Impact of Socioeconomic Status on Maternal Mental Health among Pregnant Women Using NIH All of Us Data

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OBJECTIVE

The study aimed to examine the relationship between maternal mental health and socioeconomic factors, including education level, marital status, health insurance, employment, and income, among pregnant women in the NIH All of Us Research Program. We further developed predictive models for the early prediction of maternal mental health based on socioeconomic factors.

BACKGROUND

Maternal mental health, particularly depression and anxiety, is crucial to the well-being of pregnant women and affects 1 in 5 pregnant individuals every year in the US. Among these women, less than 15% receive treatment, and 75% are untreated and undiagnosed.[1] MMH is increasingly recognized as a critical aspect of care from conception through antenatal care, labor, and into the postpartum period.[2] Understanding the complex interplay between socioeconomic factors, depression, and anxiety among different groups of pregnant women is crucial for developing targeted prevention and intervention strategies to reduce adverse maternal and fetal outcomes.

PROJECT DESIGN

Study Design: Retrospective cohort study.

Data: Electronic health records (EHR) in NIH All of Us Program.

Cohort: Women aged 18-55 who had at least one defined pregnancy in All of Us research program from Jan 1, 2018 to Dec 31, 2023.

Index Pregnancy: was defined as the first record related to pregnancy using CMS guidelines for ICD-10 codes.

Primary Outcome: from 4 months before the index pregnancy start date to 24 months after.

Predictors: Demographic factors (age, race, and ethnicity), and Socioeconomic factors (education level, marital status, health insurance, employment, and income level).

Statistical Analyses: Multivariate logistic regression was used to model the perinatal depression and anxiety, incorporating 25 variables as predictors. Odds ratios with 95% confidence intervals were calculated and reported. We further developed predictive models using logistic regression, random forest, support vector machine, and Naïve Bayes machine learning algorithms. Precision, recall, and F-1 score were reported.

RESULTS

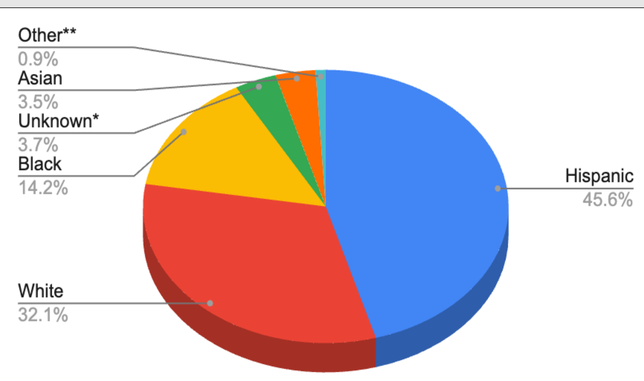

Figure 1 Racial & Ethnic groups of Pregnant Women in the cohort

A total of 9,513 pregnant women were included in this study, and their mean age was 30.3 years (SD: 6.2). Maternal mental health varies across race and ethnic groups.

