

Exploring the Impact of Happiness Metrics, Socio-Economic  
Factors, and Mental Health Disorders on Depression and  
Quality of Life Across Continents | Aarya Desai | Jeremy Tan  
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## Abstract

There is widespread research which looks into the factors that influence happiness and those that affect mental health. However, the motivation of the current research project was to gain a holistic view of world happiness and mental health, potentially identifying causality between them. Therefore, after accessing data from the World Happiness Report and a University of Oxford dataset regarding mental health, two research questions were put forth to better understand how happiness metrics may influence mental health and how mental health (and other quality of life metrics) may influence an overarching concept of happiness called Quality of Life (QoL):

1. To what extent do happiness metrics and socioeconomic factors predict depression in continents?
2. To what extent do mental health disorders, happiness metrics, and socioeconomic factors predict quality of life?

The results of this study revealed global patterns in depression predictors. Higher log GDP per capita and freedom to make life choices correlate positively with depression, while greater healthy life expectancy and lower perceptions of corruption are associated with lower depression rates. Generosity, positive affect, low social support, and negative affect impact depression. For the second part of this study, the results revealed higher percentages of the population having depression predicted “Bad Quality of Life,” while economic prosperity and freedom to make life choices enhance the likelihood of “Good Quality of Life.” Contrary to intuition, however, the results also revealed that higher percentages of eating disorder populations in a region predict “Good Quality of Life”. Finally, geographically, the Americas and Oceania are linked to better quality of life, with Asia showing a moderate connection. Both models had high predictive power, and therefore, the results are reliable. However, this brings into question the result found regarding eating disorders and Good Quality of Life. This may be explained by the complex relationship between region, QoL, and individual factors/psychology that could lead to eating disorders. Such insights along with strengths, limitations, and future directions of the study are elaborated upon in further in the paper.

## Introduction

There is widespread research looking into how happy a country is based on certain socioeconomic and individual-level factors (Ahmadiani et al., 2022). Furthermore, there is also wide-ranging research looking into various mental health disorders and their impact on quality of life (Chigerwe et al., 2020). There is a general consensus that the better a countries' socioeconomic status, the higher they score on the happiness index (Ahmadiani et al., 2022). On the other hand, mental health disorders are suggested to be caused by a plethora of factors, such as, genetics, environmental circumstances, financial circumstances, etc. (Evans et al., 2006). The aim of the current research paper is to gain a better understanding of these two schools of research together, but look at it in a more general context (continent instead of country).

The prevalence of depression is on the rise across the globe (Bell & Blanchflower, 2019). Furthermore, research has indicated that this may have to do with one's socioeconomic status, where individuals with lower socioeconomic statuses are more likely to experience depressive symptoms (Graham & Pinto, 2019). Contrarily, research has also shown that happiness interventions have been shown to reduce depression among individuals (D'raven et al., 2014). Therefore, there is an established correlation between depression and happiness. The current research paper would like to extend these findings and try to establish a predictive inference of depression based on happiness metrics.

On the other hand, there could be a reverse relationship between these factors as well. To better explain this, it is important to understand the concept of Quality of Life (QoL), which refers to the overall well-being of an individual or population (Teoli & Bhardwaj, 2023). This includes having good personal health (mental, physical, and spiritual), strong relationships, good education and social status, healthy work environment, good income, sense of safety/security, freedom to make choices, and healthy physical environment. Based on this definition, the current study could look into how/to what extent mental health disorders and the other QoL metrics mentioned could predict QoL.

Based on the motivations of this current paper, two research questions were put forth to further investigate the schools of thought mentioned. For the same, the two datasets found for this study were the World Happiness Report (2022) and University of Oxford Mental Health Disorders Data (2022). The two research questions which will be answered in the following sections are:

1. To what extent do happiness metrics and socioeconomic factors predict depression in continents?
2. To what extent do mental health disorders, happiness metrics, and socioeconomic factors predict quality of life?

Both research questions will be tackled as prediction problems, offering insights into key metrics' predictive potential for depression and QoL. This approach aims to inform interventions and policies concerning mental health and well-being at a broader scale.

## Methods

### Data

**Merging Data:** The datasets selected were merged on common countries and years, and then a larger dataset with 1462 observations was created. It contained 18 variables (9 happiness metrics, 7 mental health disorder variables): Country, Year, Life Ladder, log GDP per capita, Social Support, Life expectancy at birth, Freedom to make life choices, Perception of corruption, Generosity, Positive affect, Negative affect, Alcohol use disorders (%), Drug use disorders (%), Schizophrenia (%), Bipolar disorders (%), Anxiety Disorders (%), Eating Disorders (%), and Depression (%).

**Dataset Information:** The happiness metrics were a range of factual data collected from census surveys (e.g., Log GDP per capita, life expectancy at birth) and self-reported variables collected from the population of each country in a given year (e.g., life ladder, freedom to make choices, social support, etc). The final variables of this dataset were also self-reported measures of positive and negative emotions which were culminated and calculated into the variables positive affect and negative affect (required to analyze happiness reports for countries). The mental disorders dataset's variables indicated the percentage of the population that had the stated mental disorder in the given country and year per observation.

**Data Cleaning and Manipulation:** First, the 153 countries were grouped into their respective continents, as our primary interest lies in discerning variations in our research questions across different continents. Another transformation was done in relation to the second research question to predict one's Quality of Life (QoL) mental health and happiness metrics. This was done with the help of the variable Life Ladder in the World Happiness dataset, originally derived from a metric called the Cantril ladder, which asks respondents to rate their current lives on a scale of 0 (worst possible life) to 10 (best possible life). In the World Happiness dataset, this variable was an average of all the results collected from citizens of the specific country in the given year (i.e., a float, continuous variable). To simplify the same, an overarching binary variable indicating "Lifestyle Category", i.e., Good Quality of Life (Good QoL) vs. Bad Quality of Life (Bad QoL), was created. This was done using the midpoint of the Life Ladder scale (i.e., 5.5) and then recoding a Lifestyle Category variable to Bad QoL if the observation was below the midpoint and Good QoL if it was above.

**Dealing with Missing Data:** The exploratory analysis conducted on the NA values ( $n = 217$ ) showed that they were sporadic and random across various variables, i.e., there was no pattern or association with specific observations/variables. This indicated no discernible trend or meaningful relationship with the dataset's structure, thus, these NAs were unlikely to contribute meaningfully to the analysis. Moreover, their limited count relative to the dataset size suggested that retaining them might introduce negligible influence on the overall analysis. Thus, to ensure the validity and reliability of analyses, these randomly scattered NAs were removed from the dataset.

### Models

**Models Chosen:** Both research questions were approached as **prediction problems** and we proceeded with examining the question as such. Since we are predicting depression % for those in their respective continents, we use linear regression to build a model. For the second research question, since we are predicting QoL (a binary variable), we use logistic regression to build a model. After finalizing our models, we made test data to predict on our model to validate our model.

