The relationship between mental health, suicide and the consumption of licit and illicit substances.

Carlos Gomes[1] and Ian Machado[1]

[1] University of Minho, Braga 4710-057, Portugal

Abstract. The relationship between substance abuse, mental health, and suicide is an emerging problem, necessitating the analysis of these interactions to inform public policies that promote a healthier, more resilient society. This study collects data to visualize these relationships and raise public awareness. MongoDB was used for data storage and Power BI for visualization, covering 178 countries from 2000 to 2018. A correlation between alcohol consumption and suicide was observed, especially in Nigeria, Morocco, and North Macedonia. Additionally, a relationship between alcohol consumption and depression was identified. It was also noted that drug use is related to mental disorders such as bipolar disorder, schizophrenia, and eating disorders. The analysis aligns with the literature, corroborating the relationships between the studied variables. This study highlights the importance of effective public policies and interventions to improve mental health, reduce substance abuse, and prevent suicide.

Keywords: Mental health, Suicide, Licit and illicit substances, MongoDB, Power BI.

Motivation and Objectives

The relationship between substance abuse and mental health is an emerging problem that has been growing steadily for almost three decades. The aim of this study is to acquire data related to the topic and shape it for better visualization and understanding, thus contributing to an investigation, analysis and warning of the population, as well as demonstrating the relationship and evolution over the years of the variables under study, which can be a valuable source of information for the development of future intervention strategies and public health policies, in order to contribute to the quality of life of affected individuals. To do this, a set of database tools will be used, such as MongoDB, which is a NoSQL database, as it is suitable for the data under study, and Power BI for visualizing and analyzing the results.

1 State of the Art

Mental disorders account for approximately 14 per cent of the global burden of disease in general. Despite this significant figure, health systems do not provide the necessary support to improve and develop effective treatments. Mental disorders cause ‘triggers’ that contribute to the emergence of risky behaviour and a reduced ability to cope with situations considered traumatic/stressful [1] such as the abuse of licit and illicit substances and suicide.

1.1 Abuse of licit and illicit substances

The use of licit and illicit substances among people with mental health problems such as depression, psychotic disorders and biopolar disorders is becoming an increasingly common problem. In the USA, for example, 20,291 people were interviewed by the “National Institute of Mental Health Epidemiologic Catchment Area Program” and a high rate of substance abuse was recorded when compared to the local population, where the diagnosis of schizophrenia (16.7%) and bipolar disorder (60.7%) prevail [2]. According to a study [3], epidemiological data estimate that the rates of comorbidity in adolescents are comparable and even higher than in adults, with young people aged 14 to 18 diagnosed, where 76% of them have a concomitant psychiatric disorder, i.e. mental health disorders and substance use simultaneously. The study by [4] reflects that a group of participants with mental disorders, where about 60% were male, were analyzed in relation to substance use. Around 54% of the study subjects suffered from depression, while the remainder (46%) had a psychotic disorder. It was observed that tobacco and alcohol were the main substances consumed, mainly associated with coping mechanisms, while cannabis was associated with pleasure. In 75 patients with substance use disorders, 22.4% had primary depressive disorders, 8.4% had substance-induced depression and 5.6% exhibited mixed characteristics of both types. Furthermore, this study proved after several evaluations over a period of months that stopping the use of primary substances had a significant impact on the treatment of depression [5].

1.2 Suicide

Suicide is a global and emerging problem, arising from various complications throughout an individual's life. Approximately half of these individuals (51.3%) had been diagnosed with at least one mental health problem in the year preceding their death. This risk was higher mainly in individuals with schizophrenia spectrum disorder, followed by bipolar disorder, depressive disorders, anxiety disorders and ADHD [6]. Other studies show the direct influence of treatment and prevention when compared to patients with low insight, since it directly influences the patient's life satisfaction, decreasing protection against suicidality [7].

2 Methodology

2.1 Collecting the Data

Firstly, the information considered useful for comparison on the topics under analysis was collected. Using the "Our World in Data" website (https://ourworldindata.org), datasets were selected for further analysis. The data sets selected were as follows:

- Burden of disease from each mental illness (https://ourworldindata.org/grapher/burden-disease-from-each-mental-illness)
- Share with drug use disorders (https://ourworldindata.org/grapher/share-with-drug-use-disorders)
- Death rate from suicides (https://ourworldindata.org/grapher/death-rate-from-suicides-gho)
- Total alcohol consumption per capita (https://ourworldindata.org/grapher/total-alcohol-consumption-per-capita-litres-of-pure-alcohol)

2.2 Data storage

After collecting the data, it was decided to use MongoDB to store it. MongoDB's ability to handle large volumes of data and its compatibility with Power BI, which has native connectors for this platform, facilitates data integration for future analyses.

