Building a Risk Assessment Tool for Pediatric Anxiety Diagnosis

Data Science Interns:
Chris Fu, Max Waller, Minjue Wu, Nick Yousefi

CHOC

Background

- Anxiety disorders affect 19.1% of US adults[1] and 31.9% of adolescents[1] annually
- ~50% of people have Generalized Anxiety Disorder symptoms for 2+ years before being diagnosed[2]
- Screening tool exists for depression (PHQ-2) based on various risk factors

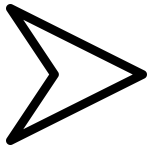
Table 2. Risk Factors for Depression

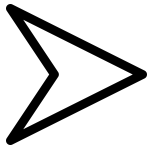
Chronic medical illness	Low self-esteem
Chronic minor daily stress	Low social support
Chronic pain syndrome	Prior depression
Family history of depression	Single/divorced/widowed
Female sex	Traumatic brain injury
Low income/job loss	Younger age

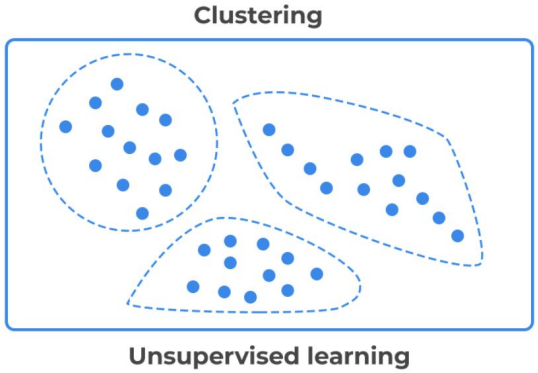
1. Anxiety Disorders - Facts & Statistics (https://adaa.org/understanding-anxiety/facts-statistics)
2. Anxiety Facts: All You Need to Know (https://psychcentral.com/anxiety/anxiety-facts)

Methods

- Public dataset for now, but in process of acquiring data from CHOC database
  - Data.world — *Indicators of Anxiety or Depression Based on Reported Frequency of Symptoms During Last 7 Days* (2020)
- Exploratory analysis of potential factors of anxiety
- Unsupervised learning (clustering, covariance between variables, etc.)
  - Search for unknown correlations and create corresponding groups highlighting these connections using unlabeled data