**Variables and Interaction Terms:** *A priori* selection of variables was conducted for both models based on pre-existing literature discussed in the introduction. For RQ1 focus on predictor variables: Log GDP per capita, Social Support, Life expectancy at birth, Freedom to make life choices, Generosity, Perceptions of Corruption, Positive affect, Negative affect, Continent, and Year. Notably, we intentionally avoided incorporating overlapping variables from other distinct research inquiries

(namely, life ladder), ensuring a tailored exploration into the predictive relationship between these factors and depression. Finally, research suggests that generosity and social support are highly interconnected, as prosocial and supportive environments elicit positive and giving behavior from individuals (Chen et al., 2021; d'Exelle & Riedl, 2010). Therefore, an interaction term of Generosity and Social Support was also included.

For RQ2, our focus is on predictor variables: Schizophrenia (%), Bipolar Disorder (%), Eating disorders (%), Anxiety disorders (%), Drug use disorders (%), Depression (%), Alcohol use disorders (%), Log GDP per capita, Social support, and Freedom to make life choices. Current research suggests that a lack of social support is likely to increase the risk of substance abuse (Cherry, 2023; Eddie et al., 2019; Horigian et al., 2020). Therefore, an interaction term of Alcohol Use and Social Support was included in this model.

## Model Assessment

**Model Fit Checks:** After building the initial benchmark models, the significance of the variables was assessed using p-values, multicollinearity was checked using VIF scores, and the accuracy was checked via cross validation to see if our model predicts well.

**Influential Points:** To improve model accuracy and reliability, high leverage points were systematically identified using Cook's Distance. Each point with the highest leverage values found from the Cook's distance plots were removed one-by-one and the model was refit to check for performance improvements. This removal of leverage points was stopped when the model's performance stagnated.

**Model's Predictive Accuracy Checks:** For RQ1, cross-validation was carried out and RMSE scores were compared to see predictive power changes between models. For RQ2, the ROC curve was checked to see the best threshold needed for our model to predict accurately. Then, a confusion matrix was made for the final model to assess it with F1, Kappa, sensitivity, specificity, and accuracy.

## Results

### Research Question 1 (RQ1): Linear Regression

#### Exploratory Data Analysis (EDA)

Table 1 provides an overview of the continuous variables used in this regression. As a part of the EDA, a correlation analysis matrix, a matrix scatterplot to assess the relationship between the outcome variable and all the predictor variables and a histogram to further understand the distribution of the outcome variable were plotted (see Appendix A).

Table 1. Descriptive Statistics for RQ1.

Variable	Mean	SD	Median	Min	Max
Depression (%)	3.46	0.65	3.47	2.19	5.68
Log GDP per capita	9.29	1.16	9.42	5.94	11.66
Social support	0.81	0.12	0.83	0.29	0.99
Healthy life expectancy at birth	62.54	7.39	64.44	6.72	73.85
Freedom to make life choices	0.73	0.15	0.75	0.26	0.99
Generosity	0.00	0.17	-0.02	-0.32	0.70
Perceptions of corruption	0.75	0.19	0.81	0.04	0.98
Positive affect	0.66	0.11	0.67	0.35	0.88
Negative affect	0.26	0.08	0.25	0.10	0.70

### ***Initial Model Assessment:***

When checking for high leverage points one observation had leverage that stood out from the remaining observations, making it influential. However, after removing this point and refitting the model, it was found that there was no significant improvement in the model. Therefore, no influential points were removed from further analysis. To mitigate high multicollinearity issues, where elevated VIF values ( $>10$ ) were observed, certain variables were excluded to ensure stable standard errors and improve model interpretability. Specifically, Generosity (74.038) and the interaction term Generosity and Social Support (74.609) were found to have very high VIF scores. The interaction term was first removed and the model was refitted and checked for performance improvements. It was found that there were no longer  $>10$  VIF scores, and thus, Generosity was maintained in the renewed model.

### ***Regression Findings:***

The baseline level of depression, with all predictors at reference levels, was estimated at 3.7486. A notable finding was the significant variation in depression rates across continents. Being in the Americas, Asia, or Europe was associated with decreases in depression rates by 0.7086, 0.5755, and 0.5167 percentage points, respectively. Conversely, Oceania demonstrated a marginal increase in depression rates by approximately 0.0025 percentage points. The coefficients for individual years from 2006 to 2017 did not show statistical significance, indicating a stable trend in depression rates over these years. Economic and health indicators revealed complex relationships with depression rates. An increase in Log GDP per capita was associated with a rise in depression percentages by 0.2327 units, suggesting that higher economic wealth might not be protective against mental health challenges. In contrast, Healthy Life Expectancy at Birth showed a negative correlation with depression (coefficient = -0.0212), highlighting the importance of physical health in mental well-being. Social and psychological factors also demonstrated significant associations with depression rates. Freedom to Make Life Choices (coefficient = 0.3260) and Generosity (coefficient = 0.2635) both positively correlated with depression rates, possibly indicating underlying societal pressures. Additionally, Social Support was positively associated with depression (coefficient = 0.2169). Perceptions of Corruption negatively affected depression rates (coefficient = -0.6717), underlining the role of societal trust in mental health. Emotional states, as indicated by Positive and Negative Affect, showed contrasting impacts on depression. While Positive Affect was marginally negatively associated with depression (coefficient = -0.6651), Negative Affect displayed a strong positive association (coefficient = 0.9535), emphasizing the influence of emotional states on mental health. The statistical significance of these predictors is mostly robust, with p-values indicating high significance ( $p<0.05$ ) for most coefficients, except for continent Oceania, Years, and Social support (see Appendix B).

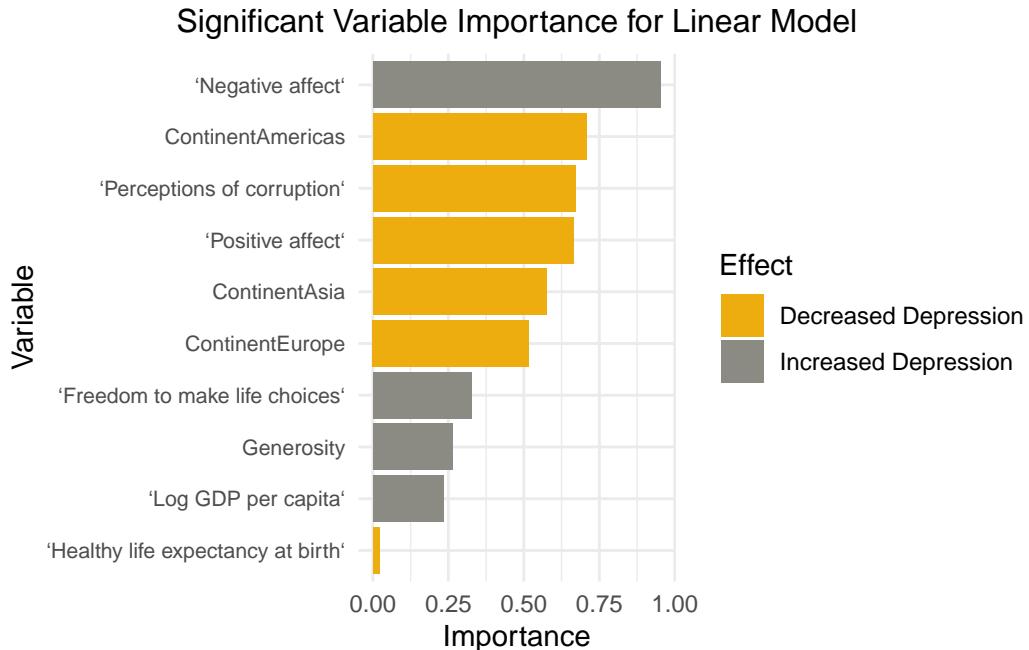
### ***Model Fit and Diagnostics***

Regarding model fit and diagnostics, the Residual Standard Error was 0.5719, and the adjusted R-squared value of 0.2324 indicated that approximately 23.24% of the variability in depression rates was captured by the model. The F-statistic is 17.61, along with its associated low p-value, confirming the model's statistical significance. The final model had an RMSE of 0.5776, which was slightly lower than the other models, thus suggesting better predictive performance of the final model.

