Data Transformation

Project Horse

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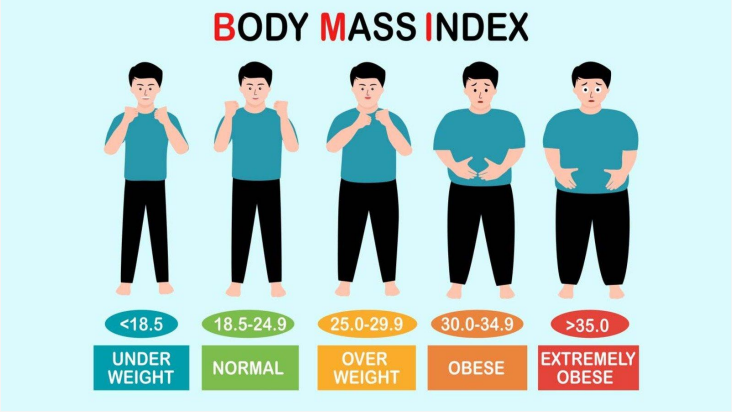
Research Question

Among U.S. adults, how is body mass index (BMI) associated with sedentary behavior (e.g. TV hours), and does this relationship differ by smoking status or age group?

Hypothesis

- Expect that individuals with **higher sedentary behavior** (measured by more TV hours) and **shorter sleep duration** will have higher BMI
- Relationships may differ by smoking status and age group.



Motivation

- Obesity is a **leading** driver of preventable chronic disease in the United States (contributor to type 2 diabetes, cardiovascular disease, certain cancers)
- Understand **health effects** of socioeconomic disadvantage
- **Rise** of diet and exercise culture
- Ozempic going **generic** in 2026 for certain countries

Introduction to NHANES

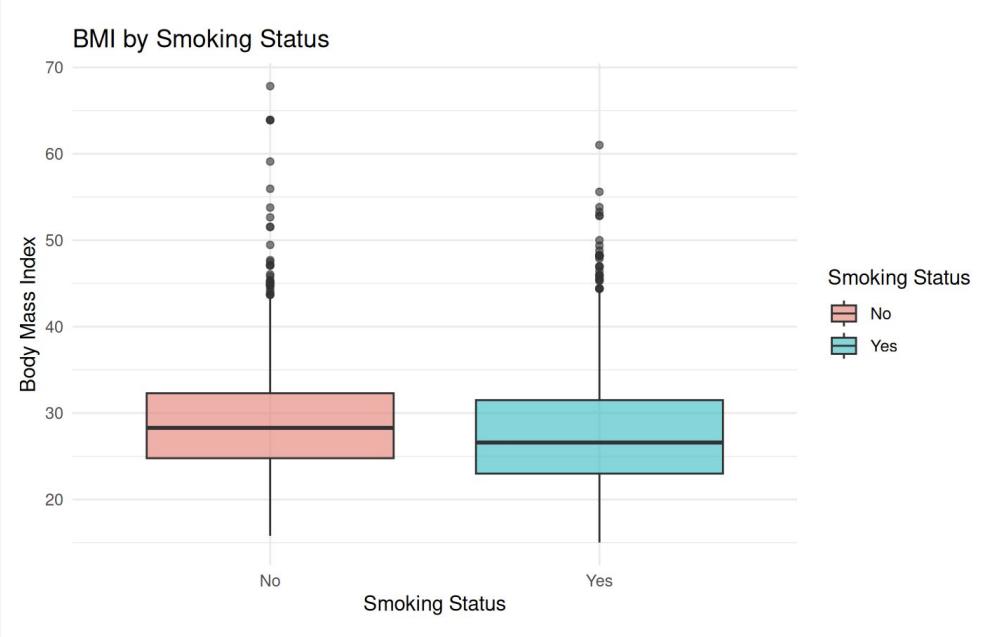
About NHANES, aka National Health and Nutrition Examination Survey

- Our specific dataset is published by the CDC Division of Nutrition, Physical Activity, Obesity
- Combines in-person interviews, physical exams, and lab tests to assess the health of U.S. adults
- Sample: ~ 10,000 U.S. adults from 2009–2012, selected using a complex stratified random sampling design to be nationally representative
- Study type: Cross-sectional, a snapshot in time, not tracking individuals over time
- Body mass index (BMI) estimates body fat → divides a person's weight in kilograms by their height in meters squared

