



DSA4262 Assignment 1

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Introduction & Motivation

The growing number of mental health disorder cases worldwide constitutes a major public health problem and it has been estimated that about one in seven people suffer from some type of mental disorder (WHO, 2025). In addition to being aware of mental health issues there also appears to be a lack of healthcare capacity expansion across different countries and populations. For this reason, we evaluated multiple data sources to identify vulnerable demographic groups, examine potential drivers behind their increased risk and highlight areas where healthcare capacity may be insufficient relative to mental health demand, thereby informing targeted and effective interventions.

This study utilizes the Global Burden of Disease (GBD) Study dataset provided by the Institute for Health Metrics and Evaluation (IHME) in conjunction with the World Health Organization's (WHO) medical workforce capacity dataset to analyze mental health burden at both the macro level and provide micro-level demographic insight. Both datasets are credible and publicly accessible, therefore providing sufficient information for analyzing mental health at a population level. Together, we hope to develop a potential intervention that can be implemented in Singapore.

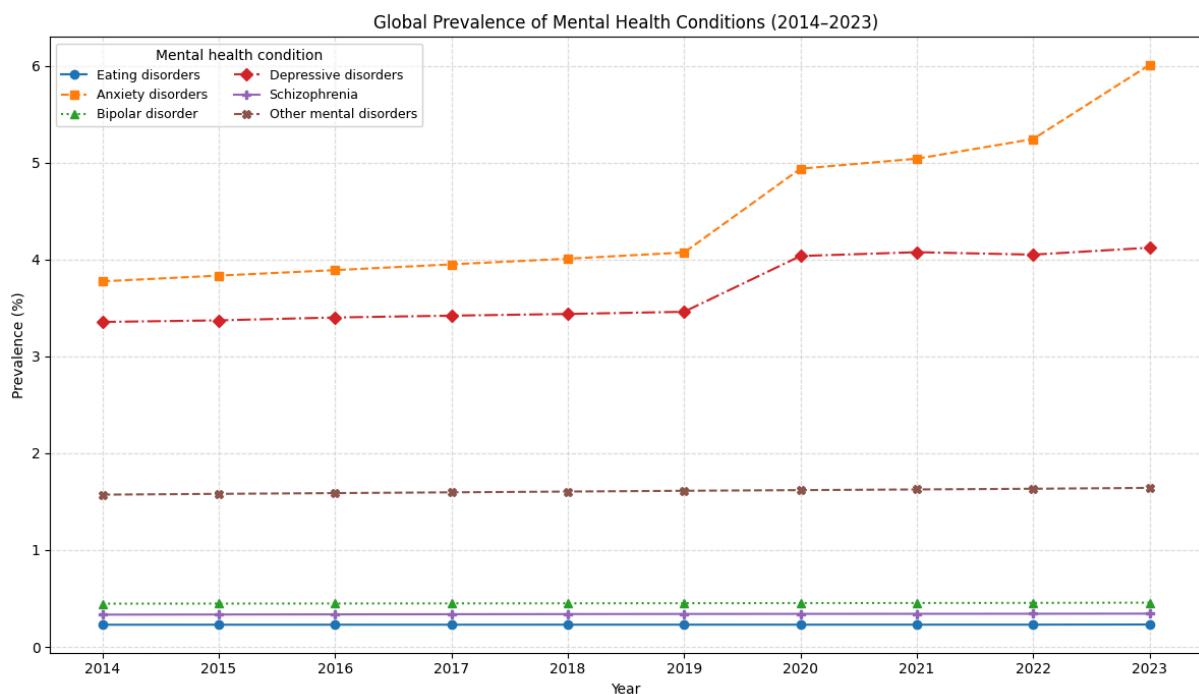
Plot 1: Global Prevalence of Mental Health Conditions (2014-2023)

The first plot aims to establish the global landscape of mental health conditions over the past decade, by examining the prevalence of several common mental health conditions, and to demonstrate that mental health disorders are evolving public health concerns that require intervention. A multi-line plot was chosen to highlight the temporal trends and compare mental health conditions. Different colours and markers were used for different health conditions to ensure contrast and accessibility under grayscale viewing.