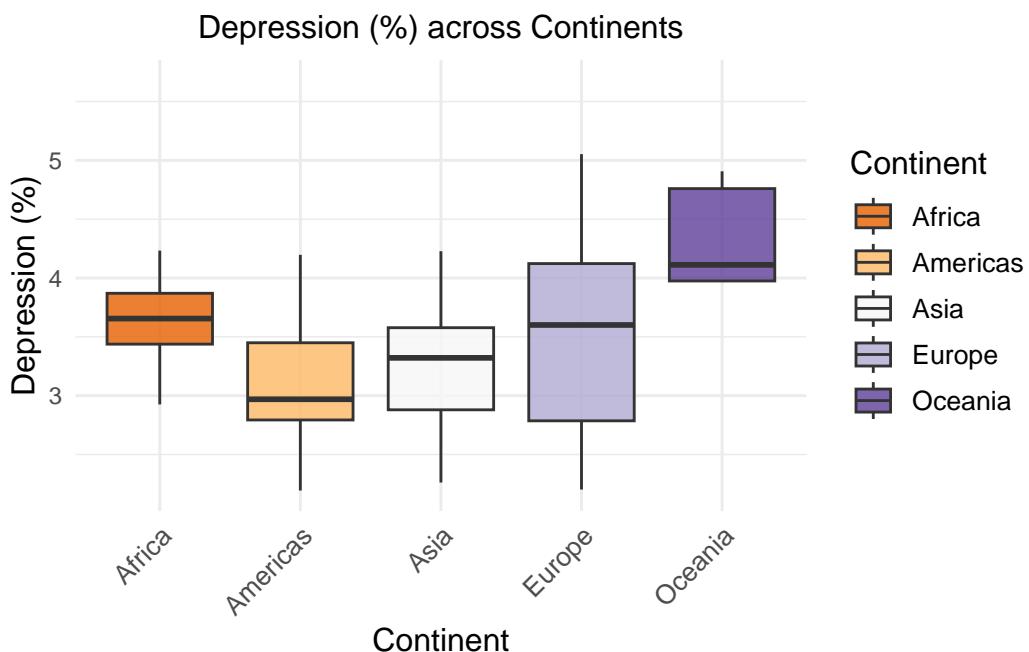
### ***Final Model Visualization***

Figure 1 illustrates the significant predictors influencing depression. Negative Affect emerges as the most impactful, while Healthy Life Expectancy at Birth has the least influence. Geographically, living in the Americas shows the highest potential for reducing depression compared to Asia and Europe. Gray bars represent predictors associated with increased depression, while orange bars signify variables linked to decreased depression. Figure 2 provides insight into depression rates across continents, highlighting the Americas with the lowest rates and Oceania with the highest.

*Figure 1.* Variable importance plot showing the significant predictors Depression (%) in order of importance, color-coded by a positive influence on depression (i.e., increasing depression rates) and negative influence on depression (i.e., decreasing depression rates).



*Figure 2.* Boxplot to show the depression rates (%) across continents.



## **Research Question 2 (RQ2): Logistic Regression**

### ***Exploratory Data Analysis (EDA):***

Table 2. provide descriptive statistics for all the variables that were included in the initial logistic model. Similar to RQ2, the histogram and bar chart distribution plots to show the variation in the variables can be found in Appendix A.

Table 2. Descriptive statistics for Research Question 2.

Variable	Mean	SD	Median	Min	Max
Depression (%)	3.46	0.64	3.48	2.19	5.68
Schizophrenia (%)	0.21	0.04	0.20	0.15	0.38
Bipolar disorder (%)	0.75	0.15	0.71	0.32	1.21
Eating disorders (%)	0.26	0.17	0.20	0.08	0.94
Anxiety disorders (%)	4.01	1.28	3.56	2.02	8.91
Log GDP per capita	9.34	1.16	9.46	5.94	11.66
Social support	0.81	0.12	0.84	0.29	0.99
Freedom to make life choices	0.73	0.14	0.75	0.26	0.99
Drug use disorders (%)	0.87	0.51	0.68	0.42	3.45
Alcohol use disorders (%)	1.68	1.00	1.51	0.45	5.47

### ***Initial Model Assessment:***

When checking for high leverage points a few observations had leverage that stood out from the remaining observations, making them influential points. After the sequential removal of these points, it was found that the model performed better only after the removal of the first high influential point. Therefore, this high leverage points was removed from further analyses. To mitigate high multicollinearity issues, where elevated VIF values ( $>10$ ) were observed, certain variables were found to have extremely high VIF scores, namely, Alcohol Use Disorders (440.182) and the interaction term Alcohol Use Disorders and Social Support (467.939). To ensure stable standard errors and improve model interpretability, these variables were removed one-by-one to see the performance of the refitted model. After removing the interaction term, it was found that the model performed much better and there were no more issues with multicollinearity.

### ***Findings:***

To better understand the results of this model, all coefficients were exponentiated to represent percentage increases in the likelihood of experiencing Good Quality of Life (QoL) with each unit increase in the predictor variable. Depression percentage showed a moderate effect, corresponding to a decrease of approximately 42.58% in the odds of Good QoL with each percentage increase. Conversely, a higher population percentage with schizophrenia exhibited a substantial increase in the odds by a factor of approximately 9.12e+11, signifying a strong positive association. Eating disorders significantly increased the odds of Good QoL by about 46.37 times, and drug use disorders had a positive effect with an odds ratio of approximately 3.05. Similarly, alcohol use disorders contributed positively with an odds ratio of about 1.48. Bipolar disorder did not show significant influence. Economic and social factors played pivotal roles: social support showed a profound impact, increasing the odds of Good QoL by approximately 3,872.70 times, while Log GDP per capita and freedom to make life choices corresponded to substantial increases in the odds by factors of around 4.21 and 79.44, respectively. Geographically, being in the Americas significantly increased the odds of Good QoL by a factor of around 28.41. Effects in other continents like Asia, Europe, and Oceania were not statistically significant, with odds ratios ranging from approximately 1.31 to 15,546. Lastly, time (i.e., years) did not significantly predict Good QoL. These results highlight the multifaceted

influences on QoL, emphasizing the need for a nuanced understanding of mental health, economic factors, and regional disparities.