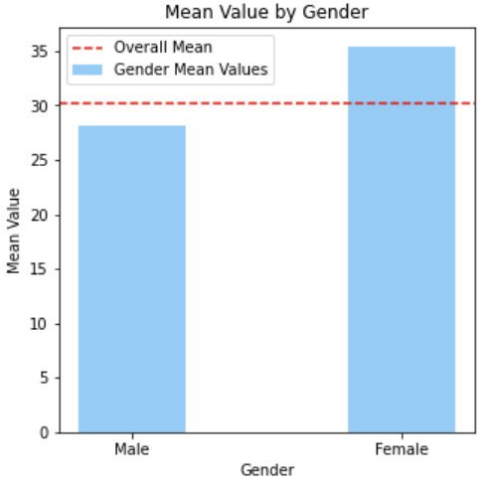


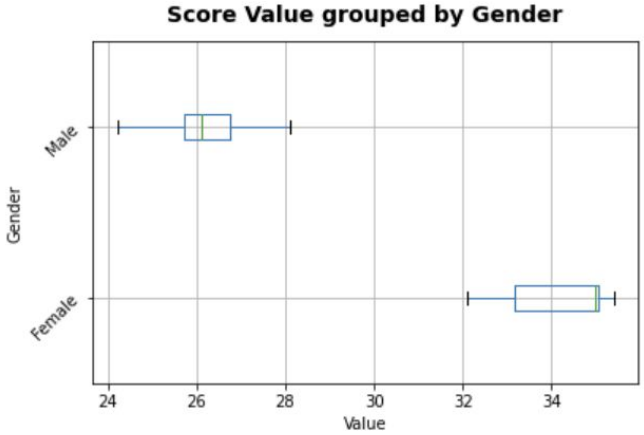
CHOC | Mi4

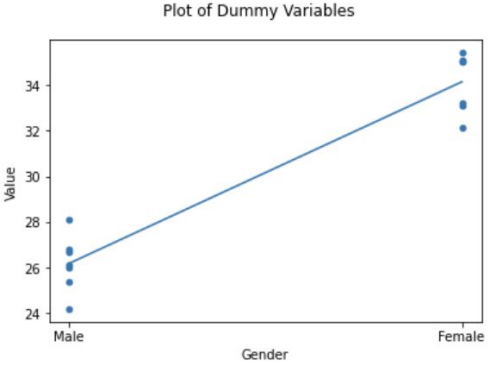
SHARON DISNEY LUND
Medical Intelligence, Information, Investigation & Innovation Institute

Exploratory Analysis

CHOC





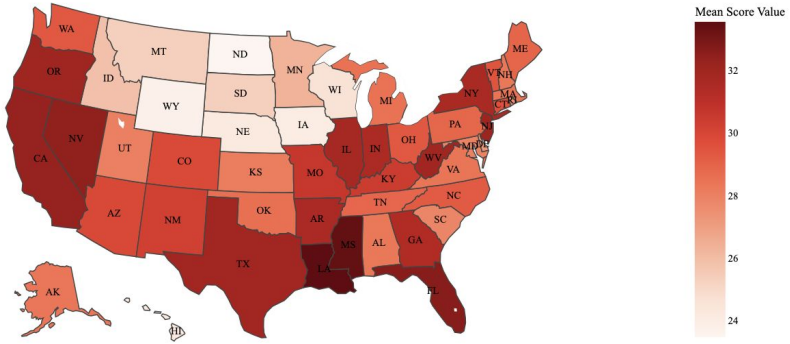


	coef	P>|t|
Intercept	34.1286	0.000
C(Subgroup)[T.Male]	-7.9429	0.000

- T-test indicates gender explains changes in mean anxiety value score
  - Males tend to be less anxious than females
- Female data heavily skewed left; specific female groups experiencing wide varying levels of anxiety
- Gender wage gap helps explain increase in anxiety[3]

3. Unequal depression for equal work? How the wage gap explains gendered disparities in mood disorders (https://www.sciencedirect.com/science/article/pii/S0277953615302616)

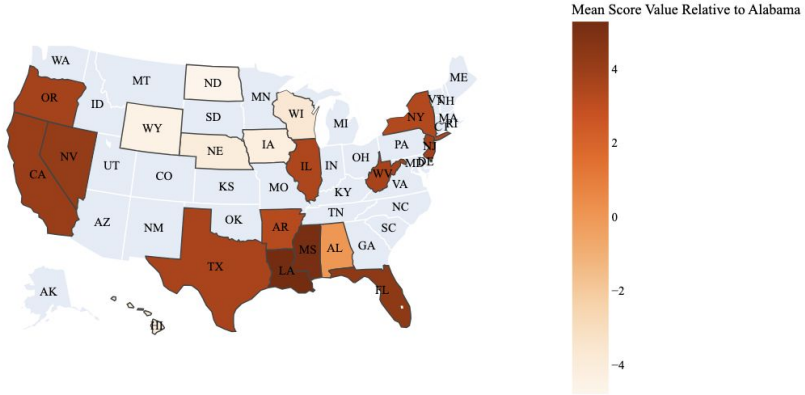
Anxiety Disorder Mean Score Value by State



- Heatmap of US with redder states indicating greater mean anxiety score value
  - Southern regions appear the most red
  - Lack of access to high quality healthcare[4]

- T-test to filter high mean value score relative to Alabama
  - States with large urban populations (e.g. CA, NY) or Deep South states (e.g. TX, LA, MS) experience heightened anxiety

