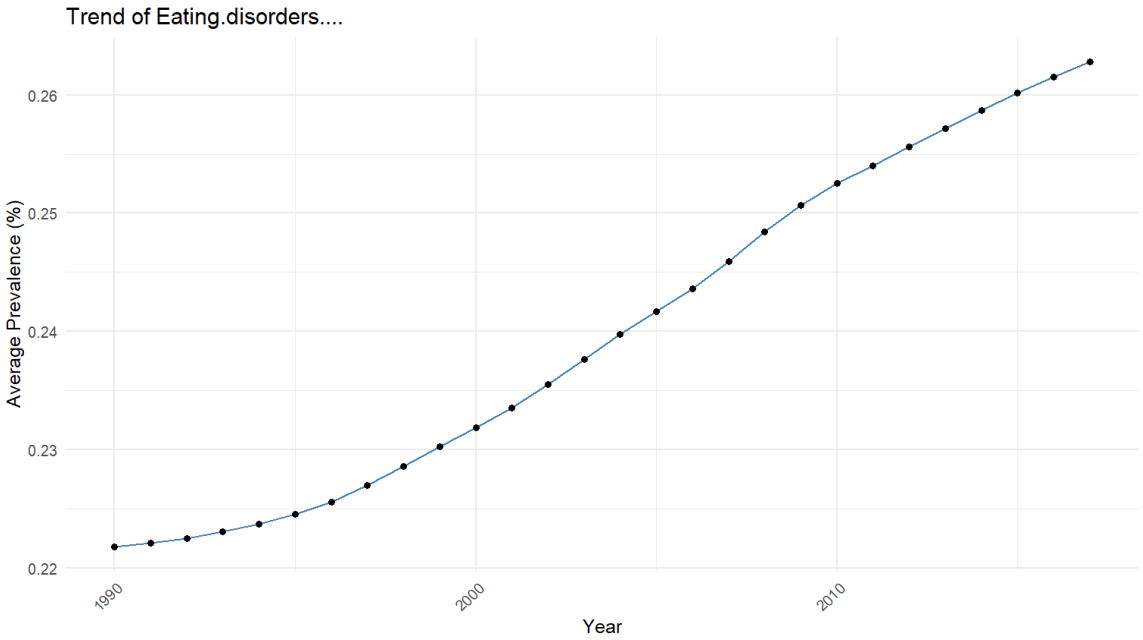

Fig 38 : Time Series Analysis on Global Eating disorder rates

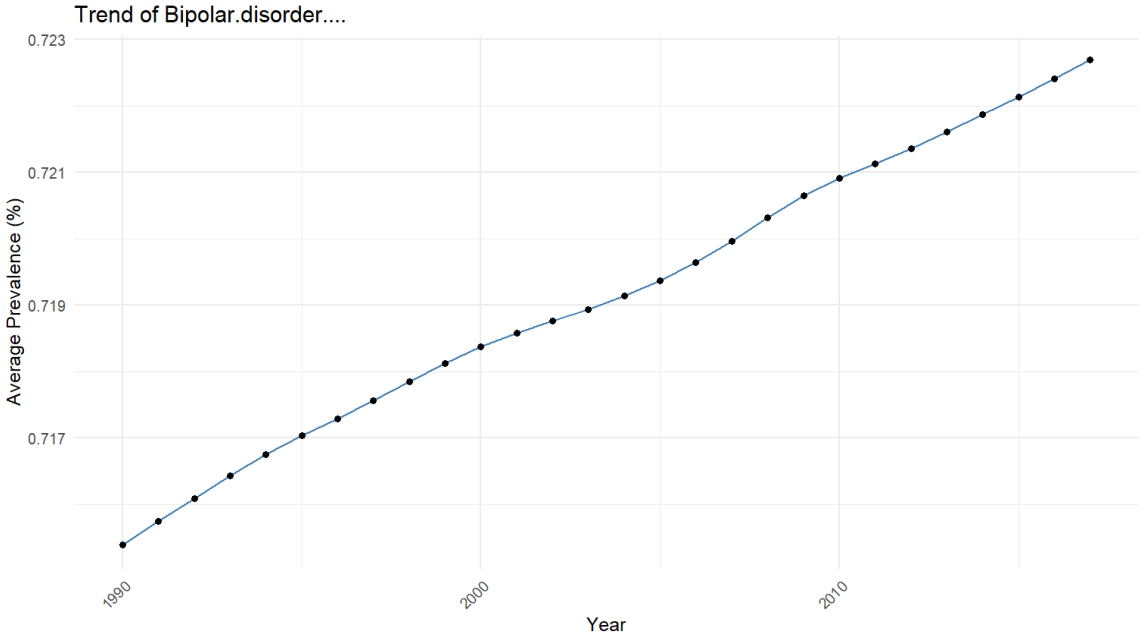

Fig 39 : Time Series Analysis on Global Bipolar disorder rates

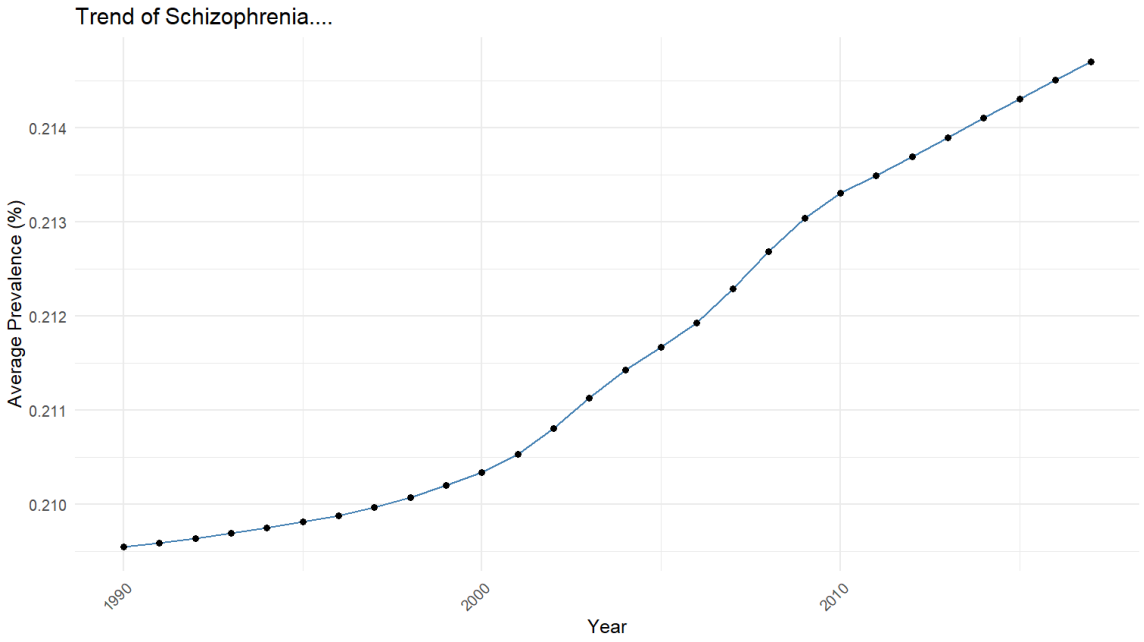

Fig 40 : Time Series Analysis on Global Schizophrenia disorder rates

Correlation Analysis:

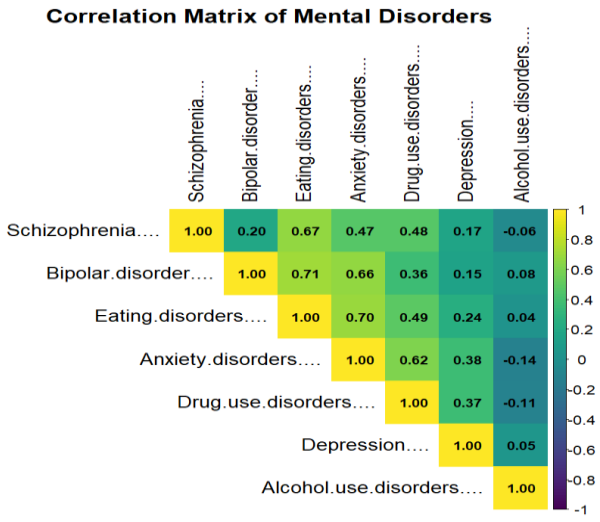

Fig 41 : Correlation Analysis on Global disorder rates

Key Insights and Policy Recommendations :

i) Schizophrenia - Rates are slightly increasing but in minor increments globally. Resource allocation may focus more on chronic care than screening. Needs medication access, and

long-term support infrastructure, community-based psychiatric care and support services. Mostly reported in Netherlands and Australia.

ii) Bipolar Disorder - Regional studies could help in addressing localized spikes, these rates are especially highest in South America, Europe, and Oceania.

iii) Eating Disorder – Rates are high in high-income Western regions and Australia. Awareness programs are vital.

iv) Anxiety Disorders - Considered a high-burden disorder with considerable variation. Mental health systems should be strengthened, especially in Oceania, Middle East, and the America. Rates are highest in New Zealand and Northern Ireland.

v) Drug Use Disorders - Certain countries, like North America and parts of the Middle East, likely inflate the global average. Policies should be tailored to national substance use patterns. Rates are notably high in the United States, and Canada.

vi) Depression – Policies should be prioritized for universal screening and prevention policies. Rates are high prevalence in the developed nations. This disorder is most common in Greenland and Morocco**.**

vii) Alcohol Use Disorders - Cultural and regional variability significant. Policies should be adaptive. Rates are significantly high in Eastern Europe and parts of Latin America, highest in Russia.

Conclusion

Eating disorders show strong correlations with both bipolar disorder and anxiety disorders. This means people with eating disorders often also struggle with mood swings or anxiety. So, treatment should focus on all these problems together. Mental health disorders show a rising global trend, with higher prevalence in high-income and Western countries due to lifestyle stress, and cultural influences [3, 4]. Universal screening and early intervention are essential for addressing depression and anxiety effectively. Substance abuse policies must be culturally and regionally tailored, considering differing norms and usage patterns. Women are disproportionately affected by depression, anxiety, and eating disorders, while men show higher prevalence in substance-related disorders [1]. There is an urgent global need for increased awareness, adaptive regional policies, and sustained investment in mental health infrastructure—especially in strengthening community-based services for long-term care and support [2].

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