WIE2003 INTRODUCTION TO DATA SCIENCE

SLEEP QUALITY PREDICTION

PRESENTED BY:

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PROJECT BACKGROUND

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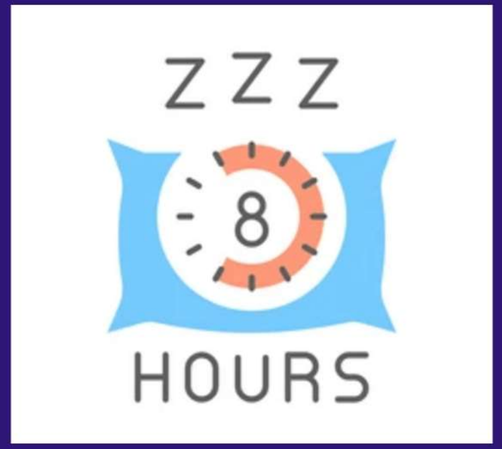
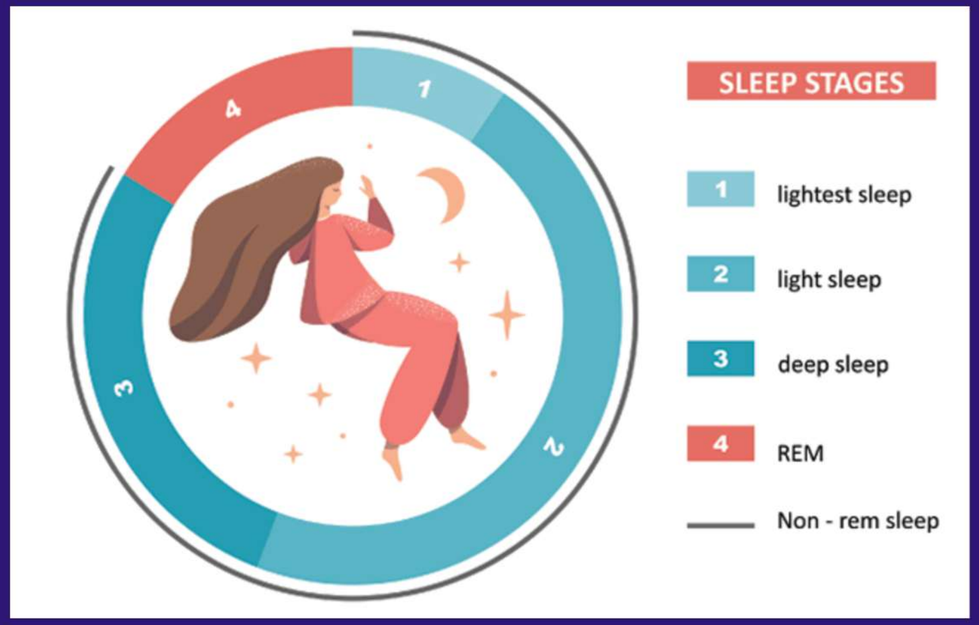
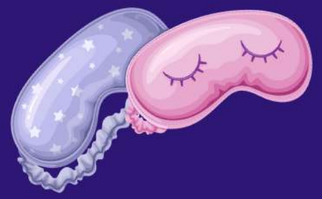