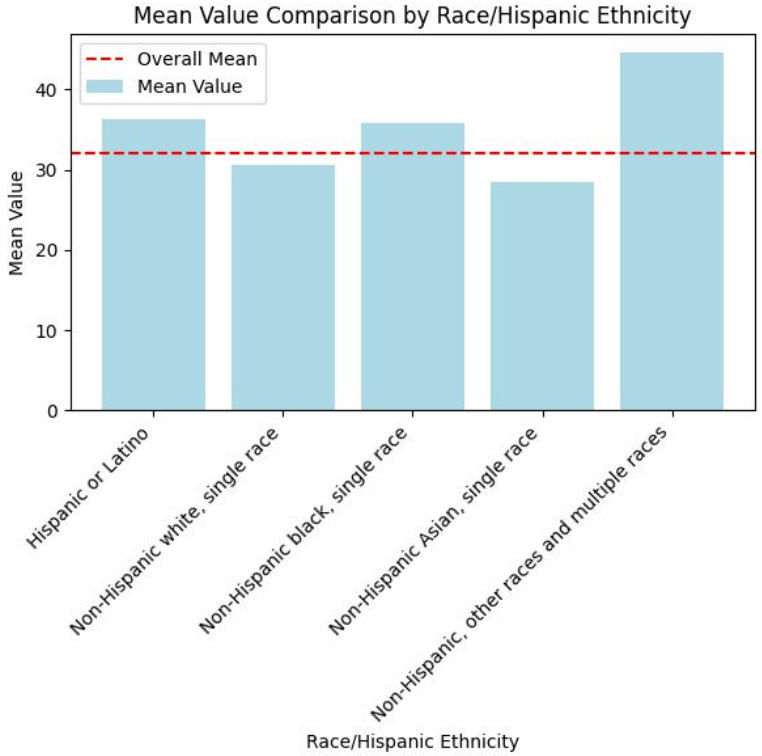
Significant States



4. US National and State-Level Prevalence of Mental Health Disorders and Disparities of Mental Health Care Use in Children (https://jamanetwork.com/journals/jamapediatrics/fullarticle/2724377)

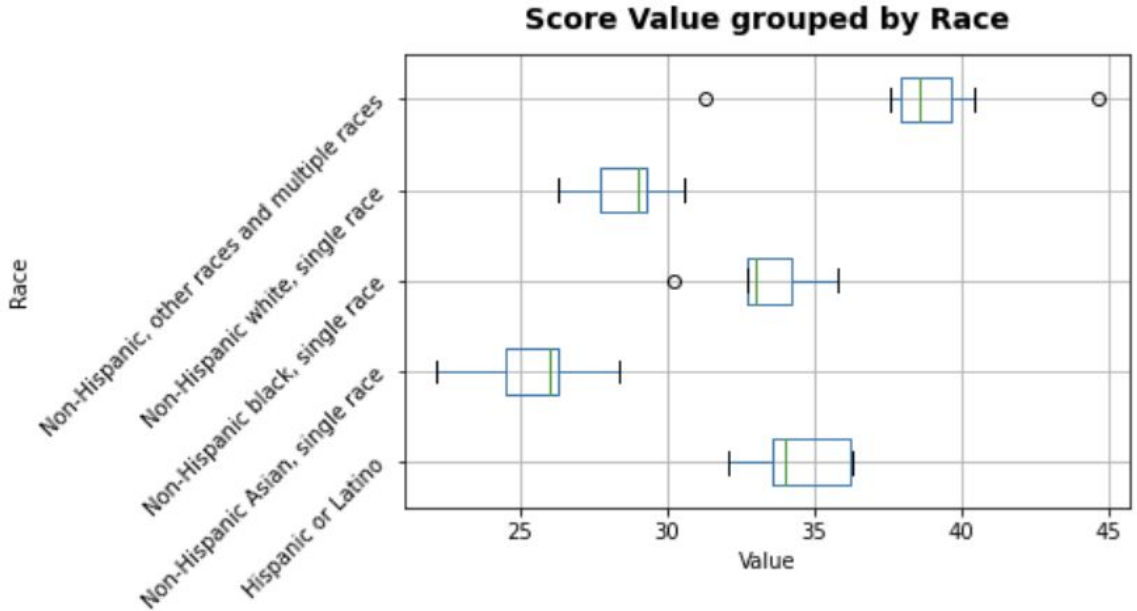
- Low p-values indicate the significance of the differing mean values for Asian, white, mixed, and Latino races when compared to the overall mean

- Asian Americans and whites are less associated with anxiety than mixed races and Hispanic ethnicity