Key findings from Plot 1 below include anxiety and depressive disorders being the most prevalent mental health conditions, with prevalence of both disorders increasing across the years. Other mental health conditions like eating, schizophrenia and bipolar disorders show a relatively stable but persistent prevalence.

However, the global aggregation of each mental health disorder may hide specific regional and demographic differences, and a possible misinterpretation is that an increase in prevalence recorded may not reflect the actual number of cases, as the increase may be attributed to improved diagnosis and reporting.

Moving on, with depression being one of the top two mental health conditions, we shall examine its prevalence in greater detail in subsequent plots.



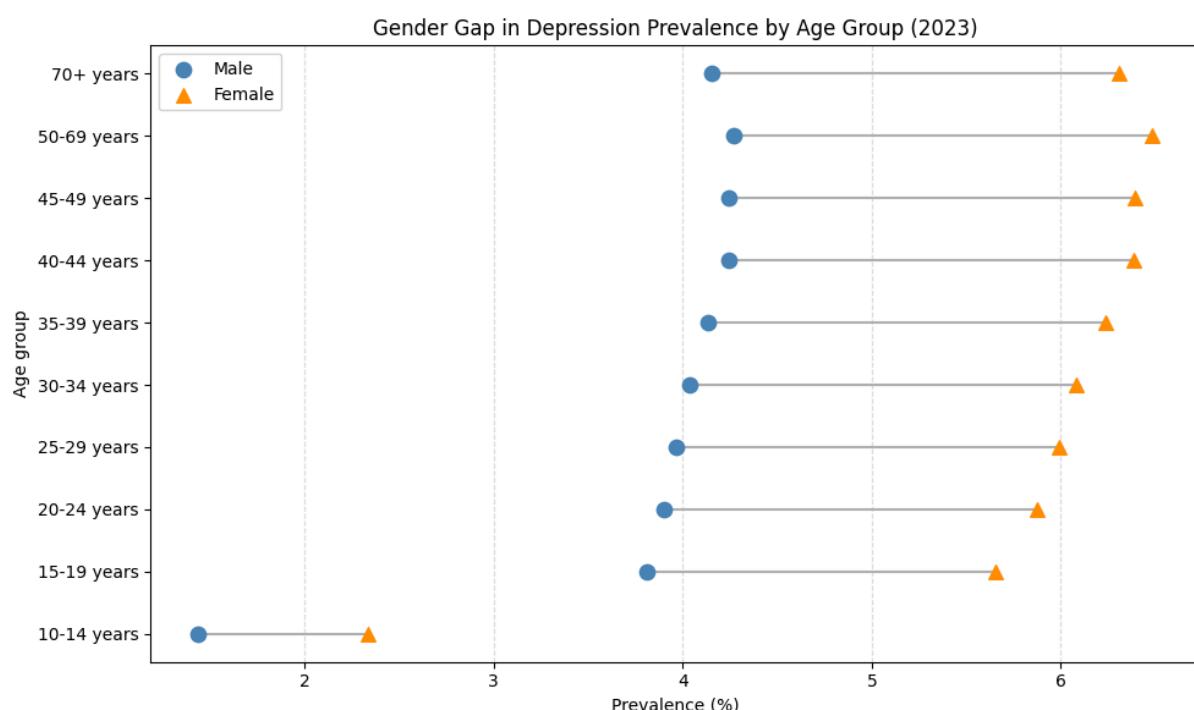
Plot 2: Gender Gap in Depression Prevalence by Age Group (2023)

Moving on from Plot 1 where we established depression as a major contributor to global mental health burden, Plot 2 aims to investigate how prevalent depression is across age and gender, revealing several important demographic nuances that are overlooked at a macro level. A dumbbell plot was chosen because it allows direct comparison between male and female prevalence across several age groups. Furthermore, the dumbbell plot highlights the magnitude of the difference between depression prevalence in male and female individuals.