### **Model Fit and Diagnostics**

The logistic regression model achieved an impressive accuracy of 90.36%, surpassing the No Information Rate of 55.2%. It correctly identified 543 ‘Good QoL’ and 647 ‘Bad QoL’ instances, with 80 ‘Bad QoL’ cases misclassified as ‘Good QoL’ and 47 ‘Good QoL’ cases misclassified as ‘Bad QoL’. The 95% confidence interval for accuracy ranges from 88.63% to 91.90%, bolstering confidence in the model’s predictive ability. With a Kappa statistic of 0.806, the model demonstrates strong agreement between predictions and actual outcomes. Sensitivity for ‘Good QoL’ cases stands at 92.03%, while specificity for ‘Bad QoL’ cases is 89.00%. The model exhibits higher accuracy in predicting ‘Bad QoL’. Positive Predictive Value and Negative Predictive Value are notably high at 87.16% and 93.23%, respectively, affirming the model’s reliability. An F1 score of 89.53% signifies a balanced precision and recall.

The ROC curve displays an AUC of 0.965, indicating excellent differentiation between outcomes. At a threshold of 0.444, the model achieves a balanced sensitivity (92%) and specificity (89%). Overall, the logistic regression model effectively categorizes individuals into QoL groups.

### **Final Model Visualization**

Figure 3 illustrates the variable importance in predicting Good QoL. Since all predictors that significantly predict QoL were found to *positively* predict Good QoL, Figure 3 presents a unified color scheme in this plot. Furthermore, while not all continents significantly impact Good QoL, Figure 4 explores the distribution of Good versus Bad QoL across continents. It highlights a comparatively balanced distribution in the Americas, Asia, and Europe, contrasting with noticeable QoL disparities in Africa and Oceania. Additionally, Figure 5 examines Schizophrenia rates across continents, providing insights into the unexpected findings discussed further in the conclusion.

*Figure 3.* Variable importance plot showing the significant predictors of Good QoL in order of importance.

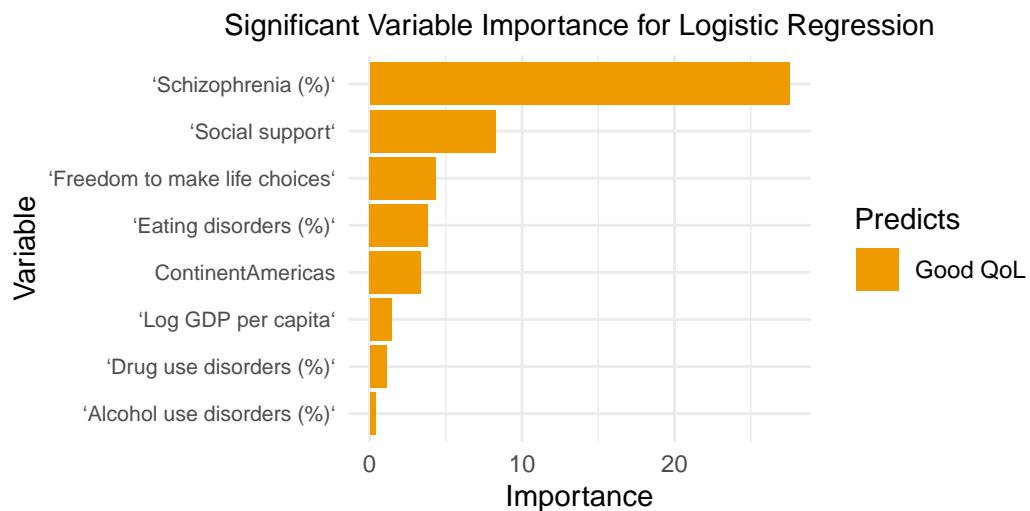


Figure 4. Stacked barplot showing the distribution of Good vs. Bad QoL in continents.

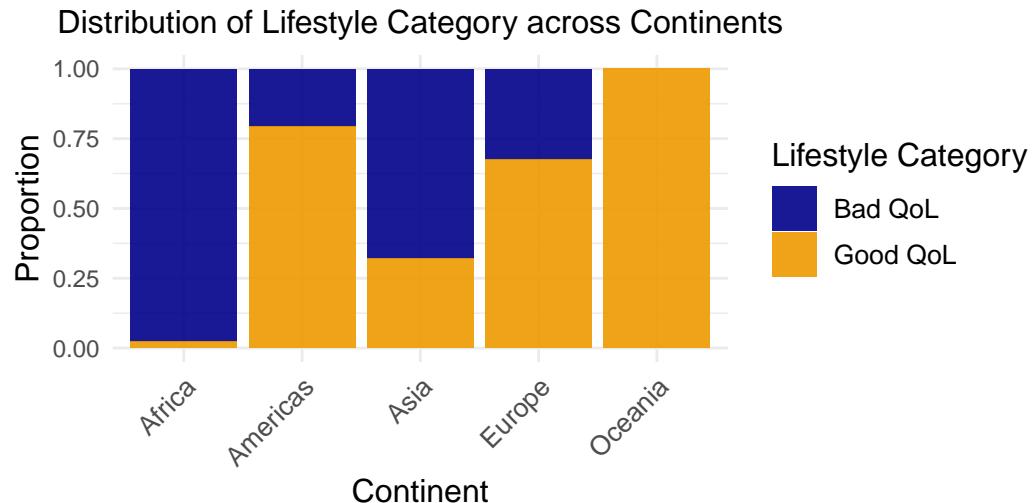
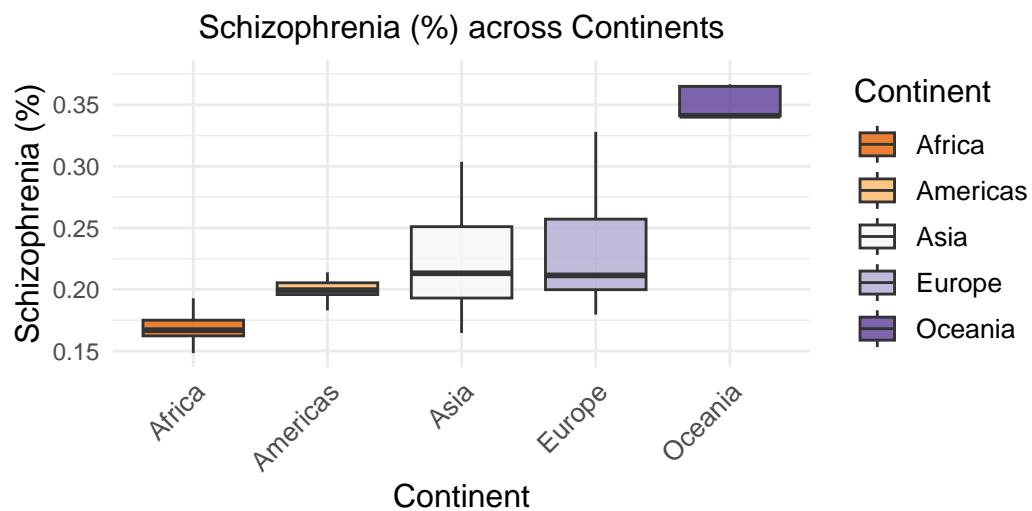


Figure 5. Boxplot to show the depression rates (%) across continents.



## Conclusion

In conclusion, our study demonstrates that both models possess strong predictive capabilities in determining depression rates and quality of life across the globe. However, the need for more comprehensive data, particularly from underrepresented regions like Oceania, and extended time frames is evident to enhance the precision of these models.