ABOUT OUR DATASET

Person ID	Gender	Age	Occupation	Sleep Duration	Quality of Sleep	Physical Activity	Stress Level	BMI Category	Blood Pressure	Heart Rate	Daily Steps	Sleep Disorder
1	Male	27	Software Engineer	6.1	6	42	6	Overweight	126/83	77	4200	None
2	Male	28	Doctor	6.2	6	60	8	Normal	125/80	75	10000	None
3	Male	28	Doctor	6.2	6	60	8	Normal	125/80	75	10000	None
4	Male	28	Sales Representative	5.9	4	30	8	Obese	140/90	85	3000	Sleep Apnea
5	Male	28	Sales Representative	5.9	4	30	8	Obese	140/90	85	3000	Sleep Apnea
6	Male	28	Software Engineer	5.9	4	30	8	Obese	140/90	85	3000	Insomnia
7	Male	29	Teacher	6.3	6	40	7	Obese	140/90	82	3500	Insomnia
8	Male	29	Doctor	7.8	7	75	6	Normal	120/80	70	8000	None
9	Male	29	Doctor	7.8	7	75	6	Normal	120/80	70	8000	None
10	Male	29	Doctor	7.8	7	75	6	Normal	120/80	70	8000	None
11	Male	29	Doctor	6.1	6	30	8	Normal	120/80	70	8000	None
12	Male	29	Doctor	7.8	7	75	6	Normal	120/80	70	8000	None
13	Male	29	Doctor	6.1	6	30	8	Normal	120/80	70	8000	None
14	Male	29	Doctor	6	6	30	8	Normal	120/80	70	8000	None
15	Male	29	Doctor	6	6	30	8	Normal	120/80	70	8000	None
16	Male	29	Doctor	6	6	30	8	Normal	120/80	70	8000	None
17	Female	29	Nurse	6.5	5	40	7	Normal Weight	132/87	80	4000	Sleep Apnea
18	Male	29	Doctor	6	6	30	8	Normal	120/80	70	8000	Sleep Apnea
19	Female	29	Nurse	6.5	5	40	7	Normal Weight	132/87	80	4000	Insomnia
20	Male	30	Doctor	7.6	7	75	6	Normal	120/80	70	8000	None
21	Male	30	Doctor	7.7	7	75	6	Normal	120/80	70	8000	None
22	Male	30	Doctor	7.7	7	75	6	Normal	120/80	70	8000	None
23	Male	30	Doctor	7.7	7	75	6	Normal	120/80	70	8000	None
24	Male	30	Doctor	7.7	7	75	6	Normal	120/80	70	8000	None
25	Male	30	Doctor	7.8	7	75	6	Normal	120/80	70	8000	None

- 400 rows and 13 columns
- detailed sleep metrics, lifestyle factors, cardiovascular health and assessment of sleep disorders



TARGET USER

- **Researchers and data scientists**
  - analyze dataset to understand sleep patterns
- **Healthcare professionals**
  - use it to assess and treat sleep disorders
- **Individuals**
  - gain insights into their sleep habits
- **Technology developers**
  - innovate new sleep tracking tools and digital solutions

ORGANIZATION

Sleep Research Society®

National Sleep Foundation

Consumer Technology Association

CES

PROBLEM STATEMENT

Sleep is **undervalued** despite its critical role in overall health.

Misconceptions about sleep perpetuate harmful behaviors and hinder efforts to promote healthy sleep habits.

Lifestyle factors such as irregular sleep schedules and excessive screen time contribute to sleep problems.

PROJECT OBJECTIVES

- **Predict the sleep quality and sleep duration** by examining variables such as gender, age, occupation, physical activity level etc.
- Identify patterns and correlations of the **relationships between various factors** such as sleep duration, quality, physical activity, stress levels, **and health metrics like** BMI, blood pressure, and heart rate.
- Investigate **how different lifestyle factors influence overall health and well-being**, with a focus on sleep disorders and related health issues.

PROJECT SCOPE

DATA COLLECTION

sourcing from Kaggle

DATA CLEANING

remove incomplete data

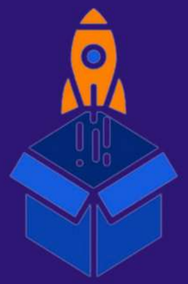
EDA

identifies general patterns in the data

MODELLING & INTERPRETING DATA

extract meaningful insights

DEPLOYMENT OF DATA PRODUCT



process data and generate results

LITERATURE STUDY

FACTOR I : STRESS

From the existing literature, the results shows a noteworthy **negative correlation between stress level and sleep quality** (*Alotaibi et al., 2020*), where **reducing stress can lead to improved sleep quality,** while heightened stress can severely degrade it (*Van Laethem et al., 2017*).

