Modeling the Relationship Between Hypertension and Income Using the PSID

A Methodological Overview

William Garcia

University of Washington. PhD student, Health Metrics and Implementation Science

October 27, 2025

Introduction

- **Hypertension** is a leading modifiable risk factor for cardiovascular disease and premature mortality.
- Socioeconomic disparities play a key role in its prevalence, control, and consequences.
- Using the **Panel Study of Income Dynamics (PSID)**, we can analyze how **income and hypertension** interact over time.

Data Source: PSID

- Nationally representative U.S. household panel survey (since 1968).
- Collects information on **income, demographics, and health** for all household members.
- **Hypertension data** collected biennially from **1999–2023**.
- Two analysis levels:
  - **Individual level:** How hypertension affects personal income.
  - **Household level:** How hypertension affects household income.

```r
# Example: reading PSID SAS data file
library(haven)
psid_2023 <- read_sas("data/FAM2023ER.sas7bdat")

# Keep relevant hypertension variables
psid_2023 <- psid_2023 %>%
  select(ER85812, ER84572, ER84773, ER70660, ER70672,
         ER84574, ER84775, ER70671, ER70673)
```

Sample Selection

- Focus on years: **2021-2023**.
- Include households with complete hypertension and income data.
- Head of family (≥ 18 years) as this group report their own physician-diagnosis hypertension.

Variables of Interest

- Hypertension was assessed with a question: Has a doctor or other health professional ever told you that you [i.e., Head of Family] had high blood pressure or hypertension?

Concept	Variable Example	Description
Hypertension (RP)	ER84572	Whether Reference Person has hypertension
Age of onset	ER84574 / ER84775	Age when first diagnosed
Income	ER70660	Total family income

Descriptive Statistics

```r
summary(psid_2023$ER84572)
summary(psid_2023$ER84773)

# Compute household hypertension indicator
psid_2023 <- psid_2023 %>%
  mutate(any_htn = if_else(ER84572 == 1 | ER84773 == 1, 1,
```

Modeling Strategy

- The **panel nature** of PSID allows controlling for unobserved individual heterogeneity.
- We estimate both:
  1. **Fixed-effects model**: Within-person variation.
  2. **Hierarchical (random-effects) model**: Between-person variation.

Model Equations

- Hypertension $\rightarrow$ Income

$$\log(Y_{it}) = \alpha_0 + \alpha_1 \mathsf{HTN}_{it} + \alpha_2 X_{it} + \eta_i + \nu_{it}$$

where u_i, η_i are individual random effects.

Example: Hierarchical Model

```
model_htn_income <- lmer(log(income) ~ hypertension + age +
                         data = psid_panel)
summary(model_htn_income)
```

Interpreting Coefficients

- $\alpha_1 < 0 \rightarrow$ Hypertension is associated with **lower income**.
- **Within-person effect:** how income changes after diagnosis.
- **Between-person effect:** differences across individuals.

Incorporating Sampling Weights

- Use PSID weights (e.g., `ER85812` for 2023).
- Normalize within-year for pooled models:

```
psid_panel <- psid_panel %>%
  group_by(year) %>%
  mutate(w_norm = ER85812 / mean(ER85812, na.rm = TRUE))
```

- Apply as analytic weights:

```
library(fixest)
feols(log(income) ~ hypertension + age + education | pid +
      data = psid_panel, weights = ~w_norm)
```

Results (Example Output)

Variable	Estimate	95% CI	p-value
Hypertension	-0.05	[-0.08, -0.02]	0.004
Age	0.01	[0.008, 0.012]	< 0.001
Education	0.03	[0.02, 0.04]	< 0.001

Discussion

- Persistent **negative association** between hypertension and household income.
- Highlights the **economic burden of chronic disease** and potential for **health-inequality feedback loops**.
- Suggests the need for targeted prevention and social protection strategies.

Limitations and Next Steps

- Self-reported hypertension (possible underreporting).
- Income measurement error and top-coding.
- Explore **causal identification** (e.g., lagged models, IVs, or event-study).
- Extend to other chronic diseases (diabetes, heart disease).

References

- Gertler, P. & Gruber, J. (2002). *Insuring Consumption Against Illness.* AER.
- Currie, J. & Madrian, B. (1999). *Health, Health Insurance and the Labor Market.*
- PSID User Guide (2023). Institute for Social Research, University of Michigan.