Key findings from Plot 2 below include a higher prevalence of depression among females compared to male individuals across all age groups, with a more significant gap from age groups 15-19 years and above. Furthermore, there are notable differences in the prevalence of depression in adolescents aged 10-14 years and young adults aged 15-19 years, showing early divergence.

A possible misinterpretation of the plot, is the assumption of a causation relationship between gender and prevalence of depression, when the data only shows association between the two variables. Additionally, the observed difference in depression prevalence among males and females could be explained by cultural stigma and reporting biases across genders. For example, social expectations that men should be mentally resilient may dissuade one from seeking help and obtaining a diagnosis, resulting in an underreporting of depression among males.

Interventions could include investigating the reason for this divide in prevalence by conducting surveys or questionnaires to find out if there is in fact an underreporting of depression among males. If the results of the survey do or do not indicate that there is an underreporting of depression, then strategies should be put in place to tackle the respective issues.



Plot 3: Depression Burden vs Psychiatrist Workforce Capacity

Moving on from Plot 2, where we dived into specific demographic characteristics like gender and age, we now shift our attention to healthcare workforce capacity in relation to depression prevalence. Unlike the previous plots, Plot 3 draws on both the GBD dataset and WHO workforce capacity dataset, which was not previously used. However, the WHO workforce data are only available for the most recent year reported by each country (ranging from 2013-2017). As a result, psychiatrist workforce capacity was compared against depression prevalence from the corresponding year for each country, meaning that the values shown in the plot may not all be from the same calendar year.

In Plot 3, by linking depression prevalence to psychiatrist density, we aim to address the question of whether mental health resources are aligned with mental health burden. A scatter plot with a median benchmark for both variables was chosen to allow us to compare the countries simultaneously across burden and capacity. The median benchmark would be a better choice compared to mean as it is less sensitive to outliers like New Zealand for psychiatrist density. This plot is especially useful to highlight relative positioning rather than ranking between countries. Only 6 countries with comparable economic capacity were included to maintain interpretability and to contextualise Singapore's position.