According to Dr Annise Wilson, **sleep loss triggers our body's stress response system**, leading to an elevation in stress hormones, namely cortisol, which further disrupts sleep. Psychological effects of stress, such as feeling overly alert and tense can also make it difficult to fall asleep

FACTOR II : BMI

From the existing literature, the results shows that sleep quality and BMI may affect each other, where **a poor sleep quality will lead to increase in BMI,** whereas a **high BMI may lead to poor sleep quality** (*Madrid-Valero J.J. et al., 2017)*. Sleep quality may affect BMI through hormonal and biochemical changes such as variations in leptin, ghrelin and cortisol levels or increased resistance to insulin (*Spiegel K. et al., 2004*). According to an article by the Sleep Foundation, sleep quality affects BMI due to **sleep loss can create a hormone imbalance** in the body that promotes overeating and weight gain.

FACTOR III : SLEEP DISORDERS

From the existing literature, the results shows that **some sleep disorders, such as sleep apnea are related to physical health problems**, while others, such as **insomnia are related to mental health problems**. And both of these sleep disorder will lead to poorer sleep quality by disrupting individual's sleep mentally or physically (*Darchia N. et al., 2018*).

According to an article from Sleep Foundation, insomnia is a condition of **ongoing difficulty to fall or remain asleep** despite wanting and having enough time to sleep. On the other hand, sleep apnea is a **breathing disorder** that disrupts breathing at night.

Reasons we choose these factors as our potential predictors of sleep quality among adults:

- Stress level are known to contribute to sleep disorders.
- BMI will affect sleep-related breathing disorders such as obstructive sleep apnea.

The gap in this literature that shows how differently these crucial factors may affect sleep quality among adults compared to students present limitations.

OUR REFERENCES

1. Obesity and sleep. Sleep Foundation. (2023, December 22). https://www.sleepfoundation.org/physical-health/obesity-and-sleep
2. Alotaibi, A. D., Alosaimi, F. M., Alajlan, A. A., & Bin Abdulrahman, K. A. (2020). The relationship between sleep quality, stress, and academic performance among medical students. Journal of family & community medicine. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6984036/
3. Gangwar, A., Tiwari, S., Rawat, A., Verma, A., Singh, K., Kant, S., Garg, R. K., & Singh, P. K. (2018, June 21). Circadian preference, sleep quality, and health-impairing lifestyles among undergraduates of Medical University. Cureus. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6104894/
4. Clement-Carbonell, V., Portilla-Tamarit, I., Rubio-Aparicio, M., & Madrid-Valero, J. J. (2021, January 8). Sleep quality, mental and physical health: A differential relationship. International journal of environmental research and public health. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7826982/
5. Obesity and sleep. Sleep Foundation. (2023b, December 22). https://www.sleepfoundation.org/physical-health/obesity-and-sleep

Description of Methodology

OBTAIN

TYPES OF DATA

- **Quantitative** : Person ID, Age, Quality of Sleep, Sleep Duration, Stress Level, Blood Pressure, Heart Rate, Daily Steps, Physical Activity Level
- **Qualitative** : Gender, Occupation, BMI Category, Sleep Disorder

SOURCES

- **Platform** : Kaggle
- **Author** : Laksika Tharmalingam
- **Version** : Version 2.0
- **Tittle** : Sleep Health and Lifestyle
- **URL**:https://www.kaggle.com/datasets/uom190346a/sleep-health-and-lifestyle-dataset/data

Description of Methodology

RELIABILITY

- **Data Source Verification** : The author verified the dataset's legitimacy by seeking additional provenance sources from Google.
- **Engagement Metrics Analysis** : The dataset gain significant attention,with over 226K view and 41.6K downloads.
- **Peer Validation** : Experts such as Amal Yasser provided invaluable feedback and validation

Description of Methodology

SCRUB

Checking for null value

Sleep Disorder is the only column containing missing value, inplace it with "No Sleep Disorder". The **NaN** value indicates that the person do not have any sleeping disorder (insomnia and sleep apnae)

Removing Duplicates

242 duplicate values had been removed

Checking Values of Categorical Variables

- **Person ID, Age, Quality of Sleep, Sleep Duration, Stress Level, Blood Pressure, Heart Rate, Daily Steps, Physical Activity Level,Gender, Occupation, BMI Category, Sleep Disorder**