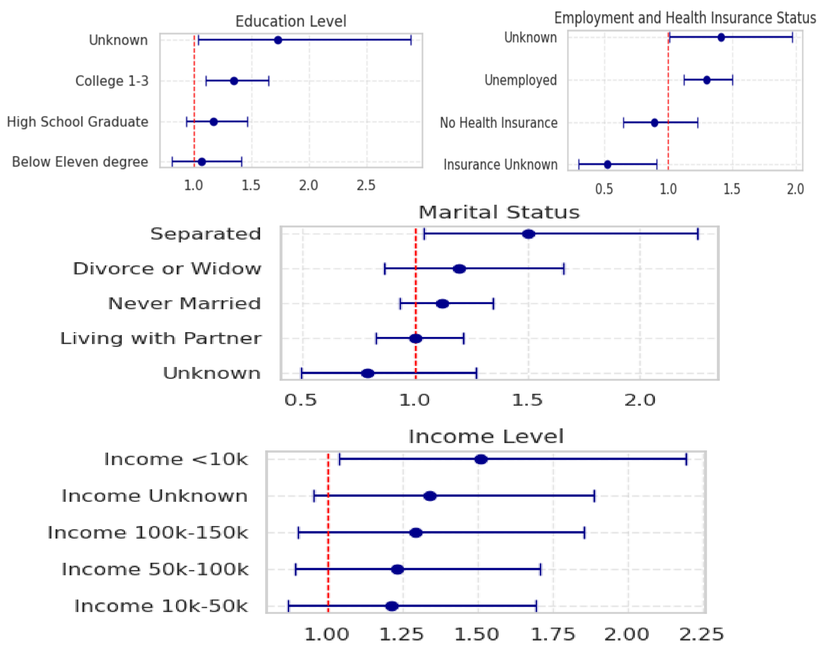

Figure 2 Odds Ratio plot of different Socioeconomic factors for Depression

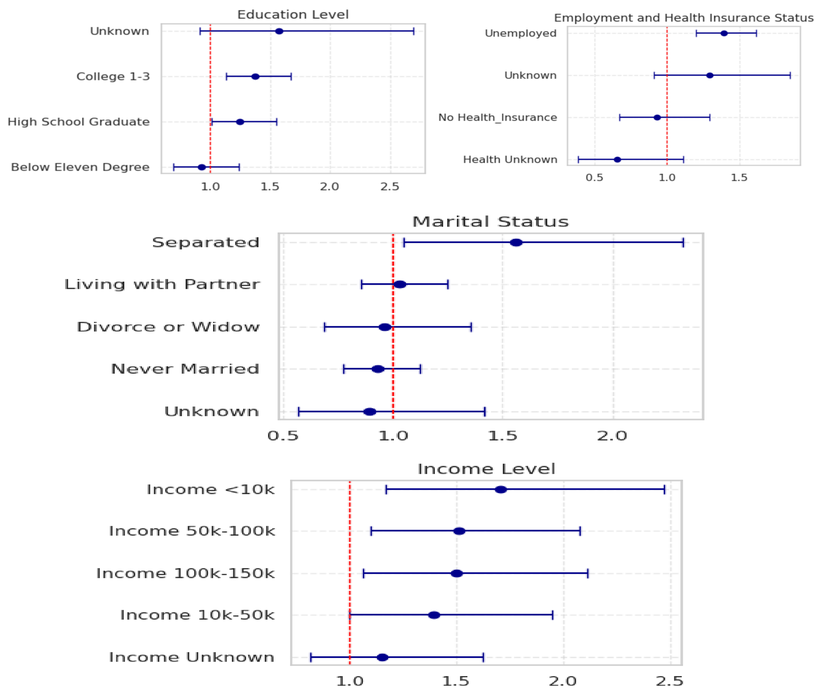

Figure 3 Odds Ratio plot of different Socioeconomic factors for Anxiety

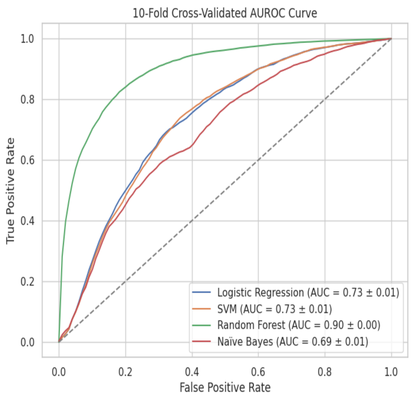

Figure 4 Model Performances for Depression

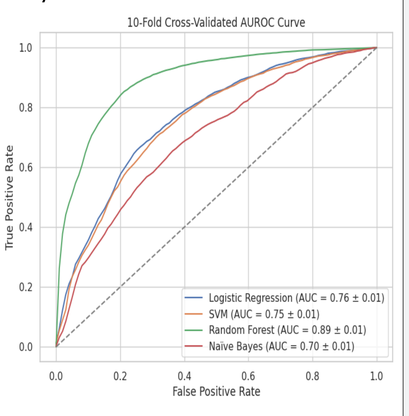

Figure 5 Model Performances for Anxiety

CONCLUSIONS

This study demonstrates a significant association between maternal mental health with socioeconomic status factors. Specifically,

- Black and Hispanic women developed higher rates of depression, whereas white women were more likely to experience anxiety during perinatal.
- Women who were separated (vs. married), unemployed (vs. employed), had an annual income below 10k (vs. above 150k), or had some college education (vs. an advanced degree) demonstrated significantly higher odds of experiencing perinatal depression and anxiety. Notably, all income categories showed a strong association with increased risk of perinatal anxiety compared to those earning more than 150k.
- Health insurance coverage was not a significant factor for both outcomes.
- Random Forest model outperformed ~90% of other models in early prediction of both depression and anxiety cases.

FUTURE WORK

Explore clinical and behavioral risk factors, investigate other maternal mental health conditions, and conduct subgroup analysis.

ACKNOWLEDGEMENTS

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REFERENCES

1. https://www.aamc.org/about-us/mission-areas/health-care/maternal-mental-health
2. Girardi G, Longo M, Bremer AA. Social determinants of health in pregnant individuals from underrepresented, understudied, and underreported populations in the United States. Int J Equity Health. 2023 Sep 6;22(1):186. doi: 10.1186/s12939-023-01963-x. PMID: 37674167; PMCID: PMC10483713.