EXPLORING THE CONNECTION BETWEEN SLEEP DURATION AND DEPRESSION

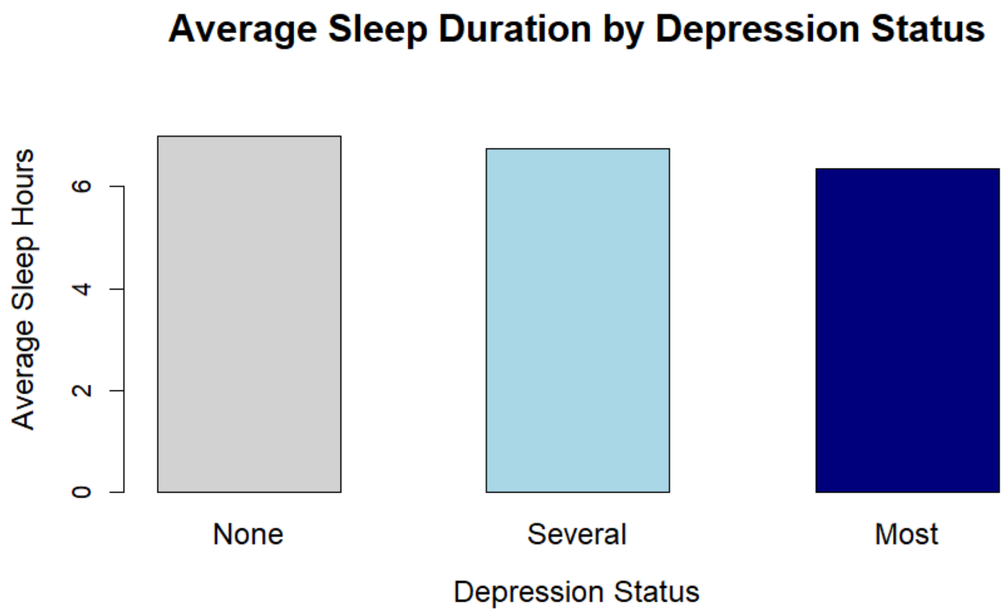
BY
ARIANE LIN, JING JIN, KIN FUNG NG

MOTIVATION AND RESEARCH QUESTION

Sleep is essential for mental health, yet poor sleep is linked to higher depression risks. This study examines how nightly sleep duration affecta depression, focusing on factors including age, gender, mentally unhealthy days (DaysMentHlthBad), and sleep problems.

Research Question:

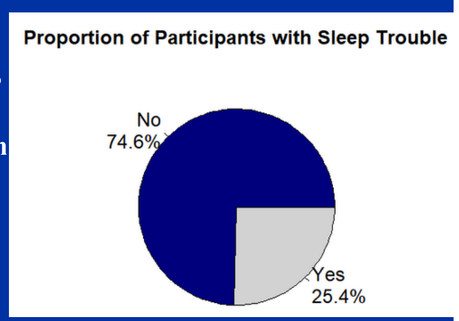
How does sleep duration impact the likelihood of depression, and what role do demographic and behavioral factors play?



DATA COLLECTION

The data comes from the National Health and Nutrition Examination Survey (NHANES), conducted by the National Center for Health Statistics (NCHS).

- **Purpose: NHANES tracks the health and nutritional status of the U.S. population, monitoring disease prevalence and risk factors to inform public health strategies.**
- **Relevance: This dataset is ideal for studying the relationship between sleep duration and depression, as it includes extensive health, demographic, and behavioral data.**
- **Collection Process:**
  - **Annually samples ~5,000 participants.**
  - **Combines home interviews and physical examinations.**
- **Reliability: NHANES is a trusted resource due to its rigorous sampling design and consistent data collection protocols, ensuring high-quality, representative data.**



METHODS OF ANALYSIS

- ***Data Cleaning***
  - **Missing values were removed, and categorical variables (Gender, SleepTrouble, Depressed) were converted into factors for analysis.**
  - **Outliers were retained to prevent bias in the analysis.**
- ***Exploratory Analysis***
  - **Scatterplots and boxplots were used to examine relationships between predictors (Age, DaysMentHlthBad, Gender, SleepTrouble) and the response variable, SleepHrsNight.**
- ***Model Building***
  - **Multiple linear regression was used to analyze the combined effects of predictors on sleep duration.**
- ***Assumption Diagnostics***
  - **Normality: Assessed using Q-Q plots and histograms.**
  - **Linearity & Homoscedasticity: Checked via residuals vs. fitted values.**
  - **Multicollinearity: Tested using Variance Inflation Factors (VIF).**
- ***Model Refinement***
  - **Backward selection was applied to remove predictors with $p > 0.05$.**
  - **Model fit and complexity were evaluated using AIC and BIC.**
- ***Validation***
  - **Leave-One-Out Cross-Validation (LOOCV) calculated Mean Squared Error (MSE) to confirm reliability.**
- ***Final Model***
  - **Assumptions were rechecked, and unresolved issues were noted as limitations.**