Description of Methodology

Removing unecessary column

- removing ‘person ID’ column

Replace unecessary value

- **redundancy** between 'Normal' and 'Normal Weight' in BMI Category
- Replace Normal weight with normal

Merge

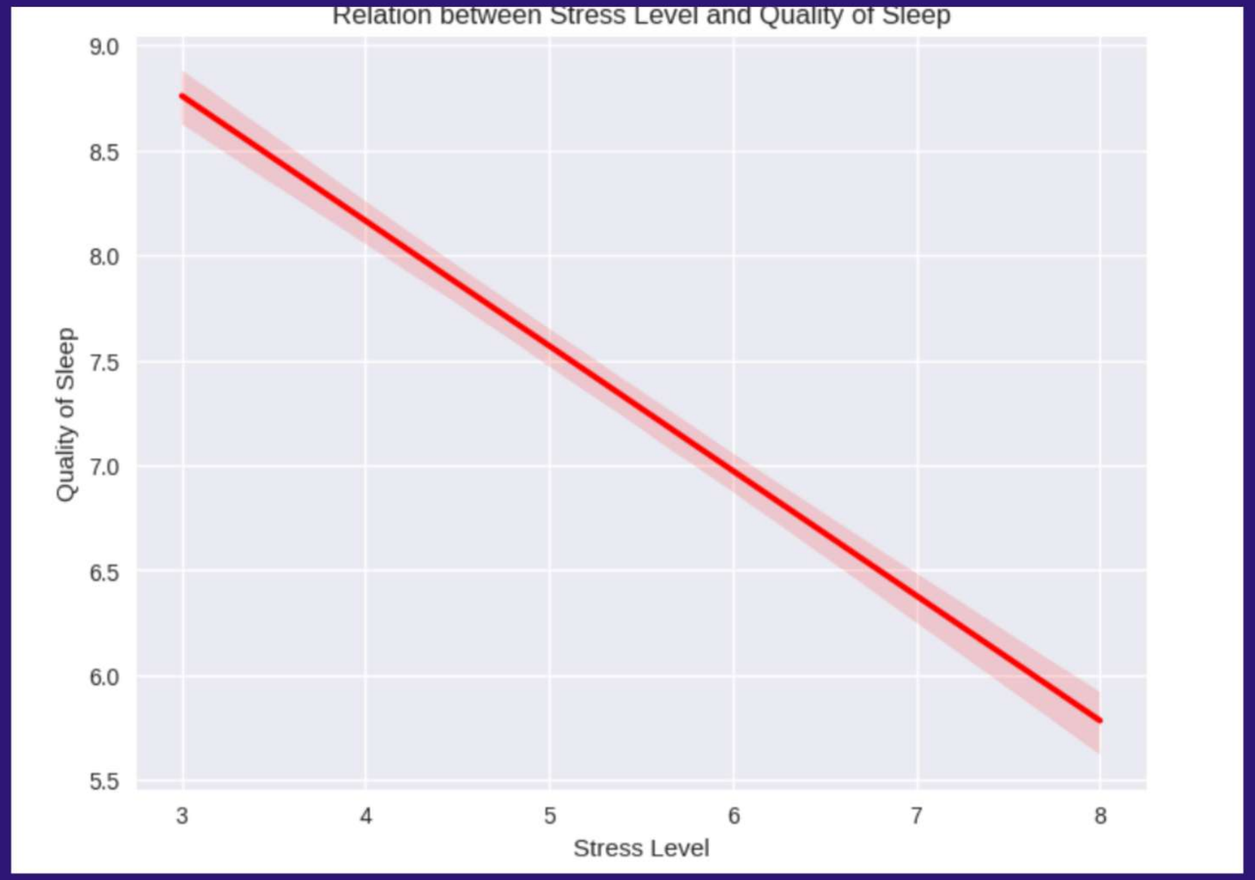
- 'Salesperson' merged with 'Sales Representative'
- 'Software Engineer' merged with 'Engineer'
- 'Scientist' and 'Manager' occupations are too poorly represented in the dataset
  Action : delete the rows related