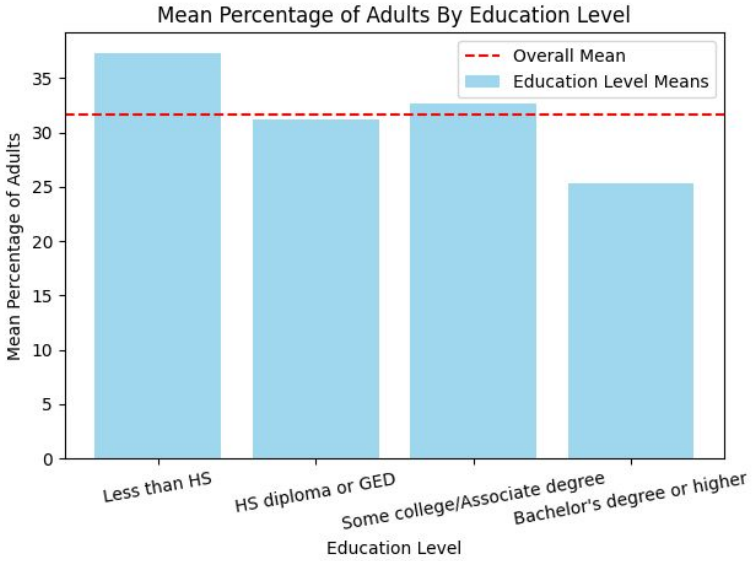


	coef	P>|t|
Intercept	34.5857	0.000
C(Subgroup)[T.Non-Hispanic Asian, single race]	-9.1286	0.000
C(Subgroup)[T.Non-Hispanic black, single race]	-1.3143	0.305
C(Subgroup)[T.Non-Hispanic white, single race]	-6.0286	0.000
C(Subgroup)[T.Non-Hispanic, other races and multiple races]	3.9286	0.004

- Box plot indicates skewed distribution among majority of data
- Alludes to the racial wage gap, language barriers within healthcare access to medical care,[5] and health disparities
- Conclusions reinforced by research several research papers



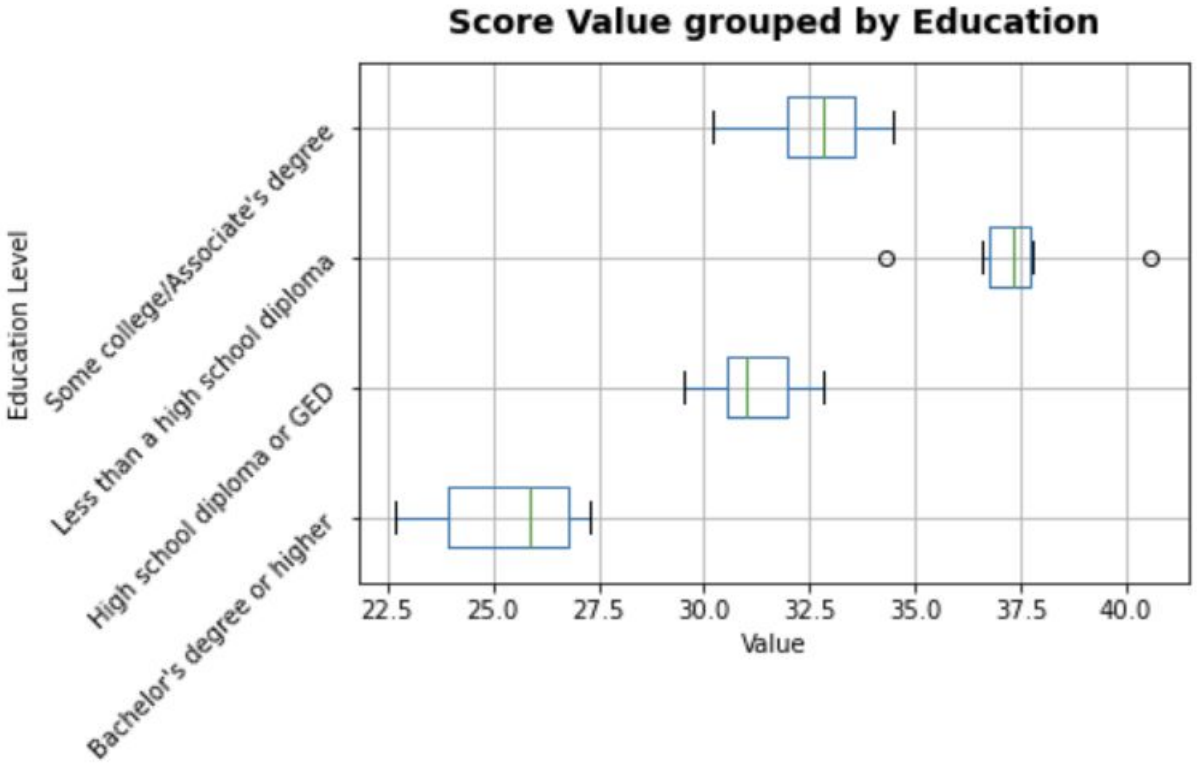
5. A Cross-Ethnic Comparison of Lifetime Prevalence Rates of Anxiety Disorders (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2931265)