2.3 Data Treatment and Transformation

The data was processed and transformed to ensure its quality for analysis. Null and/or missing values were identified and removed, columns and rows that were not relevant to the analysis were eliminated and the data was normalized to facilitate comparison between different data sets.

2.4 Visualization and Analysis

After processing the data, Power BI resources were used to build and visualize charts that contributed to data analysis. These visualizations were essential for comparisons, identifying patterns, trends and relationships between datasets.

3 Results

This chapter will show charts that reveal a possible interaction between variables in the dataset. These charts will be presented on a global scale, covering 178 countries between 2000 and 2018. However, this general analysis may often not be the most accurate due to the presence of external factors such as wars, economic crises and natural disasters.

Therefore, although it is not possible to completely eliminate this “noise”, in order to reduce the interference of other variables that can affect the performance of the parameters under analysis, it was also decided, whenever necessary, to analyze three countries individually:

- Nigeria;
- Morocco;
- North Macedonia.

3.1 Alcohol consumption

As is well known, excessive alcohol consumption is theoretically associated with some kind of momentary problem affecting the individual. For this reason, we have chosen other parameters that may also be related to these problems, in order to find some correlation between the two. The correlations under analysis will therefore be:

- Alcohol Consumption / Number of Suicides;
- Alcohol Consumption / Number of Depressions.

Alcohol Consumption - Number of Suicides. We started by looking at alcohol consumption and the number of suicides on a global scale, as shown in Figure 1:

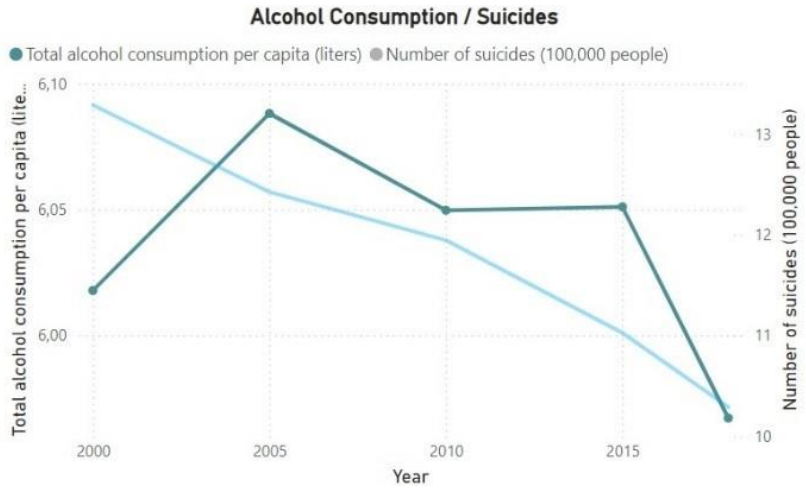

Fig. 1. A worldwide analysis of alcohol consumption and number of suicides between 2000 and 2018.

The chart shows that there was a slight increase in alcohol consumption between 2000 and 2005, which is not in line with the figures for the number of suicides, which fell. However, after 2005, the rates saw a similar decline, getting closer and closer over the years.

So, in order to investigate further, it was decided to analyze the three chosen countries individually.

The comparison for Nigeria can be seen in Figure 2.

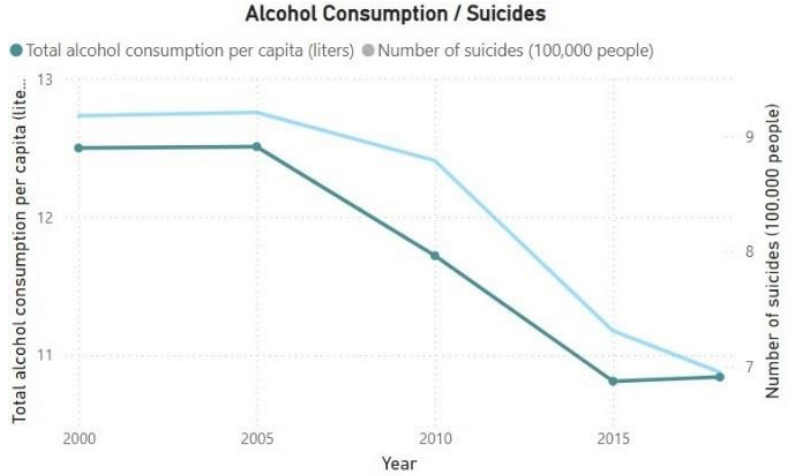

Fig. 2. An analysis of alcohol consumption and the number of suicides in Nigeria between 2000 and 2018.