The analysis reveals unexpected findings, where higher wealth and greater freedom are associated with increased depression levels, challenging conventional assumptions. This points to a complex interplay between socioeconomic status, emotional well-being, and mental health, as positive emotions are linked to lower depression. The study's strength lies in providing valuable cross-continental insights and the ability to forecast depression rates based on socioeconomic factors, crucial for policy-making and healthcare planning. However, its correlational design limits causal inferences, and the

potential impact of unaccounted confounding variables on depression rates cannot be overlooked. Future research should focus on broadening the dataset to include more diverse populations and a wider range of variables, enhancing our understanding of depression's multifaceted nature.

In terms of quality of life, the study is commendable for its robust predictive capabilities in identifying factors that influence life quality. Nonetheless, it encounters challenges in providing clear results for certain disorders, such as eating disorders, drug and alcohol use disorders, and most notably, schizophrenia, underscoring the complexity of the subject. After plotting the rates of schizophrenia across continents (Figure 5), it was found that the continents with the highest rates of schizophrenia (Oceania, Europe, and Asia) are also those which are known to have the best and/or cheapest health care systems compared to the others. In relation to schizophrenia specifically, the best treatment centers in the world are located in Asia and Europe (Mawlood, 2023), and research suggests that QoL is likely to significantly improve when there are reliable and effective rehabilitation institutions those at need can go to (Galuppi et al., 2010). Furthermore, the unexpected positive correlation between schizophrenia rates and Good QoL may be attributed to a potential confounding effect related to the region of Oceania. Notably, all reported data from Oceania reflects Good QoL (Figure 4), coinciding with the region having the highest schizophrenia rates (Figure 5). This concentration of positive outcomes in both variables might introduce a confounding influence, leading the model to strongly associate schizophrenia rates with Good QoL. It suggests that the observed correlation may be a result of the unique data distribution in Oceania rather than a genuine relationship. Similar explanations may apply to other counterintuitive results, such as positive associations between mental health disorders and Good Quality of Life (QoL). To ensure the robustness of conclusions, it is essential to consider and control for potential confounding variables in further analyses, emphasizing the need for a nuanced interpretation of the model's findings.

Furthermore, it could be argued that these findings of mental health disorders positively predicting Good QoL were found due to the subjective nature of QoL. Recent research has shown that while health-related quality of life may significantly deteriorate due to mental health disorders, this association is not as strong for subjective quality of life (Engel et al., 2008). Nevertheless, future research should focus on expanding the datasets to cover a broader spectrum of populations and incorporating more precise and explainable measures of quality of life. Including variables such as access to healthcare, familial support, community outreach, etc. could help in gaining a better understanding of why this model presented such counter-intuitive results. These enhancements would facilitate a more comprehensive understanding of what influences life quality across different groups.

Also, this study used continental regions to do analyses. This may have caused certain issues in inferring the results of our models as continents have a lot of differences within them (e.g., economic differences, cultural differences, etc.). Therefore, future research could take this into consideration and use other region demarcations instead, such as, income categories (WDI, 2023), individualist vs. collectivist regions (Hui, 1988) or other categorizations that might be able to provide a clearer understanding of mental health and QoL.

Overall, the findings emphasize the multifaceted nature of factors that contribute to quality of life and depression rates. They underline the necessity for holistic mental health policies and interventions that integrate economic, social, health, and emotional aspects. The study's insights into the complex relationship between various factors, including disorders, and life quality provide a foundation for more informed and effective health strategies and interventions.

## References

- Bell, D. N., & Blanchflower, D. G. (2019). The well-being of the overemployed and the underemployed and the rise in depression in the UK. *Journal of Economic Behavior & Organization*, 161, 180-196.
- Chen, E., Lam, P. H., Finegood, E. D., Turiano, N. A., Mroczek, D. K., & Miller, G. E. (2021). The balance of giving versus receiving social support and all-cause mortality in a US national sample. *Proceedings of the National Academy of Sciences*, 118(24), e2024770118.
- Cherry, K. Mse. (2023, March 3). *A social support system is imperative for Health and well-being*. Verywell Mind. <https://www.verywellmind.com/social-support-for-psychological-health-4119970#:~:text=1%20Poor%20social%20support%20has,Alcohol%20use>
- d'Exelle, B., & Riedl, A. (2010). Directed generosity and network formation: network dimension matters.
- D'raven, L. T. L., Moliver, N., & Thompson, D. (2015). Happiness intervention decreases pain and depression, boosts happiness among primary care patients. *Primary health care research & development*, 16(2), 114-126.
- Eddie, D., Hoffman, L., Vilsaint, C., Abry, A., Bergman, B., Hoeppner, B., ... & Kelly, J. F. (2019). Lived experience in new models of care for substance use disorder: a systematic review of peer recovery support services and recovery coaching. *Frontiers in psychology*, 10, 1052.
- Engel, S. G., Adair, C. E., Hayas, C. L., & Abraham, S. (2009). Health-related quality of life and eating disorders: A review and update. *International Journal of Eating Disorders*, 42(2), 179-187.
- Galuppi, A., Turola, M. C., Nanni, M. G., Mazzoni, P., & Grassi, L. (2010). Schizophrenia and quality of life: how important are symptoms and functioning?. *International journal of mental health systems*, 4(1), 1-8.
- Graham, C., & Pinto, S. (2019). Using Well-Being Metrics to Assess Social Well-Being and Ill-Being: Lessons from Rising Mortality Rates in the United States. *The Economics of Happiness: How the Easterlin Paradox Transformed Our Understanding of Well-Being and Progress*, 319-353.
- Hanssen, L., Deindl, C., & Lechler, B. (Year not provided). Determinants of Well-Being and Health in Old Age: The Role of Living Arrangements and Partnership Status. *PLOS ONE*, 15(10), e0241302. <https://doi.org/10.1371/journal.pone.0241302>
- Horigian, V. E., Schmidt, R. D., & Feaster, D. J. (2021). Loneliness, mental health, and substance use among US young adults during COVID-19. *Journal of psychoactive drugs*, 53(1), 1-9.
- Hui, C. H. (1988). Measurement of individualism-collectivism. *Journal of research in personality*, 22(1), 17-36.
- Jones, J. (2023, February 14). *The most similar countries to China*. OBJECTIVE LISTS. <https://objectivelists.com/2022/04/22/which-countries-are-most-similar-to-china/>
- Jones, J. (2023, February 14). *The most similar countries to Turkmenistan*. OBJECTIVE LISTS. <https://objectivelists.com/2022/08/09/which-countries-are-most-similar-to-turkmenistan/>
- Kim, S., Wang, W. L., & Mason, T. (2021). Eating disorders and trajectory of mental health across the COVID-19 pandemic: Results from the understanding America study. *Journal of Affective Disorders Reports*, 5, 100187.
- Mawlood, F. (2023). *Treatment abroad*. Best Schizophrenia Treatment Centers: Top 10+ Clinics, Prices, Doctors, and Reviews. <https://us-uk.bookimed.com/clinics/illness=schizophrenia/>

