Mental Health Issues related to Covid-19 in U.S.A from 2020 through 2022

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Abstract. In this project, we intend to learn about the impact on people's mental health in the United States after the outbreak of the COVID-19 pandemic. We used data collected from the CDC and related to Covid-19 mental health that has the indicators of anxiety or depression based on the reported frequency of symptoms in the United States. By analyzing and visualizing the data, we learned the average depression disorder rate among different groups, such as building time series charts based on states to see the growth of the depression disorder rate from 2020 through 2022. Also, we created simple linear models to do predictive analysis. We found out the model makes robust predictions on age group data where young people (18 - 29 years) have the highest depression disorder rate in both actual and predicted.

Keywords: Mental Health · Covid-19 · Depression · Anxiety · United States of America

1 Data

The dataset we used for the project is collected from CDC and is related to Covid-19 mental health that has the indicators of anxiety or depression based on the reported frequency of symptoms in the United States. It contains 14 columns and has a period from 2020 through 2022. The indicators of anxiety or depression are estimated by groups, which include age, sex, gender identity, sexual orientation, race/Hispanic ethnicity, education, and disability status. Inside each group, there are several subgroups, such as education levels and different age groups. The data set can be found Here

2 Predictive Model

2.1 Data Preparation

The primary data source for this project originates from the "Household Pulse Survey,"[1] produced by the U.S. Census Bureau in collaboration with five federal agencies to produce "data on the social and economic impacts of Covid-19 on American households." The original data file contains 11,484 observations

Indicator	Group	State	Subgroup	Phase	Time Peri..	Time Peri..	Time Peri..	Time Peri..	Value
Symptoms of Depressive Disorder	National Esti...	United States	United States	1	1	Apr 23 - May...	04/23/2020	05/05/2020	23.
Symptoms of Depressive Disorder	By Age	United States	18 - 29 years	1	1	Apr 23 - May...	04/23/2020	05/05/2020	32.
Symptoms of Depressive Disorder	By Age	United States	30 - 39 years	1	1	Apr 23 - May...	04/23/2020	05/05/2020	25.
Symptoms of Depressive Disorder	By Age	United States	40 - 49 years	1	1	Apr 23 - May...	04/23/2020	05/05/2020	24.
Symptoms of Depressive Disorder	By Age	United States	50 - 59 years	1	1	Apr 23 - May...	04/23/2020	05/05/2020	23.
Symptoms of Depressive Disorder	By Age	United States	60 - 69 years	1	1	Apr 23 - May...	04/23/2020	05/05/2020	18.
Symptoms of Depressive Disorder	By Age	United States	70 - 79 years	1	1	Apr 23 - May...	04/23/2020	05/05/2020	13.
Symptoms of Depressive Disorder	By Age	United States	80 years and above	1	1	Apr 23 - May...	04/23/2020	05/05/2020	14.
Symptoms of Depressive Disorder	By Sex	United States	Male	1	1	Apr 23 - May...	04/23/2020	05/05/2020	20.
Symptoms of Depressive Disorder	By Sex	United States	Female	1	1	Apr 23 - May...	04/23/2020	05/05/2020	26.
Symptoms of Depressive Disorder	By Race/His...	United States	Hispanic or Latino	1	1	Apr 23 - May...	04/23/2020	05/05/2020	29.
Symptoms of Depressive Disorder	By Race/His...	United States	Non-Hispanic White, s...	1	1	Apr 23 - May...	04/23/2020	05/05/2020	21.
Symptoms of Depressive Disorder	By Race/His...	United States	Non-Hispanic Black, si...	1	1	Apr 23 - May...	04/23/2020	05/05/2020	25.
Symptoms of Depressive Disorder	By Race/His...	United States	Non-Hispanic Asian, si...	1	1	Apr 23 - May...	04/23/2020	05/05/2020	23.
Symptoms of Depressive Disorder	By Race/His...	United States	Non-Hispanic, other ra...	1	1	Apr 23 - May...	04/23/2020	05/05/2020	28.
Symptoms of Depressive Disorder	By Education	United States	Less than a high schoo...	1	1	Apr 23 - May...	04/23/2020	05/05/2020	32.
Symptoms of Depressive Disorder	By Education	United States	High school diploma o...	1	1	Apr 23 - May...	04/23/2020	05/05/2020	25.
Symptoms of Depressive Disorder	By Education	United States	Some college/Associat...	1	1	Apr 23 - May...	04/23/2020	05/05/2020	25.