Looking at the chart above, you can see that the data for both variables follow the same trend over the years. This could be a sign that the parameters are closely related.

We then analyzed the chart for Morocco:

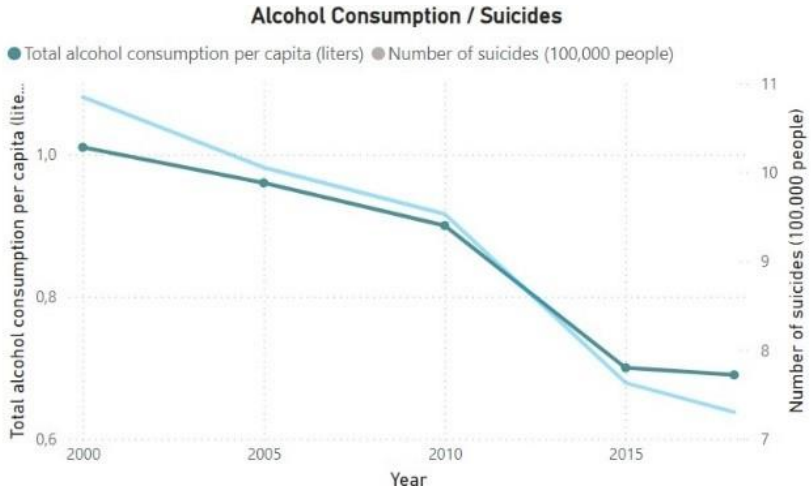

Fig. 3. An analysis of alcohol consumption and the number of suicides in Marroco between 2000 and 2018.

Looking at the chart, we can see an enormous similarity in the evolution of the values of the variables over the years. Once again, this may indicate that suicide and alcohol consumption are strongly related.

Finally, the chart for North Macedonia was analyzed:

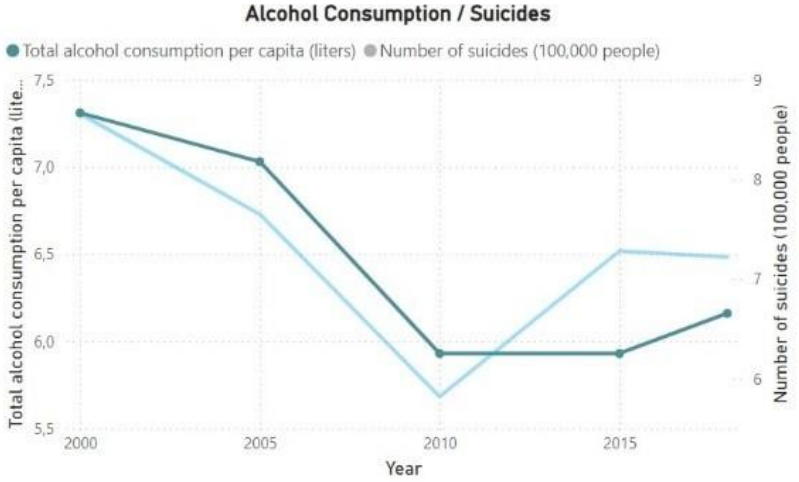

Fig. 4. An analysis of alcohol consumption and the number of suicides in North Macedonia between 2000 and 2018.

This chart also shows a similar trend in the values for the two variables, with only slight deviations from 2010 onwards. However, due to the major similarity, this chart can also be an insight into the relationship between suicide and alcohol consumption.

Depression - Alcohol consumption. After the previous analyses, we tried to find a connection between alcohol consumption and depression in the data. Figure 5 shows the evolution of alcohol consumption per capita and the number of cases of depression per 100,000 inhabitants worldwide.