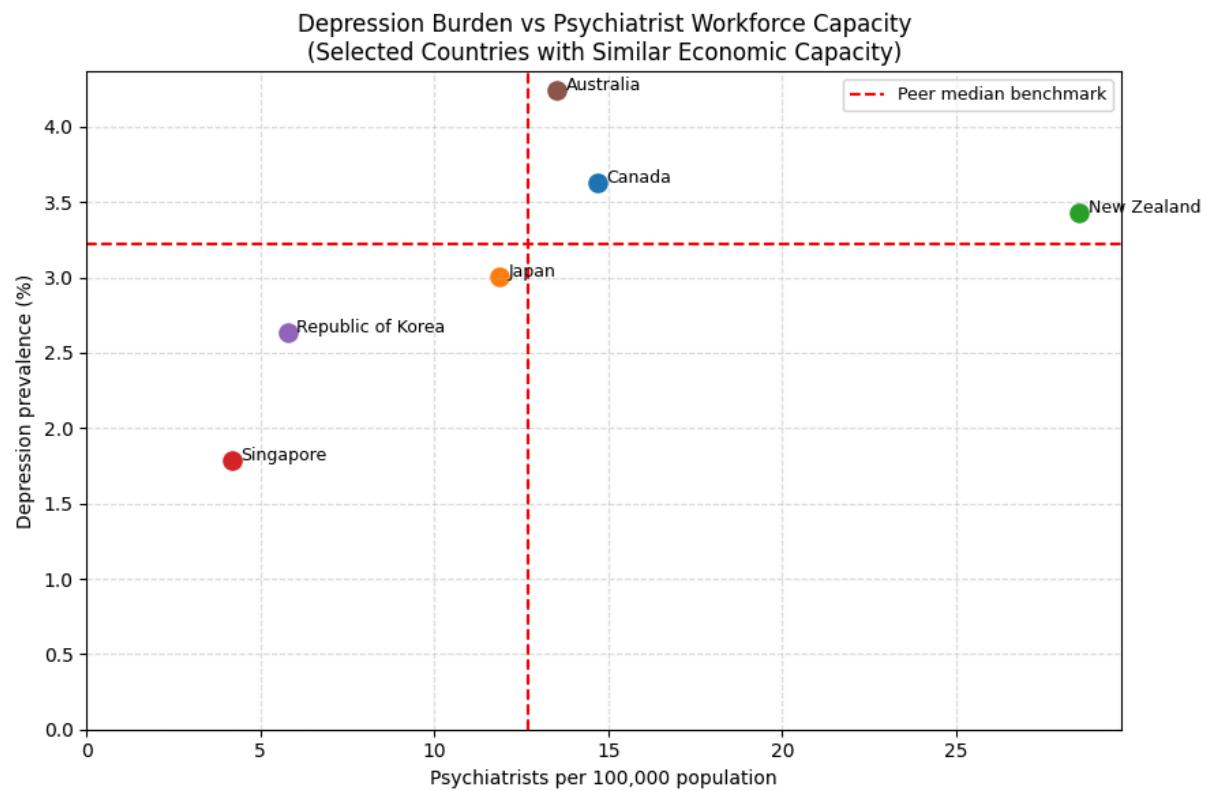
The median lines split the graph into 4 regions, each representing different combinations of depression burden and psychiatrist workforce capacity. Countries in the top-left region indicate a higher than median prevalence but lower than median capacity, which could suggest that there could be a potential need for more mental health resources in that region. In contrast, the bottom-right region exhibits a lower than median prevalence but higher than median capacity, which could indicate that there is a relatively stronger workforce capacity given a lower depression burden. The top-right and bottom-left regions could be interpreted as cases where psychiatrist capacity broadly aligns with depression burden.

Key findings from Plot 3 below include that countries with similar depression prevalence can have vastly different psychiatrist densities. We see that all 6 countries lie in either the top-right or the bottom-left regions, which may reflect that these are high-income countries with broadly aligned mental health resources and burden. Singapore specifically appears in the bottom-left region with lower than median depression prevalence and a lower than median psychiatrist capacity.

Despite Singapore being in the bottom-left region, a possible misinterpretation is that mental health needs are being met. Instead, the lower psychiatrist workforce capacity may limit access to care and discourage individuals from getting diagnosed, thereby understating the prevalence of depression. As such, a possible intervention for Singapore would be to explore task-shifting strategies, providing more emphasis on mental health by allocating additional resources or increasing investments to increase public awareness through targeted campaigns, strengthening community-level mental health services.

A key limitation of this analysis is that psychiatrist density does not capture the full spectrum of mental health resources available such as psychologists or digital mental health services. Furthermore, the workforce data is outdated, with the most recent data dating back to 2017.

Access to more up-to-date data would allow for better assessment of the current mental health workforce capacity across countries.



References

WHO. (2025, 30 September). Mental disorders. *World Health Organization*.
<https://www.who.int/news-room/fact-sheets/detail/mental-disorders>

Datasets

Dataset 1: Global Burden of Disease (GBD) Study. *Institute for Health Metrics and Evaluation*
<https://vizhub.healthdata.org/gbd-results/>

global_mental_health_2013_2017.csv

global_mental_health_2023.csv

global_mental_health.csv

Dataset 2: Medical Workforce Capacity. *World Health Organization*

[https://www.who.int/data/gho/data/indicators/indicator-details/GHO/psychiatrists-working-in-mental-health-sector-\(per-100-000\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/psychiatrists-working-in-mental-health-sector-(per-100-000))

psychiatrists_working_in_mental_health_sector.csv