Key Variables

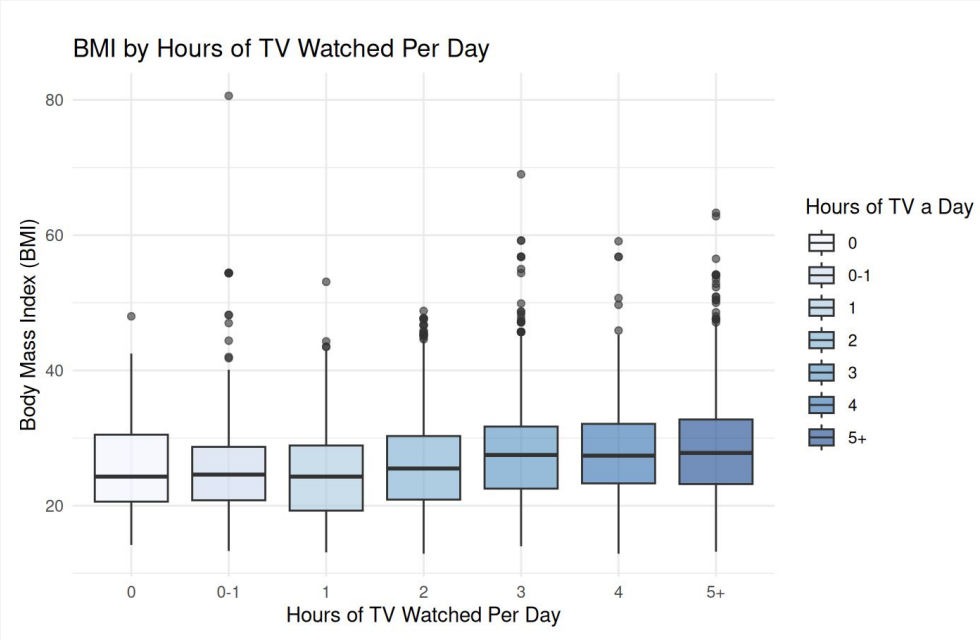
- bmi — continuous, clinician-measured
- tv_hrs_day — daily TV hours (proxy for sedentary behavior: 0, 0–1, 1, 2, 3, 4, 5+)
- sleep_hrs_night — self-reported hours of sleep per night
- smoke_now — current smoking status (Yes/No)
- age_decade — age grouped by decade (e.g., 20s, 30s, 40s...)

BMI vs Smoking



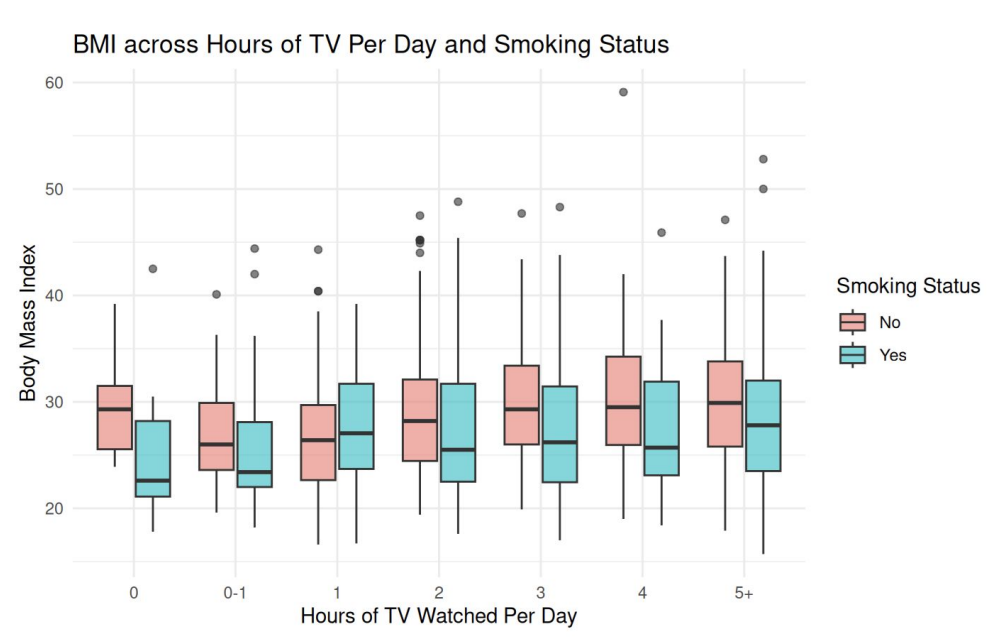
- Smokers have lower median BMI than non-smokers
- Distribution for smokers is slightly shifted downward
- Substantial overlap between the groups Outliers exist in both groups, indicating variability
- Importance
  - Lower BMI among smokers may be related to metabolic effects of nicotine However, the overlap suggests smoking is not a strong predictor of BMI on its own
- Smoking has a statistically visible but relatively weak relationship with BMI

BMI vs TV



- Median BMI increases steadily as TV hours increase
- Individuals watching 4–5+ hours have noticeably higher BMI than those watching 0–1 hours
- Spread of BMI also increases at higher TV levels, suggesting greater variability
- Pattern suggests a positive association between sedentary behavior and BMI
- Importance
  - Increased sedentary time may contribute to higher BMI through reduced physical activity and energy expenditure

Stratified Analysis



- BMI increases with TV hours for both smokers and non-smokers
- Parallel upward trends suggest the relationship is consistent across groups
- Smokers have slightly lower BMI at each TV level, but the gap remains small
- No evidence that smoking changes the direction of the relationship
- Interpretation
    - Sedentary behavior appears to influence BMI independently of smoking status Smoking shifts BMI slightly but does not alter the overall pattern
- TV viewing remains the dominant factor associated with BMI, regardless of smoking status

The -tion and -tions

Finding	Interpretation	Limitations
TV hours ↑ BMI Consistent across all TV levels	Sedentary behavior independently predicts higher BMI	TV ≠ all sedentary behavior; desk work & phone use not captured
Smokers: slightly lower BMI Small gap, much overlap	Smoking is a confounder, not a modifier — doesn't change the pattern	Self-reported smoking subject to social desirability bias
TV–BMI trend holds for smokers and non-smokers alike	TV time is a modifiable target for obesity prevention	Observational data — cannot establish causation