

State-mandated increased years of K-12 education decreased systolic and diastolic blood pressure

An instrumental variable quantile analysis of a natural experiment

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Increased years of education decreased median systolic and diastolic blood pressure later in life, with potential larger benefits for those in higher quantiles.

INTRO

- More schooling predicts better cardiovascular disease (CVD) outcomes
- Most work is correlational and insufficient to establish causality
- We leveraged a natural experiment, variation in compulsory schooling laws (CSLs), to evaluate how increased education impacted later-life CVD
- We used quantile regression to assess for heterogeneity of the effects of education along the distribution of systolic and diastolic blood pressure (SBP, DBP)

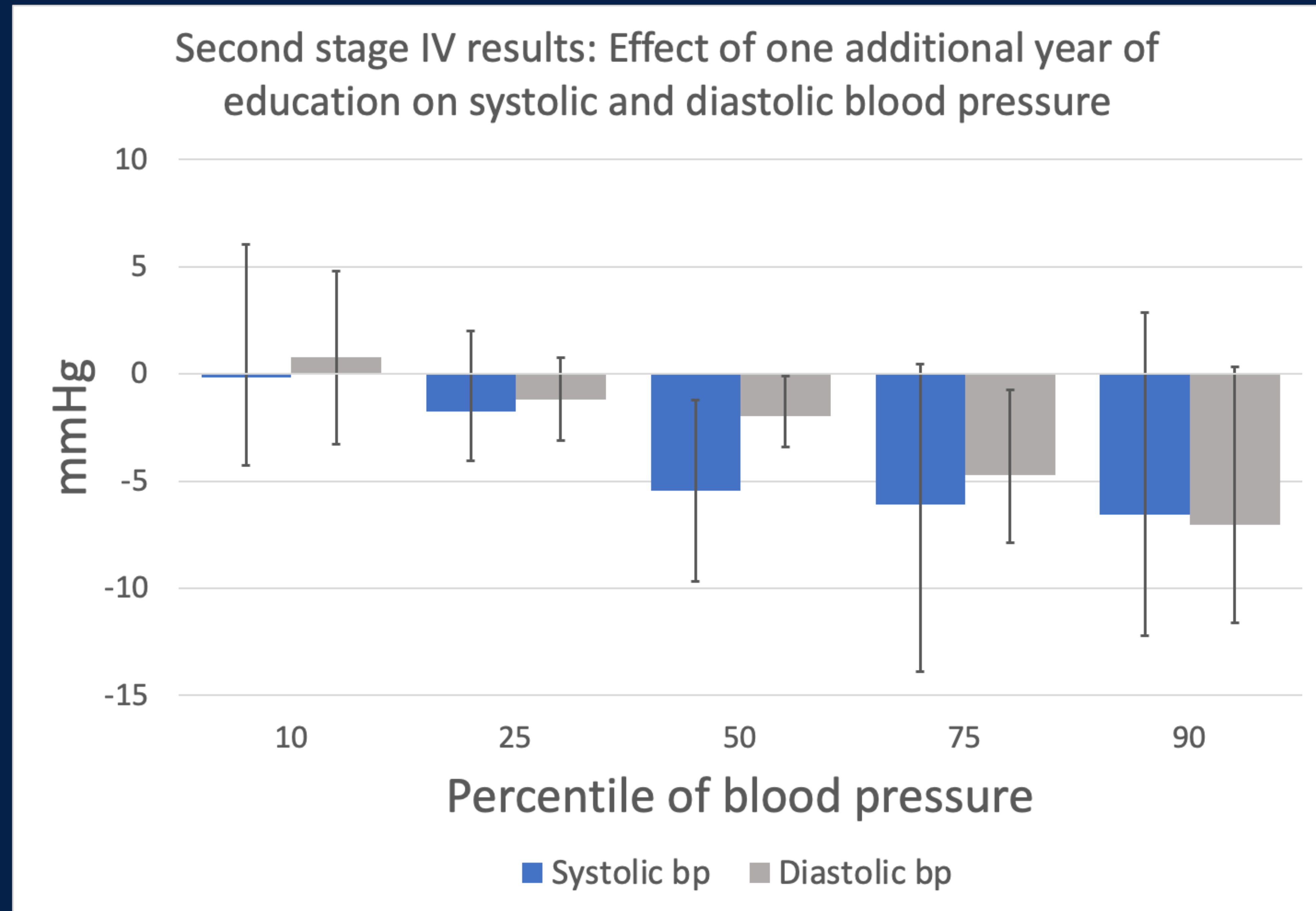
METHODS

Data

- 1st stage: 1980 & 1990 US census 5% samples
- 2nd stage: Health and Retirement Study (HRS)
 - National sample of US residents aged 50 years or more at enrollment
 - Samples matched on race, state of birth, year of birth, nativity, and educational attainment