Fig. 1. A snippet of the dataset.

corresponding to a particular rate of symptoms of Depressive Disorder, Anxiety Disorder, or both, filtered by subgroups for a given period. The "subgroups" stem from the "Groups" field, which has values for National Estimate, Age, Sex, Race/Hispanic ethnicity, Education, State, Disability status, Gender identity, and Sexual orientation. The periods conducted for this study range from April 2020 - October 2022. Because each row contains the week-long content of days in which the survey was completed, the median day is used in this study for each row.

Splitting by year, anxiety and depressive symptoms were statistically higher in 2020 than in 2021 and 2022, which makes us wonder if the emergence of Covid had an impact.

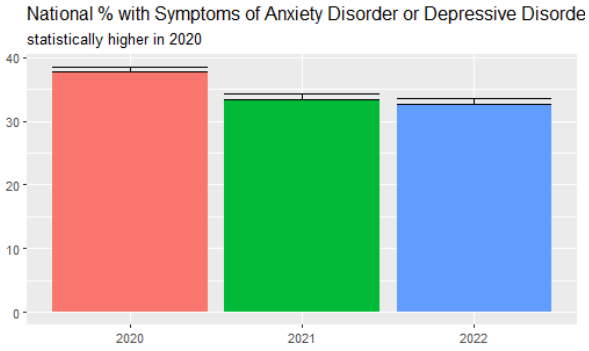

Fig. 2. Percentage of population in USA with symptons of anxiety and depression disorder for the year 2020, 2021 and 2022

2.2 Methods

Our modeling process aimed to predict anxiety and depressive symptom rates for each of the unique Subgroups for a given period. To account for the possible effect of Covid on anxiety and depressive symptom rates, United States Covid counts, tabulated by the Centers for Disease Control and Prevention,[2] were incorporated in the analysis. This was conducted via simple linear models, separated by group, which includes the date, weekly Covid cases, increase in Covid cases, and factor variables to capture the effect of subgroups. The data were randomly split into training and testing sets of size 70% and 30%, respectively, for each Grouped linear model.

2.3 Results

With each model created [3], subgroups had a noticeable impact on the predicted value of anxiety and depressive symptoms rate. For example, the model makes robust predictions on the age group data, where fear and depressive rates are highly exaggerated by age group, with Covid counts, Covid case increase, and seasonal effects also playing a predictive role. Some Groups, like the State variable, had less noticeable divides in anxiety and depressive rates. The chart below displays how each model performed on test data, where the R-squared value serves as a proxy for the variation in depressive and anxiety rates among subgroups.

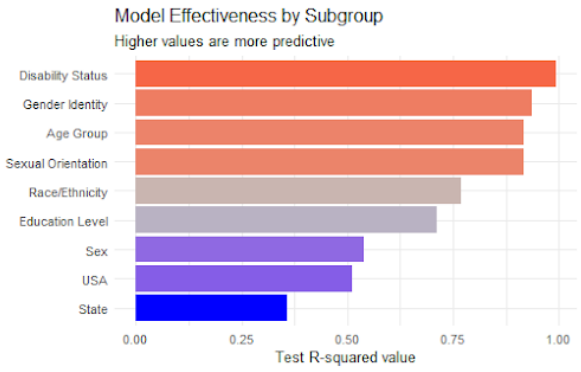

Fig. 3. Effeciency of the predictive model for different sub-groups

3 Infographics

After we developed a mature model for the prediction of anxiety rates sorted into various categories, we proceeded to develop an interactive infographic that

supports our predictions developed in R. The infographic primarily uses vanilla Javascript and D3, with a landing page dedicated to the present stage of matters and an evolution page for the predictive results. We used responsive charts, interactivity, and animations to fully inform and inspire the user on the issue of depression and anxiety that different demographics might face in the country. The pages are styled via CSS and modules like bootstrap, allowing users to navigate seamlessly and intuitively through the pages. The main landing page consists of a US map with the 50 states color-coded and highlighted with borders. Hovering over the various states will turn the selection red. In contrast, clicking on a particular state will enlarge the selected state in an interaction, allowing the user to focus their attention on it.