Checking for outlier

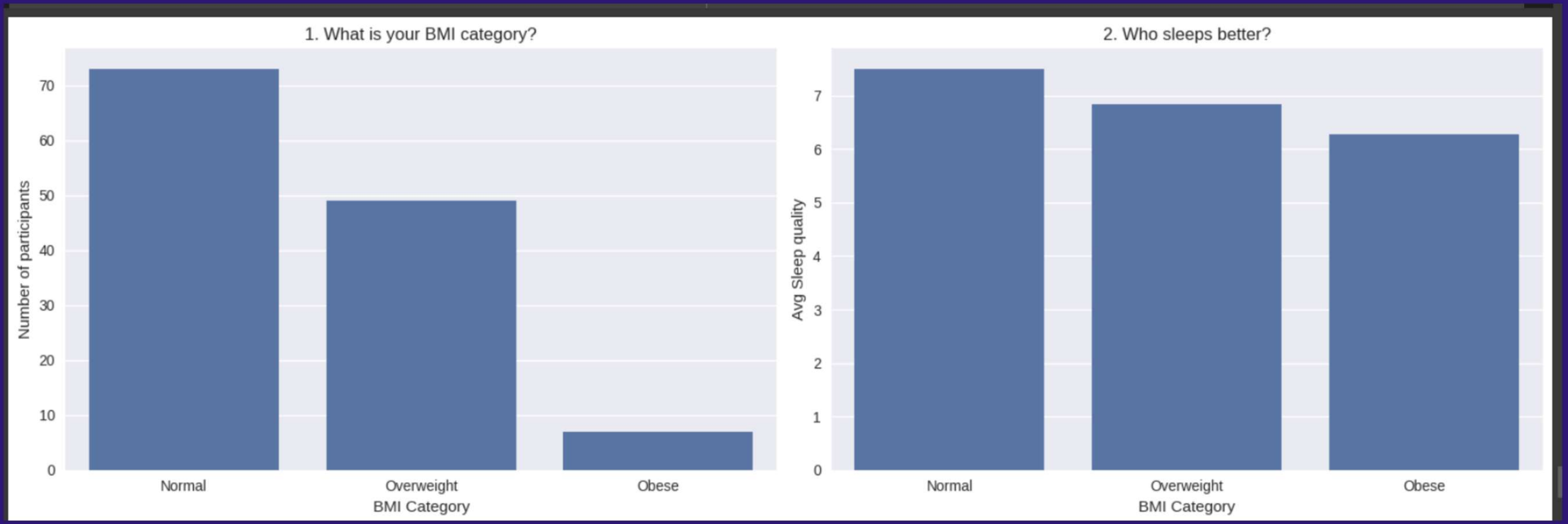
- the only metric that have outliers is **heart rate**

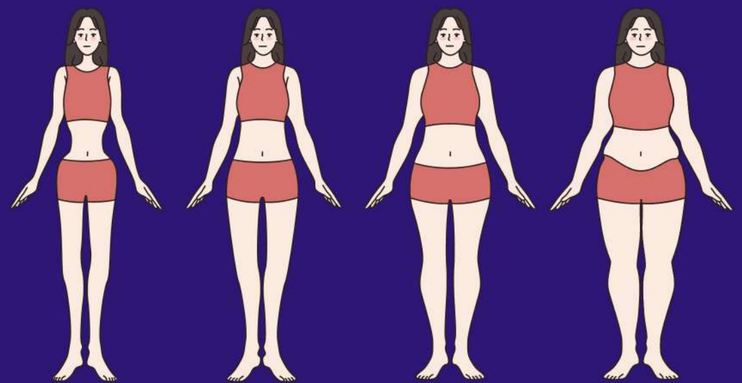
Relationship between stress and quality of sleep