- Ortega, J., & Hergovich, P. (2011). The Strength of Absent Ties: Social Integration via Online Dating. *SSRN*. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1730092](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1730092)
- Siemsen, E. H., Cappaert, R. A., Gonzalez, J. T., & Wilson, R. R. (2007). The WHOQOL-OLD in the United States: Methodological and Structural Issues. *Quality of Life Research*, 16(1), 1-12. <https://doi.org/10.1007/s11136-006-9002-6>
- Teoli D, Bhardwaj A. Quality Of Life. [Updated 2023 Mar 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: [https://www.ncbi.nlm.nih.gov/books/NBK536962/#The\\_world\\_by\\_income\\_and\\_region](https://www.ncbi.nlm.nih.gov/books/NBK536962/#The_world_by_income_and_region)
- Xu, X., Geng, F., & Xu, H. (2021). Understanding Loneliness Among Older Adults in Rural China: A Mixed-Methods Study. *Applied Research in Quality of Life*. <https://doi.org/10.1007/s10902-021-00478-y>

## Appendix A: Exploratory Data Analysis Results

### Research Question 1

Figure 1. Matrix scatterplot showing the relationship between continuous predictor variables and outcome variable Depression (%)

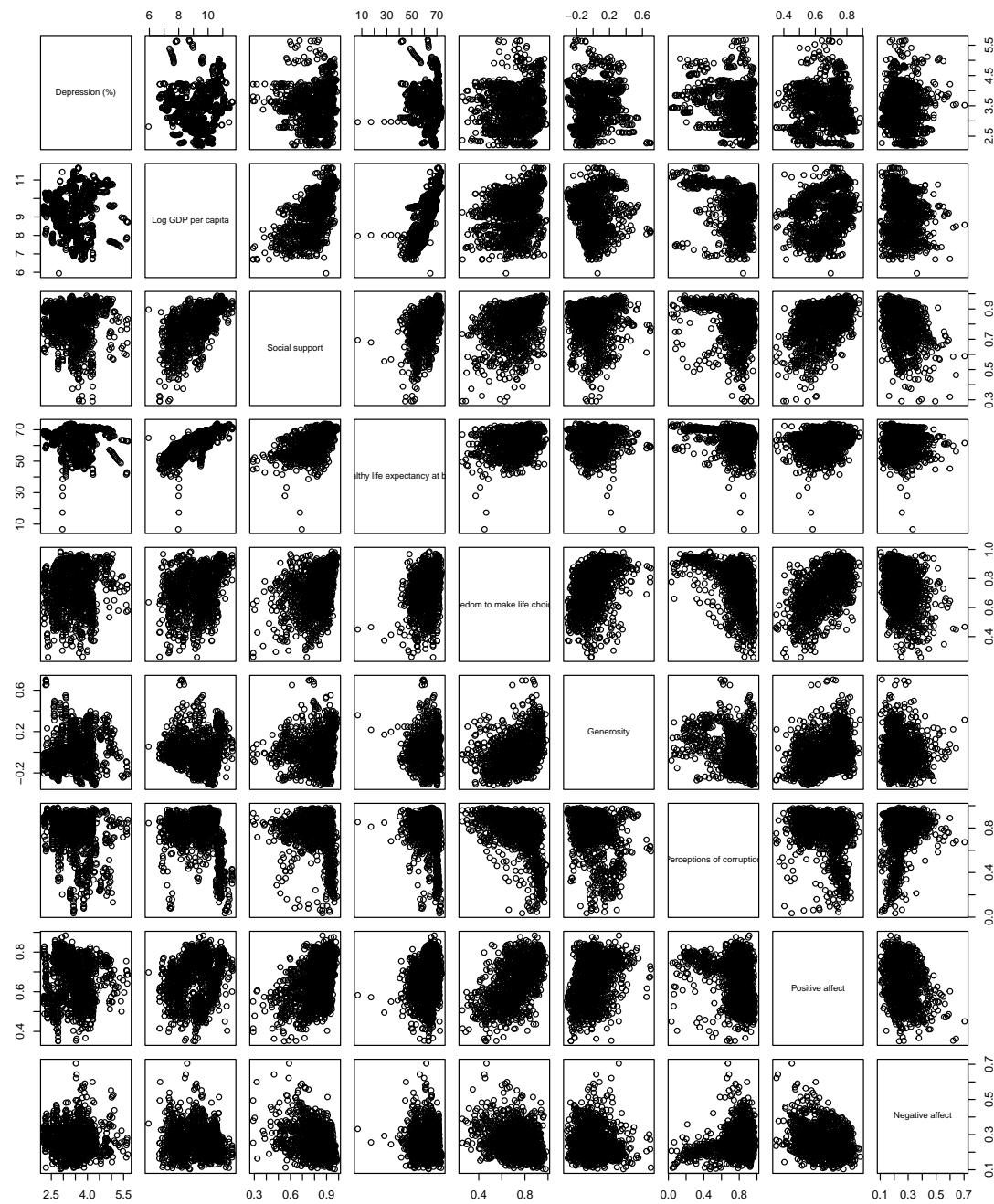


Figure 2. Correlation matrix showing the strength of correlation between continuous variables in RQ1.

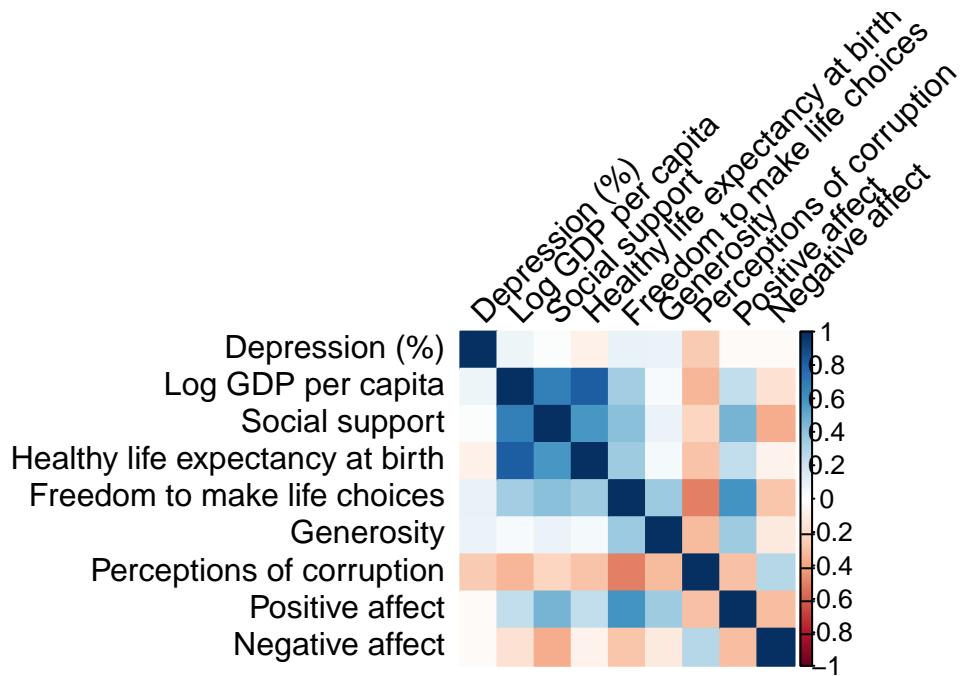


Figure 3. Histogram showing the distribution of the continuous outcome variable Depression (%).