	coef	P>|t|
Intercept	25.3429	0.000
C(Subgroup)[T.High school diploma or GED]	5.8429	0.000
C(Subgroup)[T.Less than a high school diploma]	11.9714	0.000
C(Subgroup)[T.Some college/Associate's degree]	7.3000	0.000

- Intercept: Bachelor's degree or higher
- People with some college/associates degree more anxiety symptoms than people with HS diploma
- All other education levels significantly different from Bachelor's degree or higher.
- Consistent with other study[6]

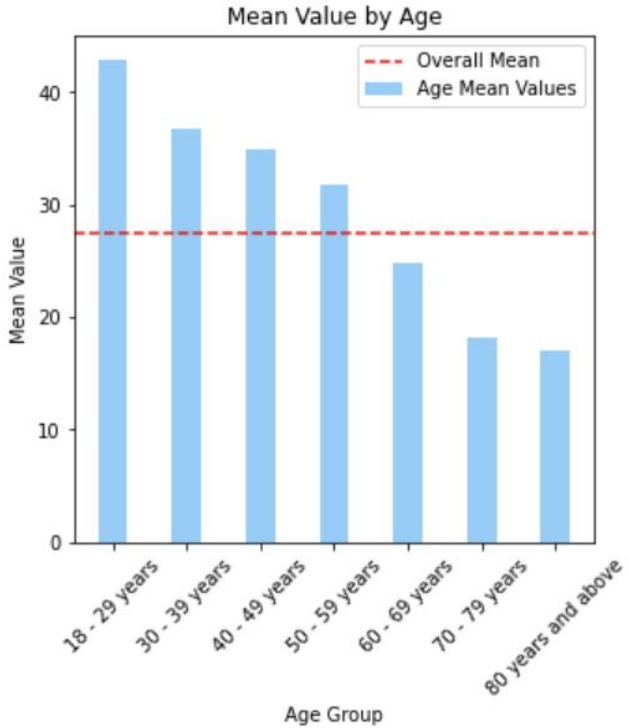
6. Does a higher educational level protect against anxiety and depression? The HUNT study (https://pubmed.ncbi.nlm.nih.gov/18234406/)