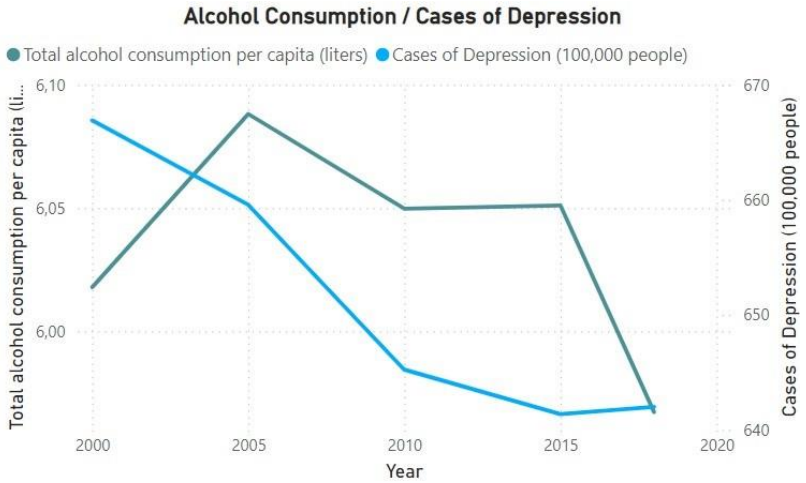

Fig. 3. A worldwide analysis of alcohol consumption and cases of depression between 2000 and 2018.

In the Figure, although there is a convergence in values between 2010 and 2018, there is no clear interaction between the two parameters under analysis. It was therefore decided to carry out an individual analysis of the countries chosen upstream. We started with the analysis of Nigeria.

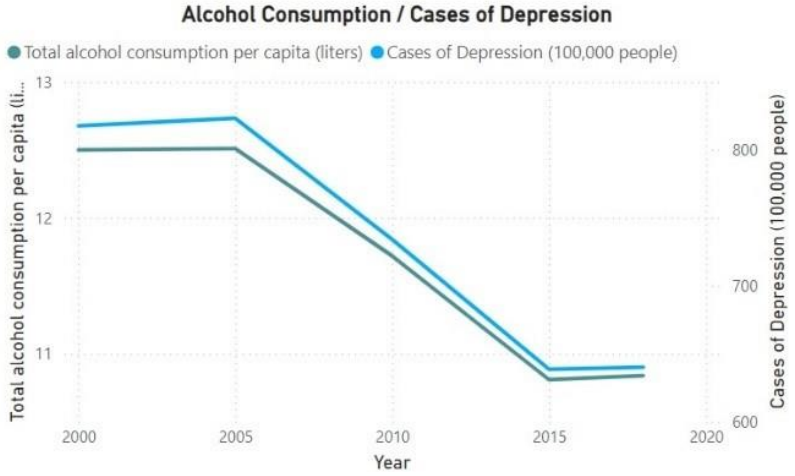

Fig. 4. An analysis of alcohol consumption and cases of depression in Nigeria between 2000 and 2018.

In the chart above, you can see that the lines corresponding to the variables almost overlap. This shows that there is probably a strong correlation between the variables under study. Moving on to the analysis of the figures for North Macedonia.

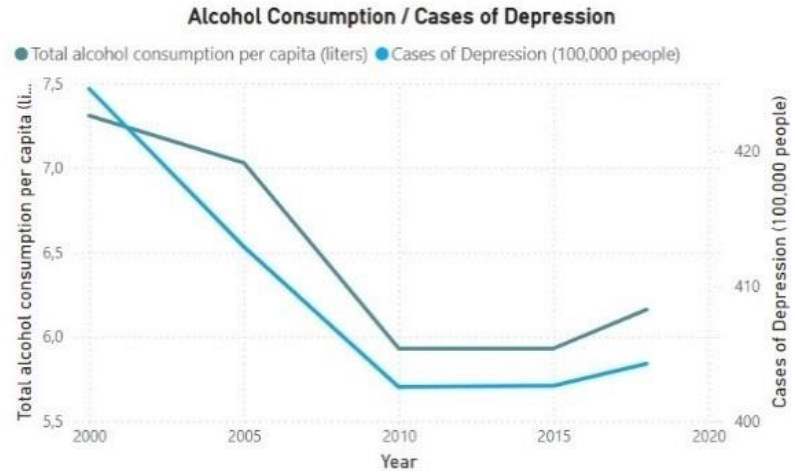

Fig. 5. An analysis of alcohol consumption and cases of depression in North Macedonia between 2000 and 2018.

As in the case of Nigeria, the values corresponding to the variables show a very similar trend, with a decrease until 2010, followed by a slight increase until 2018. So, we moved on to the visualization of the chart for Morocco.