EXPLORATORY DATA ANALYSIS

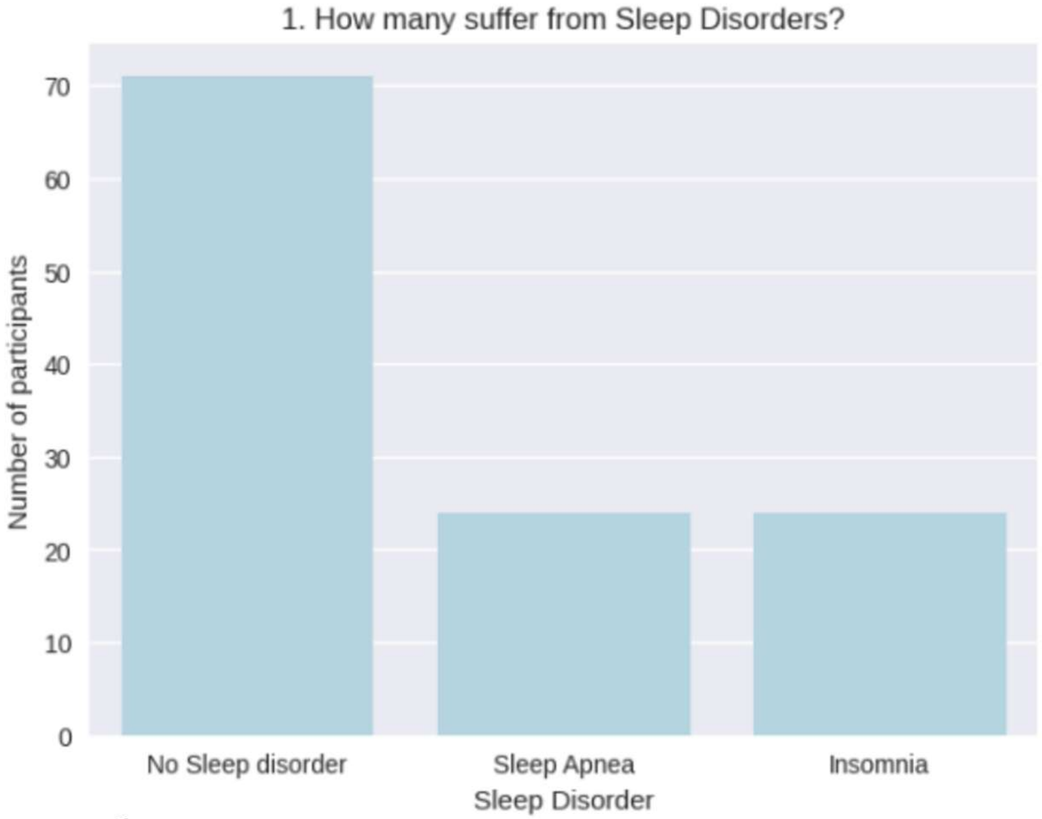


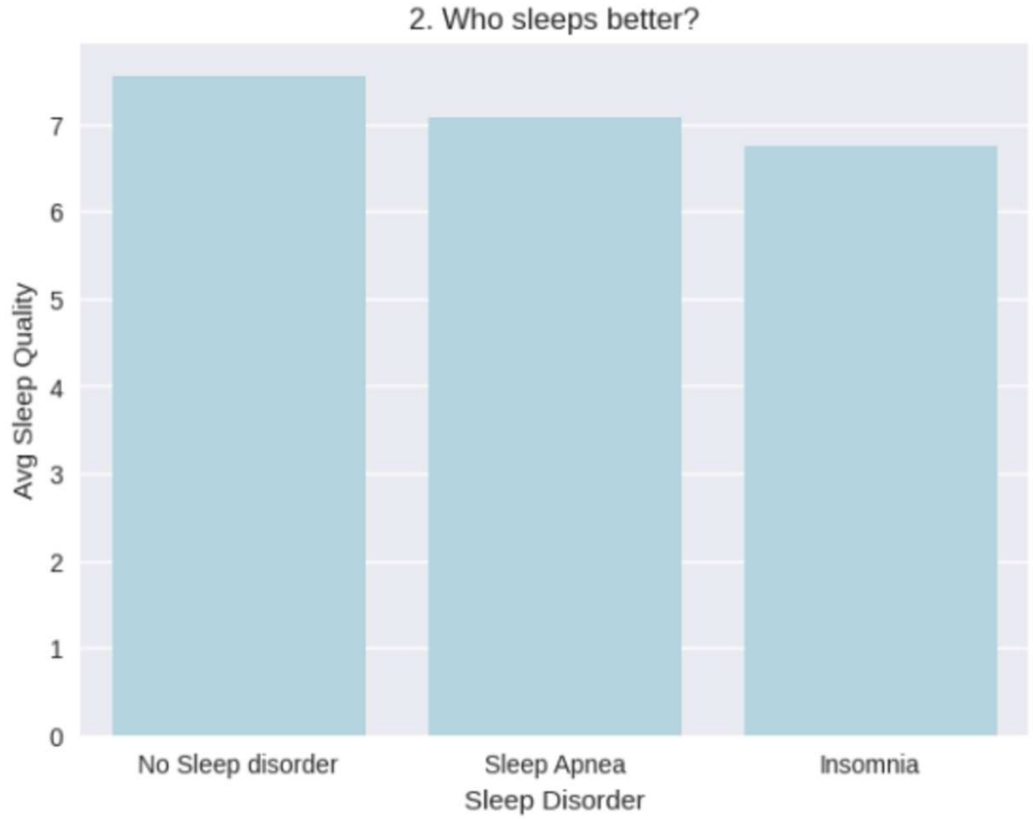
Relationship between BMI and quality of sleep