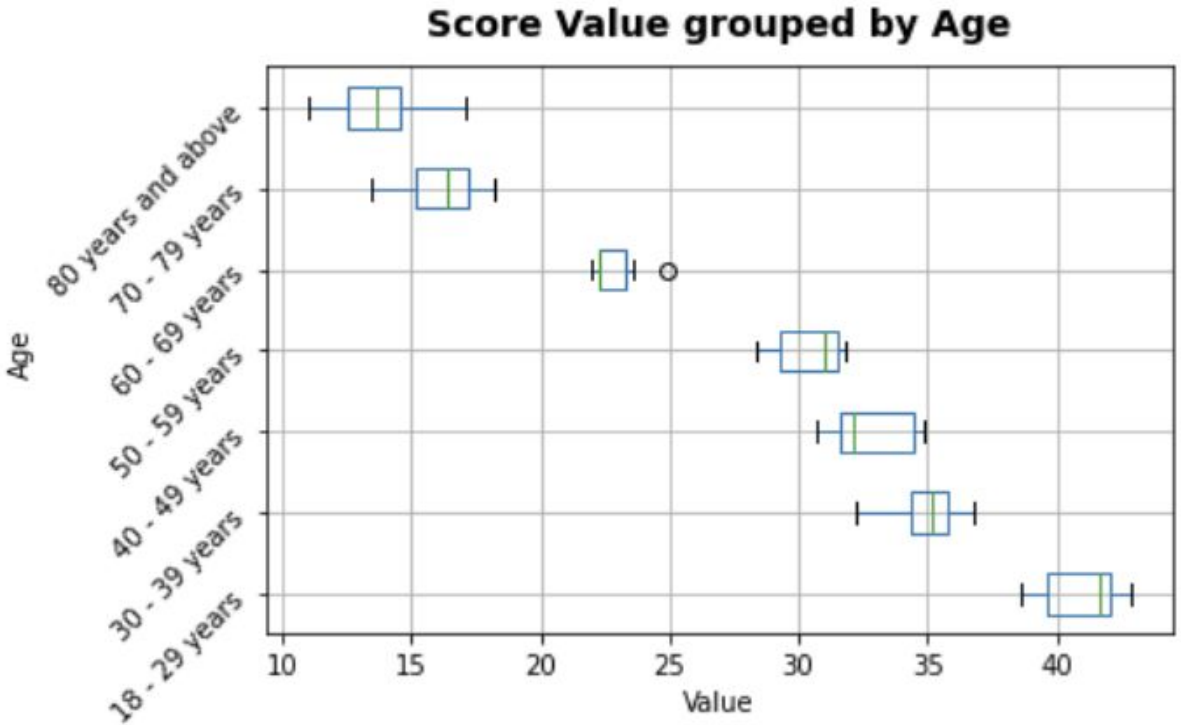


- HS Diploma/GED skewed right
- Bachelor's Degree/higher skewed left

- 18-29 years had the greatest mean value for anxiety amongst all age groups
- Mean anxiety score decreased with increasing age groups

	coef	P>|t|
Intercept	40.9571	0.000
C(Subgroup)[T.30 - 39 years]	-6.0286	0.000
C(Subgroup)[T.40 - 49 years]	-8.1143	0.000
C(Subgroup)[T.50 - 59 years]	-10.5571	0.000
C(Subgroup)[T.60 - 69 years]	-18.0571	0.000
C(Subgroup)[T.70 - 79 years]	-24.8429	0.000
C(Subgroup)[T.80 years and above]	-27.2286	0.000





- IQR width varies in each age group
  - Varying levels of anxiety
- Possibly generational trauma factoring into anxiety [7]
- Competitive job market for younger generations

7. Age differences in psychological distress during the COVID-19 pandemic: March 2020 – June 2021 (https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1101353/full)

Conclusion

- Unsupervised learning approach to develop a better understanding of how these variables interact with one another
  - Determining the covariance to characterize the patient population
  - Example: Higher education patterns within racial groups can contribute to lower anxiety scores
  - Obtaining a higher quality data set to solidify and further our findings

Questions?

Contact Information:
wallermb@bc.edu
wminjue@gmail.com
christopherfuwas@gmail.com
nicholas.yousefi.26@gmail.com

CHOC

References

1. Anxiety Disorders - Facts & Statistics (https://adaa.org/understanding-anxiety/facts-statistics)
2. Anxiety Facts: All You Need to Know (https://psychcentral.com/anxiety/anxiety-facts)
3. Unequal depression for equal work? How the wage gap explains gendered disparities in mood disorders (https://www.sciencedirect.com/science/article/pii/S0277953615302616)
4. US National and State-Level PRevalence of Mental Health Disorders and Disparities of Mental Health Care Use in Children (https://jamanetwork.com/journals/jamapediatrics/fullarticle/2724377)
5. A Cross-Ethnic Comparison of Lifetime Prevalence Rates of Anxiety Disorders (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2931265)
6. Does a higher educational level protect against anxiety and depression? The HUNT study (https://pubmed.ncbi.nlm.nih.gov/18234406/)
7. Age differences in psychological distress during the COVID-19 pandemic: March 2020 – June 2021 (https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1101353/full)

CHOC