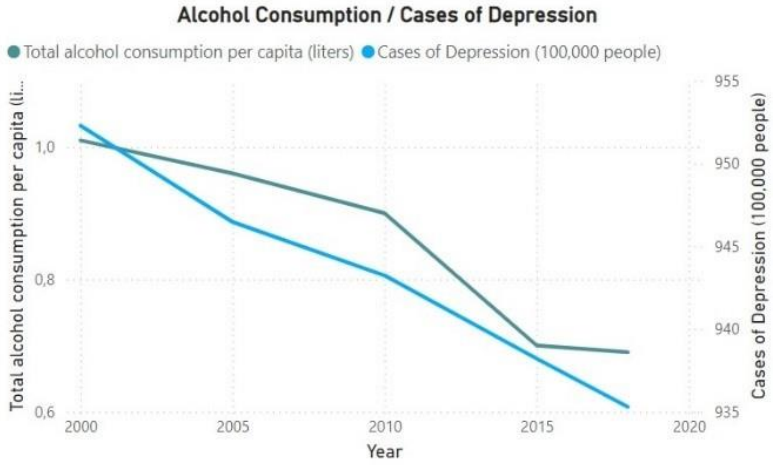

Fig. 6. An analysis of alcohol consumption and cases of depression in Marocco between 2000 and 2018.

Finally, looking at Morocco, although it is not as noticeable as in the other countries analyzed individually, it is possible to correlate the variables since they show a similar drop in the amount of alcohol consumption and cases of depression.

3.2 Suicide

In this subchapter, we have chosen to try to understand the interaction between two parameters that are strongly correlated in the literature: depression and suicide. To do this, we used information on the number of suicides per 100,000 inhabitants, as well as the number of depressive disorders per 100,000 inhabitants, from 2000 to 2018.

First of all, we began with an analysis of 178 countries, in order to obtain a general overview of the planet over the aforementioned period of time.

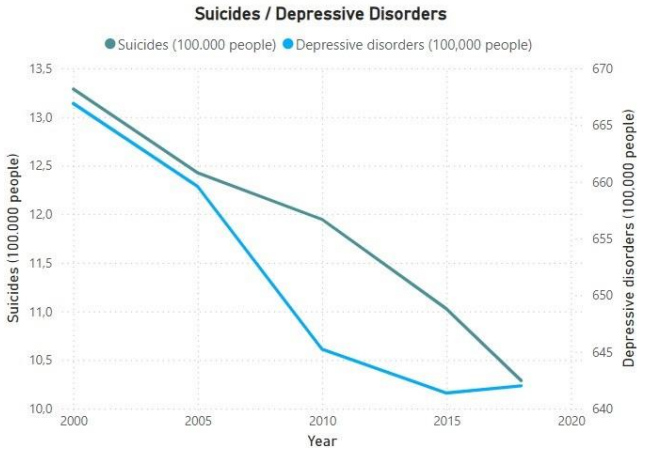

Fig. 7. A worldwide analysis of the number of suicides and depressions between 2000 and 2018.

The chart (Fig. 9) shows a similarity in the evolution of the data over the years. From 2000 to 2018, there was a decrease in both the number of suicides and the number of depressions worldwide. Furthermore, the trend followed a similar pattern, which may reveal some correlation between the two parameters. Despite the similarities, it was decided to move on to analyzing the countries individually. So we started by analysing the chart for Nigeria

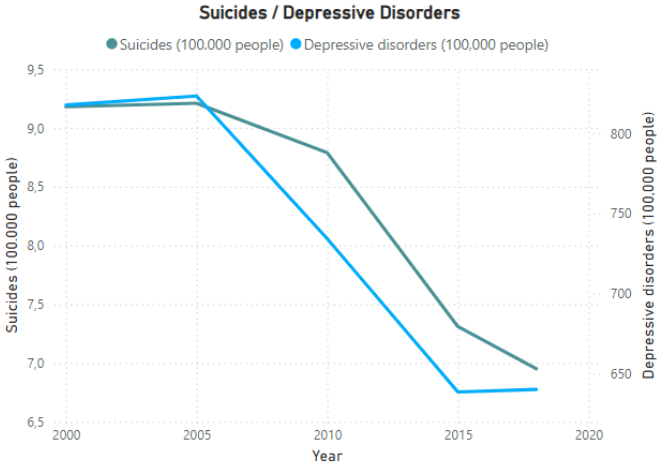

Fig. 80. An analysis of the number of suicides and depressions in Nigeria between 2000 and 2018.