**Figure 3. Distribution of Depression (%)**

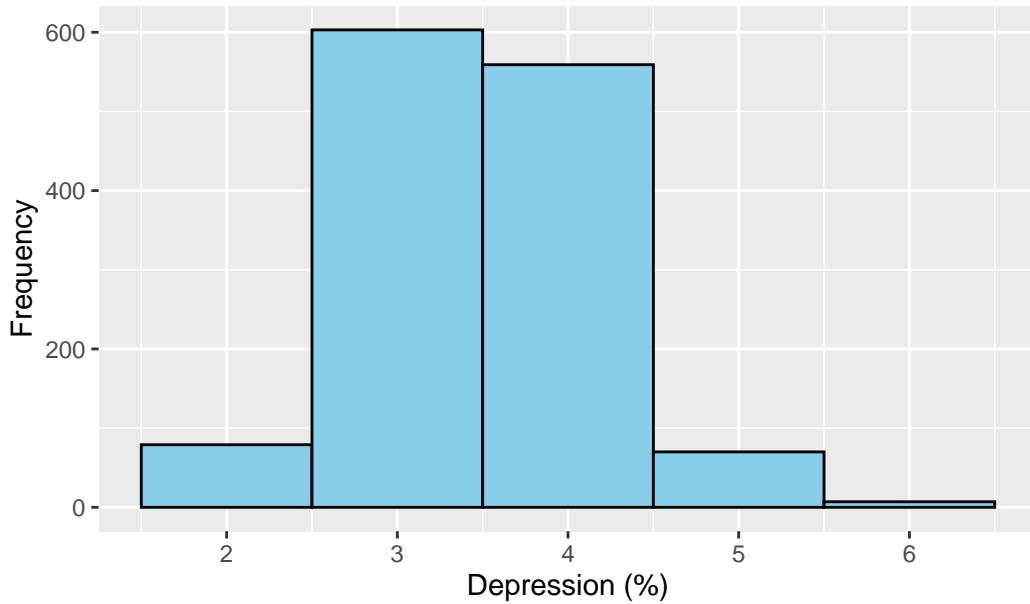


Figure 4. Bar plots showing the distribution of categorical variables used in RQ1 (Continent and Year).

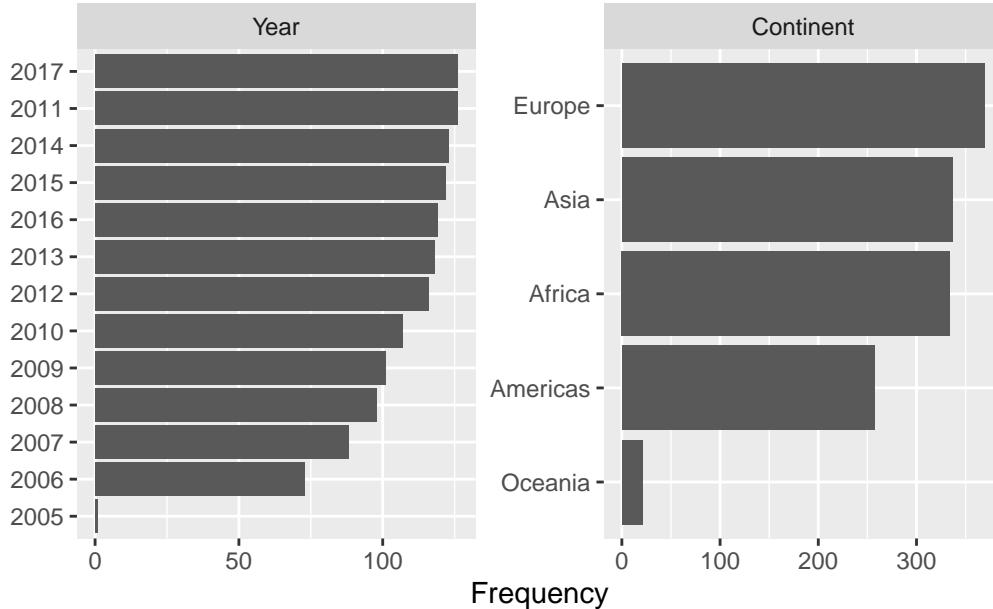
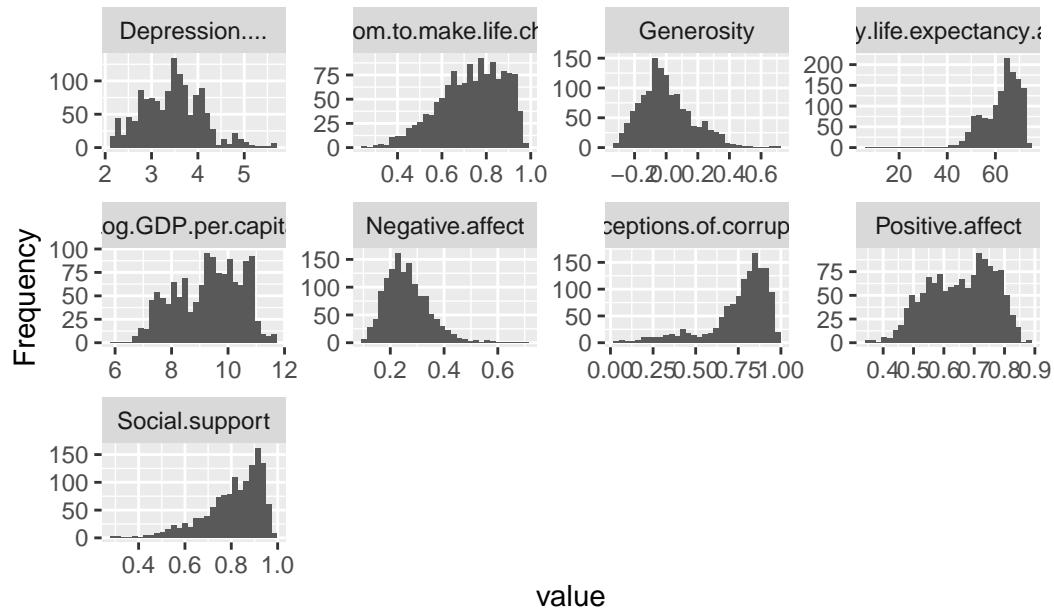


Figure 5. Histograms showing the distribution of all the continuous variables used in RQ1.



## Research Question 2

Figure 1. Barplots showing the distribution of categorical variables used in RQ2 (Continent, Year, and outcome variable Lifestyle Category).