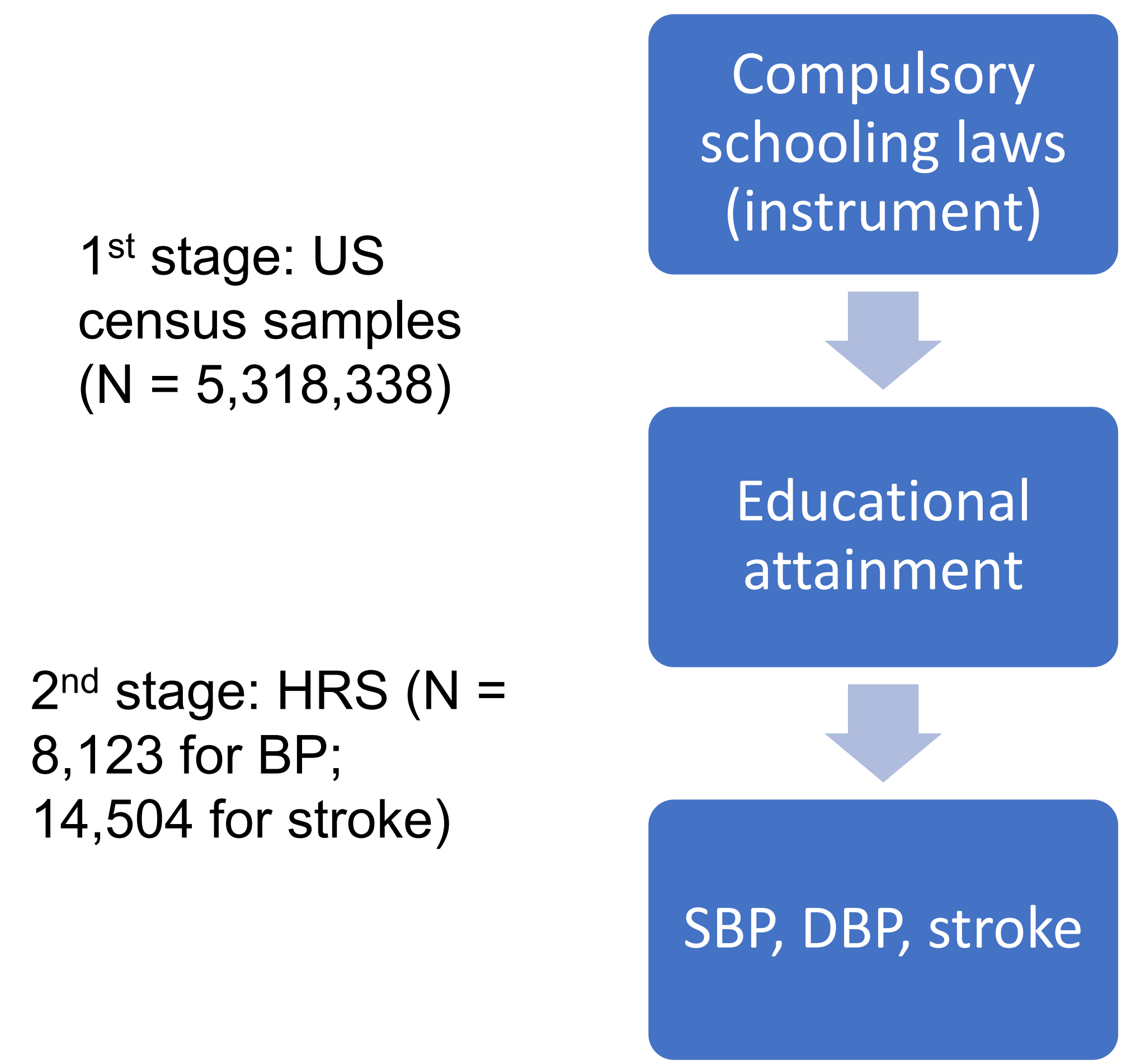
Study design

- Two-sample instrumental variables (IV) analysis
- 1st stage: ordinary least squares (OLS) regression to predict educational attainment
- 2nd stage:
 - Unconditional quantile & OLS regression (continuous blood pressure)
 - Logistic regression (stroke)
- All models adjusted for individual- and state-level covariates
- Analyses restricted to those with ≤12 years of education because this population is affected by CSLs



Systolic blood pressure decreased by 6.6 (95% CI: -12.2, 2.8) mmHg with each additional year of education for those in the 90th percentile of SBP. SBP decreased by 5.5 (95% CI: -9.7, -1.2) mmHg for those in the 50th percentile of SBP.

Figure 1. Instrumental variable study design



RESULTS

Table 1. HRS sample characteristics

	Total	Black	White
N	8,123	1,812	6,311
Birth year (mean ± SD)	1941 (11)	1946 (11)	1940 (11)
Female (%)	59.3	59.7	59.2
Predicted educational attainment (mean ± SD, years of school)	10.8 (0.72)	10.2 (0.79)	11.0 (0.59)
Actual educational attainment (mean ± SD, years of school)	11.1 (1.8)	10.5 (2.3)	11.2 (1.6)
US census region (%)			
Northeast	19.8	9.0	22.9
Midwest	31.6	8.5	38.3
South	43.0	81.6	31.9
West	5.6	0.88	6.9

Table 2. Additional second stage IV results (effect of one additional year of education)

	Coefficient (95% CI)
OLS regression	
Systolic blood pressure	-2.72 (-7.17, 0.52)
Diastolic blood pressure	-2.42 (-4.27, -0.50)
Logistic regression	
Self-reported stroke	1.18 (0.88, 1.59)

Unconditional quantile regression results (central figure) highlight the heterogenous effect of education on blood pressure, which is not apparent using OLS regression.

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