For the parameters analyzed in Nigeria between 2000 and 2018, it is possible to observe a great similarity in the decrease of their values. This could be an indicator of the direct

correlation between cases of depression and the number of suicides. Then we move onto the next country.

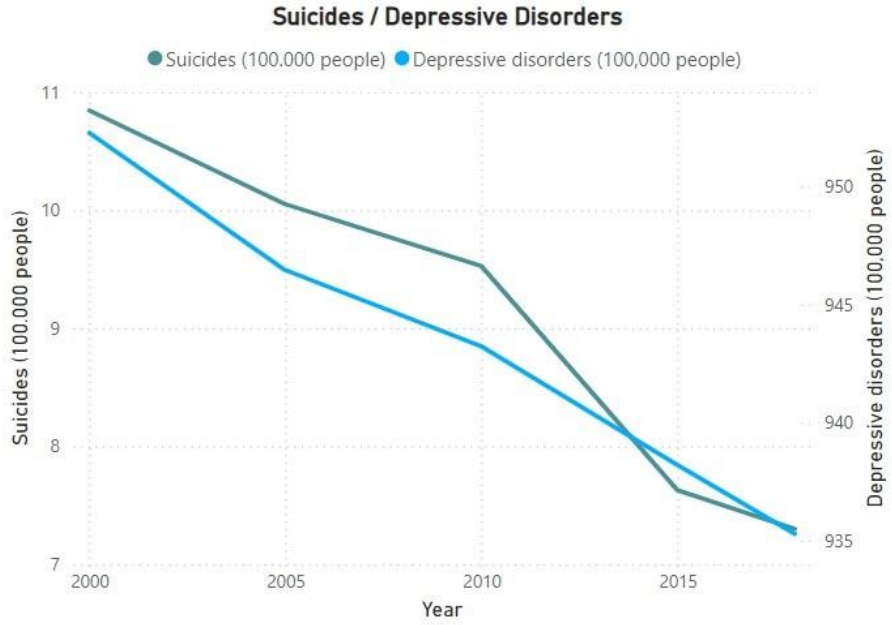

Fig. 91. An analysis of the number of suicides and depressions in Marocco between 2000 and 2018.

With regard to the parameters under analysis in Morocco between 2000 and 2018, it is also possible to observe a similarity in the decrease in their values. Once again, the presence of similarities in the evolution of the two variables may be an indicator of the direct correlation between cases of depression and the number of suicides.

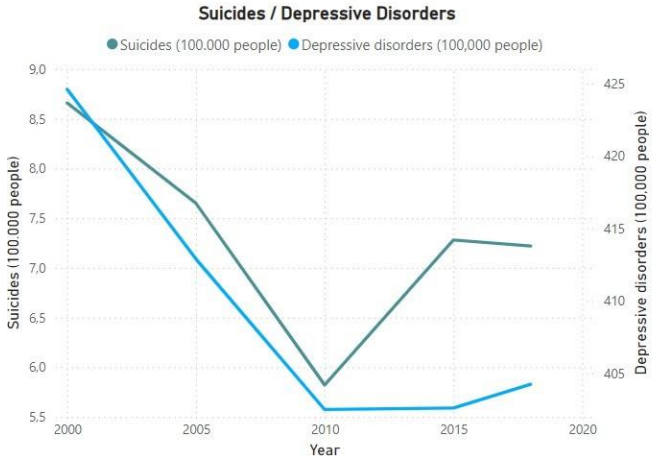

Fig. 102. An analysis of the number of suicides and depressions in North Macedonia 2000 and 2018.

Finally, in the parameters under analysis in North Macedonia between 2000 and 2018, it is also possible to observe a parity in the decrease of their values until 2010, and then there is some discrepancy in their behavior. That's because between 2010 and 2015, there was a large increase in the number of suicides, while the number of depressions remained steady.

3.3 **Drugs**

This subchapter analyses the relationship between the use of illegal psychoactive substances and the prevalence of mental illness in the population. In these examples, you can look at the charts for the following illnesses:

- Bipolar disorder (Fig. 13);
- Schizophrenia (Fig. 14);
- Eating Disorders (Fig. 15).

Within eating disorders, there is no differentiation between anorexia, bulimia, binge eating disorder and restrictive and avoidant eating disorders, so all these disorders will be considered. Then we proceeded with the analysis of the charts.