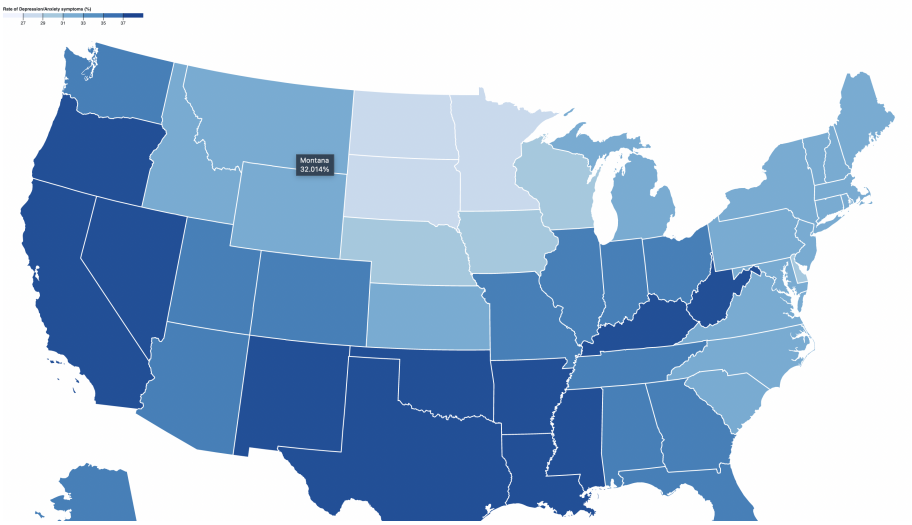

Fig. 4. Map of US states with average rates of anxiety/depression symptoms in 2020-2022

The user will then be led to the scatterplot at the bottom, corresponding to current and predicted anxiety rates color-coded by state. By selecting the desired US state in the legend, the corresponding bubbles for the state will be highlighted, making it extremely easy to view the numbers for a particular state and compare it with other states. The d3 methods we used, like enter and append selection, will allow a seamless link to our current and predicted data. The user will also be enabled with coherent transitions through various charts via binding our JSON and CSV files. When accessed by the visualization wheel, these methods have allowed us to create dashboards that are not only original but have great multidimensionality and functionality as well.

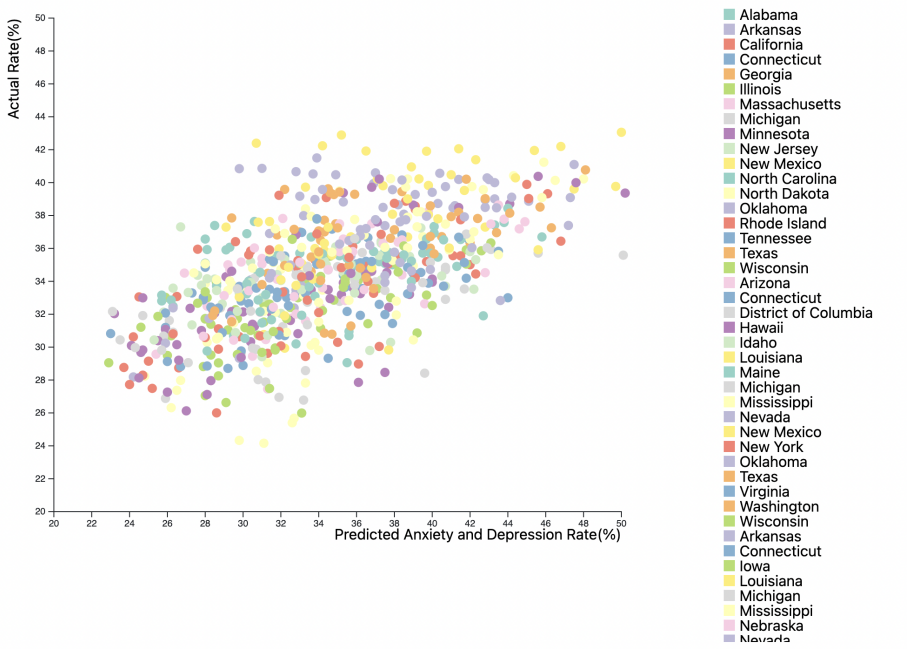

Fig. 5. Predictions of Anxiety Rates by State.

References

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