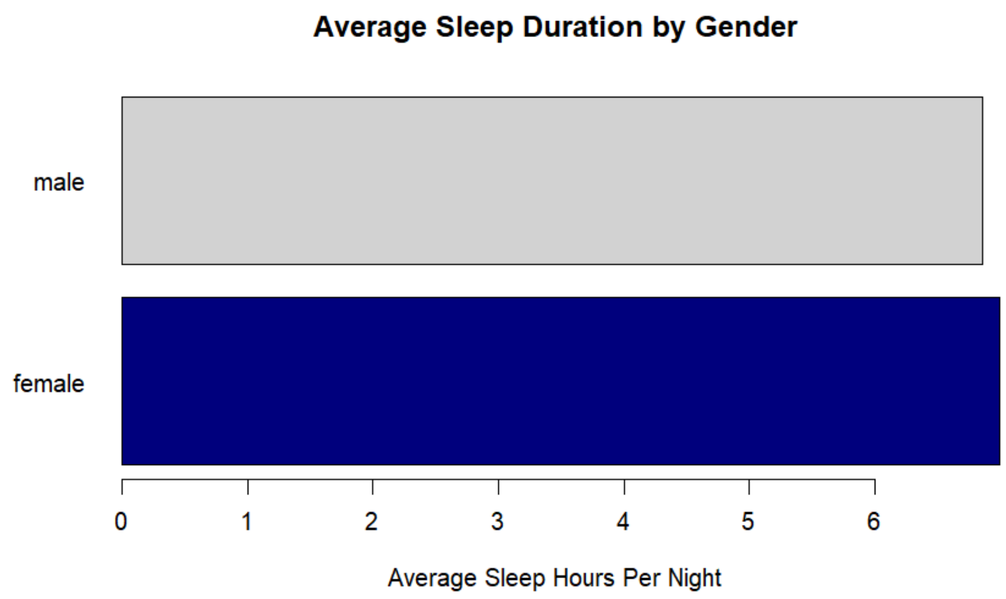
RESULTS/FINDINGS AND CONCLUSION

***Results*:**

- **Gender and sleep trouble significantly impact sleep duration:**
  - **Males sleep, on average, 0.262 fewer hours per night than females, holding all other factors constant.**
  - **Individuals with sleep trouble sleep 0.546 fewer hours per night than those without, on average.**
- **The model explained 6.68% of the variance in sleep duration, indicating that other factors not included in the analysis may influence sleep.**
- **Other predictors, such as Age and less severe depression, were not statistically significant in the model.**
- **The model met key linear regression assumptions (normality, linearity, and constant variance), and cross-validation showed a Mean Squared Error (MSE) of 1.6766, confirming reliability.**

***Conclusion*:**

- **Mental health and demographic factors, particularly Gender and Sleep Trouble, influence sleep duration significantly.**
- **The findings align with existing research, showing males and individuals with sleep difficulties experience shorter sleep durations.**
- **Although the model has low explanatory power, it provides insights into how these predictors relate to sleep and highlights the complexity of sleep behavior.**



LIMITATIONS

- ***Low explanatory power:***
  - **The model explained only 6.68% of the variance, suggesting important predictors were missing (e.g., physical activity, diet, socioeconomic status).**
- ***Self-reported data:***
  - **Sleep duration data relied on self-reports, which may introduce biases or inaccuracies.**
- ***Assumption deviations:***
  - **Minor deviations in normality and constant variance could slightly affect the model's validity.**
- ***Outliers:***
  - **Extreme values were included in the dataset, which might influence coefficient estimates and predictions.**

REFERENCES

Centers for Disease Control and Prevention. (2023, May 31). Nhanes - about the National Health and Nutrition Examination Survey. Centers for Disease Control and Prevention. https://www.cdc.gov/nchs/nhanes/about_nhanes.htm

Dickinson, D. L., Wolkow, A. P., Rajaratnam, S. M. W., & Drummond, S. P. A. (2018). Personal sleep debt and daytime sleepiness mediate the relationship between sleep and mental health outcomes in young adults. Depression and Anxiety, 35(8), 775–783. https://doi.org/10.1002/da.22769

Riemann, D., Krone, L. B., Wulff, K., & others. (2020). Sleep, insomnia, and depression. Neuropsychopharmacology, 45(1), 74–89. https://doi.org/10.1038/s41386-019-0411-y

Steiger, A., & Pawlowski, M. (2019). Depression and Sleep. International Journal of Molecular Sciences, 20(3), 607--. https://doi.org/10.3390/ijms20030607