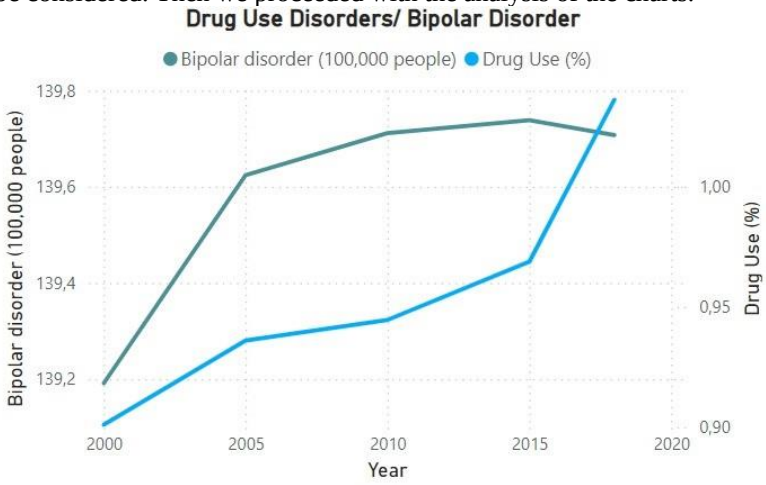

Fig. 113. A worldwide analysis of the rate of drug use disorders and the number of bipolar patients between 2000 and 2018.

Figure 13 analyzes the relationship between drug use (in %) and the presence of bipolar disorder (per 100,000 people). It can be seen that over the years there has been a tendency for both parameters to increase, with a slight similarity in the evolution of their values.

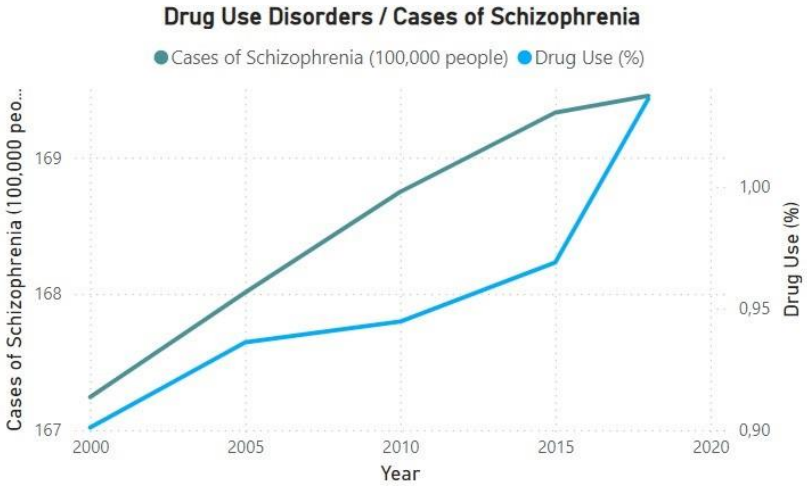

Fig. 124. A worldwide analysis of the number of drug use disorders and the number of cases of schizophrenia between 2000 and 2018.

The chart shows the relationship between drug consumption (in %) and the number of schizophrenia cases (per 100,000 people). It can be seen that over the years, both parameters follow an upward trend, and there is also a similarity in the way their values evolve, with similar trend lines.

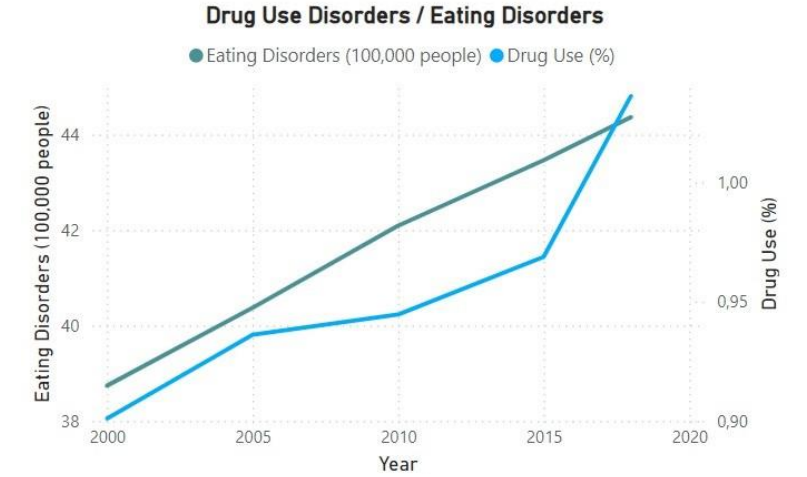

Fig. 135. A worldwide analysis of the number of drug use disorders and the number of eating disorders between 2000 and 2018.