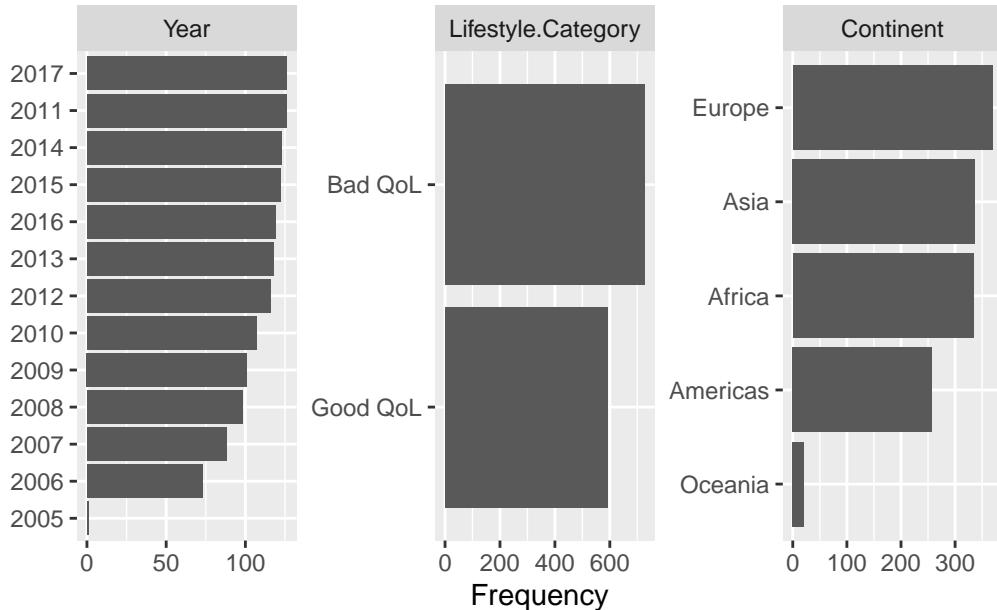
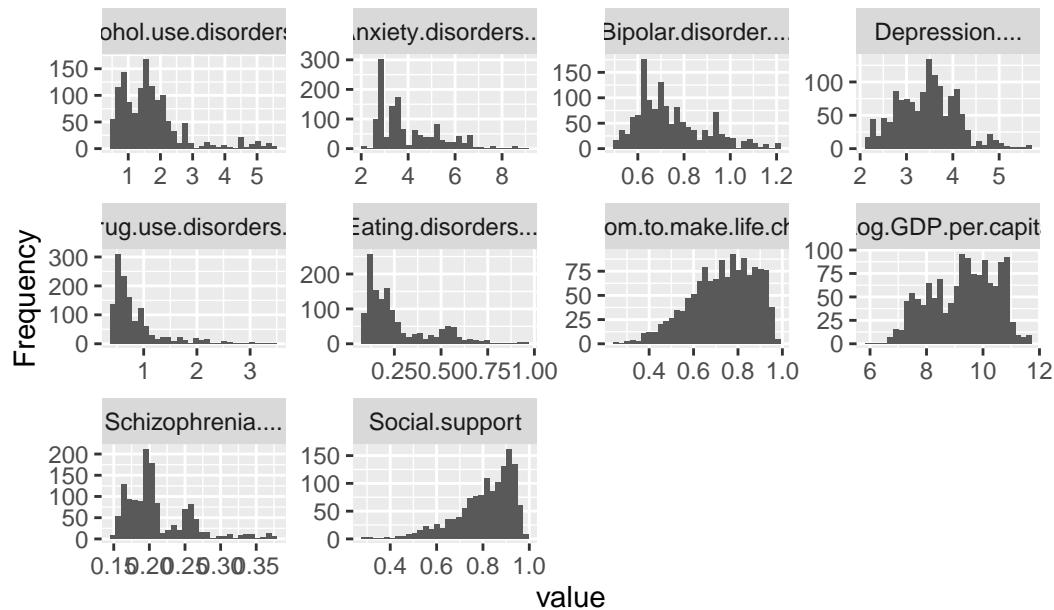


Figure 2. Histograms showing the distribution of all the continuous variables used in RQ2.



## Appendix B: Summary Statistics Tables

Table 1. Model Summary Statistics for Research Question 1.

Coefficient	Estimate	Std. Error	t value
(Intercept)	3.733	0.637	5.864
ContinentAmericas	-0.721	0.066	-11.004
ContinentAsia	-0.589	0.064	-9.144
ContinentEurope	-0.532	0.075	-7.069
ContinentOceania	0.004	0.149	0.024
Year2006	-0.449	0.579	-0.775
Year2007	-0.411	0.579	-0.711
Year2008	-0.309	0.578	-0.535
Year2009	-0.434	0.578	-0.750
Year2010	-0.434	0.578	-0.752
Year2011	-0.418	0.577	-0.725
Year2012	-0.438	0.578	-0.758
Year2013	-0.444	0.578	-0.768
Year2014	-0.497	0.577	-0.861
Year2015	-0.463	0.577	-0.802
Year2016	-0.471	0.578	-0.815
Year2017	-0.491	0.577	-0.850
Log GDP per capita	0.234	0.030	7.925
Healthy life expectancy at birth	-0.020	0.005	-4.467
Freedom to make life choices	0.331	0.162	2.041
Perceptions of corruption	-0.683	0.110	-6.234
Positive affect	-0.684	0.262	-2.613
Negative affect	0.935	0.238	3.926
Social support	0.204	0.214	0.953
Generosity	0.960	0.816	1.176
Social support:Generosity	-0.840	0.974	-0.862

Table 1: Coefficients and statistics. \*, \*\*, and \*\*\* indicate significance at the 0.05, 0.01, and 0.001 levels, respectively.

Table 2. Model Summary Statistics for Research Question 2.

Variable	Estimate	Std. Error	z value	Pr(>  z )
(Intercept)	-23.4368	2399.5474	-0.010	0.992207
Depression (%)	-0.5547	0.2670	-2.077	0.037779*
Schizophrenia (%)	27.5393	7.5899	3.628	0.000285***
Bipolar disorder (%)	-1.6308	1.4388	-1.134	0.256999
Eating disorders (%)	3.8366	1.8839	2.036	0.041701*
Anxiety disorders (%)	-0.2242	0.1620	-1.384	0.166449
Log GDP per capita	1.4373	0.2764	5.199	2.00e-07***
Freedom to make life choices	4.3750	1.0086	4.338	1.44e-05***
Social support	8.2617	1.7932	4.607	4.08e-06***
Drug use disorders (%)	1.1145	0.4159	2.680	0.007373**
Alcohol use disorders (%)	0.3909	0.1566	2.496	0.012547*
ContinentAmericas	3.3466	0.6627	5.050	4.42e-07***
ContinentAsia	0.5634	0.5623	1.002	0.316406
ContinentEurope	0.2730	0.6273	0.435	0.663379
ContinentOceania	9.6516	471.9020	0.020	0.983682
Year2006	-7.2990	2399.5452	-0.003	0.997573
Year2007	-6.2648	2399.5452	-0.003	0.997917
Year2008	-6.3671	2399.5452	-0.003	0.997883
Year2009	-6.1697	2399.5452	-0.003	0.997948
Year2010	-5.5919	2399.5452	-0.002	0.998141
Year2011	-6.4923	2399.5452	-0.003	0.997841
Year2012	-5.7019	2399.5452	-0.002	0.998104
Year2013	-6.1429	2399.5452	-0.003	0.997957
Year2014	-6.0114	2399.5452	-0.003	0.998001
Year2015	-5.9282	2399.5452	-0.002	0.998029
Year2016	-6.1626	2399.5452	-0.003	0.997951
Year2017	-5.4154	2399.5452	-0.002	0.998199

Table 2: Coefficients and statistics. \*, \*\*, and \*\*\* indicate significance at the 0.05, 0.01, and 0.001 levels, respectively.