Relationship between sleep disorders and quality of sleep





IMPACT OF THE PROJECT TO THE SOCIETY

IMPROVES PUBLIC HEALTH AWARENESS

Raise awareness about the importance of sleep for overall health

PROVIDING CUSTOMIZED HEALTH RECOMMEDATIONS

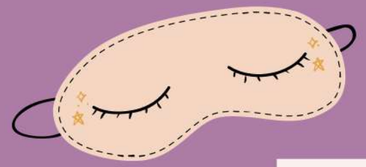
Personalized health recommendations tailored to individuals' specific needs and lifestyle factors

INTRODUCE LONG-TERM HEALTH BENEFITS

Project brings forth early detection and intervention and reduces burden of healthcare systems as well as healthcare cost

PROMOTES HOLISTIC HEALTH

Emphasizes the interconnectedness of lifestyle factors and overall well-being and showing how daily activities affects us and what can we do for a positive impact



BRING AMPLE ECONOMIC BENEFITS

Development of new technologies and interventions based on the project's findings could create new jobs and economic opportunities

PROMOTES ADVANCEMENT OF SCIENTIFIC KNOWLEDGES

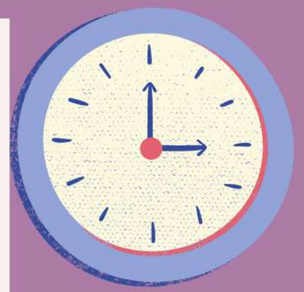
Pave the way for further research and development of new diagnostic tools and treatment options for sleep disorders.

PROMOTES DATA-DRIVEN POLICY DECISIONS

Insights can inform public health policies related to sleep health, workplace wellness programs, and healthcare system improvements.

ENHANCE PRODUCTIVITY & LIFE QUALITY

Better sleep quality positively impacts productivity, cognitive function, mood, and quality of life



ETHICAL CONSIDERATION

ETHICAL REVIEW AND OVERSIGHT

Seeking ethical approval from relevant institutional review boards or ethics committees before initiating the study

PRACTICE RESPECT FOR AUTONOMY

We respect participants' right to make informed decisions about their involvement in the study.

PRIVACY AND CONFIDENTIALITY

We protect the privacy of participants' sleep data and health information

EQUITABLE ACCESS AND BENEFIT SHARING

We ensure equitable access to any interventions or recommendations resulting from the study.

AVOID BIAS AND DISCRIMINATION

We analyze and interprete data in a manner that avoids perpetuating biases related to gender, age, occupation or other demographic factors

MAINTAIN TRANSPARENCY THROUGHOUT THE STUDY PROCESS

Communications regarding the limitations of the study and potential implications of the findings should be transparent and clear

OBTAIN INFORMED CONSENT FROM ALL PARTICIPANT

We ensures that participants fully understand the purpose, procedures, and potential risks of the study before agreeing to participate

Thank you

wish you have a good night sleep :)