Finally, Figure 15 shows the relationship between drug use (in %) and the number of eating disorders (per 100,000 people). As in the charts above (Fig. 13 and Fig. 14), the parameters show a similar behavior over the years, even when analyzed as an average of the global panorama. Furthermore, it can be seen that since the 2000s, both overall

drug consumption and the presence of mental illness in the population have increased in a similar way, which may reveal some relationship between the parameters analyzed.

4 Discuss

4.1 Alcohol consumption and suicide

According to the literature, several studies have shown the close connection between alcohol and suicide. According to [8], this relationship was investigated in 183 countries, and was observed in both sexes, regardless of the country's income level. It has also been shown, in the various groups studied, that the suicide rate was higher in males, especially in middle-aged and older men. In this study [9], which investigates the relationship between parameters, it can be seen how aggressive, impulsive and alcohol-dependent behaviour contributes to suicide.

In another study with a sample including more than 10 million participants from several groups, the results show that alcohol consumption is associated with around 94 per cent of the risk of death by suicide. Furthermore, the analysis pointed out that this association is more pronounced in younger age groups and with a higher amount of alcohol consumption [10].

4.2 Alcohol consumption and depression

According to the literature, studies have demonstrated the relationship between alcohol and depression. For example, in one study, this complex correlation was studied taking into account bidirectionality, where over 3 periods, more than 10,000 samples were observed. The results revealed that alcohol consumption at harmful levels was associated with a significant increase in the risk of depression. In addition, not only the amount of alcohol consumed was taken into account, but also the pattern of consumption, where the higher the level, the worse the situation [11]. In the analysis of the Canadian population in 1994, for instance, which included a sample of approximately 18,000 participants, the results indicated that participants who had consumed alcohol in the year prior to the analysis were more likely to have had a depressive episode than those who had not. They also found that heavy consumption on single occasions (more than 10 drinks) was associated with a higher risk of depression [12].

4.3 Drugs and mental illness

Several studies have shown a number of connections between drug use and mental illness. Eating disorders, for example, such as bulimia, which occurs mainly in women due to social pressure, involve the concomitant consumption of substances such as cigarettes, diuretics, emetics and illicit drugs, with the main aim of suppressing appetite, controlling weight or inducing throwing up [13]. Other studies have also investigated binge eating disorder. For this analysis, the Yale Food Addiction Scale 2.0 was used.

The results show that patients with one or more addictive behaviours reported the highest clinical severity[14].

When it comes to schizophrenia, studies indicate that patients are more vulnerable to substance use, mainly due to genetic determinants that contribute to the risk of psychosis and dependency. This weakness can appear even before the symptoms associated with schizophrenia begin, increasing the risk of developing a substance use disorder [15]. Substance abuse and violent behaviour in patients with schizophrenia have also been reported in North America. This mostly indicates the vulnerability of these patients to the negative effects of substance abuse, generating antisocial and, in some cases, violent behaviour [16].

Bipolar disorders have also been studied. According to the literature, the relationship between bipolar disorder and drug use is very common. Patients are often hospitalized with early signs of the illness, with more significant numbers of depressive episodes and suicide attempts reported [17]. Furthermore, bipolar patients who abuse substances find it more difficult to stick to treatment, which is a cause for concern as it increases the number of hospitalisations [18].

5 Conclusion

Therefore, after several analyses, it is possible to confirm the intrinsic link between these parameters. Depression often contributes to the use of psychoactive substances and alcohol, in search of momentary relief which, over time, can worsen depressive symptoms, making it difficult for the patient to recover.

In addition, excessive alcohol use carries a higher risk of suicidal behaviour, because according to some studies, people who have some kind of dependency, along with depressive disorders, have significantly higher suicide rates, and so interventions that highlight all the problems derived from alcohol are vital.

Finally, this project contributes to raising public awareness and calling for the creation of new public health policies. The creation of safe and supportive environments, for instance, is essential to break this harmful cycle. Effective intervention strategies are vital to promote mental health, reduce substance abuse and prevent suicide, contributing to a healthier and more resilient society.

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