Monte Carlo Simulation of the Affordable Care Act's Impact on Lung Cancer Mortality

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Introduction

- Affordable Care Act (ACA), Medicaid expansions began in 2014
  - >35 million people newly gained health insurance coverage & pre-existing conditions
- Intervening Supreme Court decision (2012), state can choose whether to implement Medicaid expansion
- Lung cancer is deadliest form of cancer, WV had highest mortality rate in 2022
- Research Goals:
  - Did ACA reduce lung cancer mortality?
  - Compare modeling techniques:
    - Difference-in-Differences, Linear Regression
- Factors: Obesity, Smoking, Air Quality ($PM_{2.5}$)
- Monte Carlo propagates covariate uncertainty

Figure 1: Medicaid Expansion Status of All US States

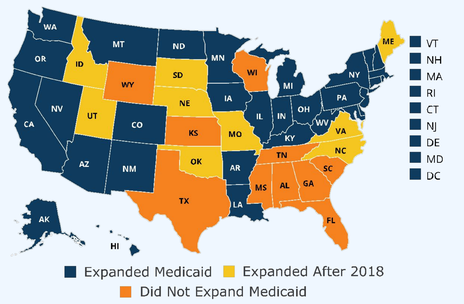
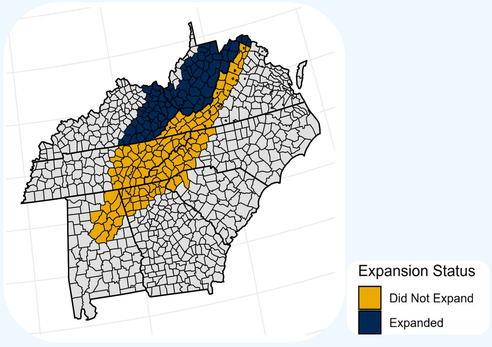
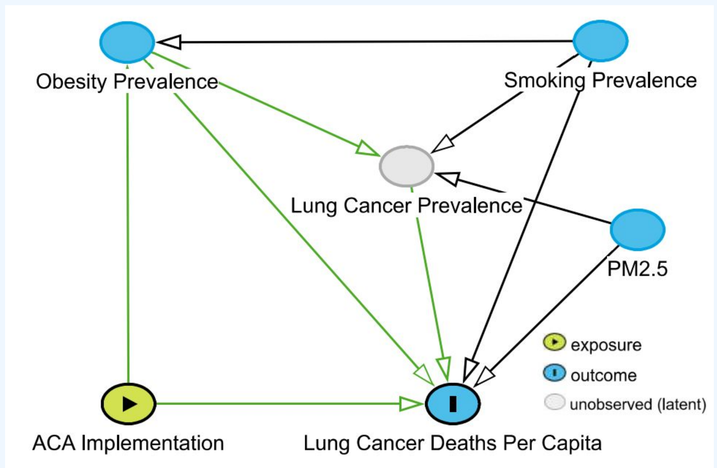


Figure 2: Appalachian Medicaid Expansion Status



Consensus Appalachia, John Alexander Williams

Methodology

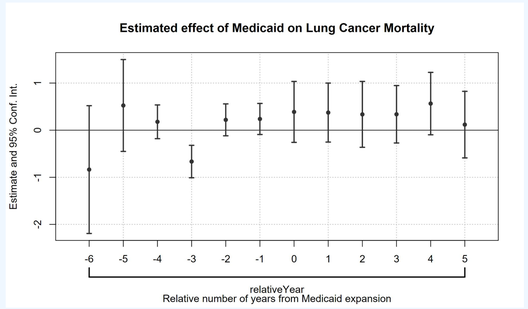


- Directed Acyclic Graph (DAG) shows causal relationships
- Estimated effect of the affordable care act on lung cancer deaths using DiD and Multiple Linear Regression.
- Error was propagated through MLR using Monte Carlo

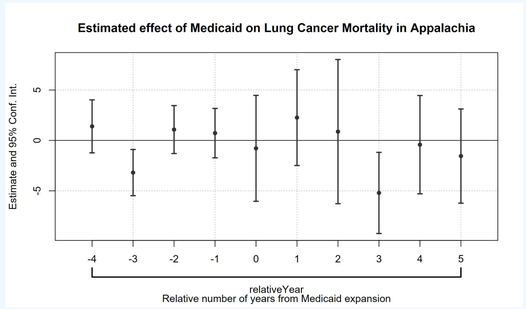
Results

Difference-in-Differences (County-level)

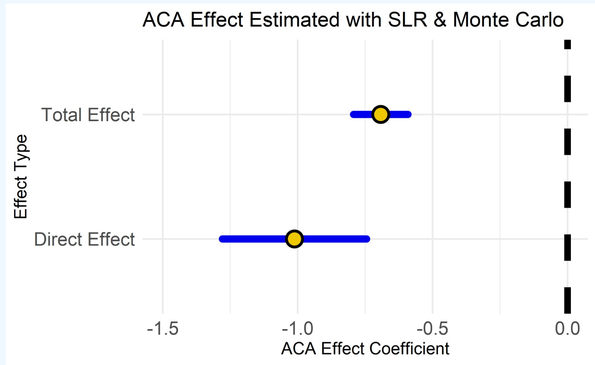
Nationwide

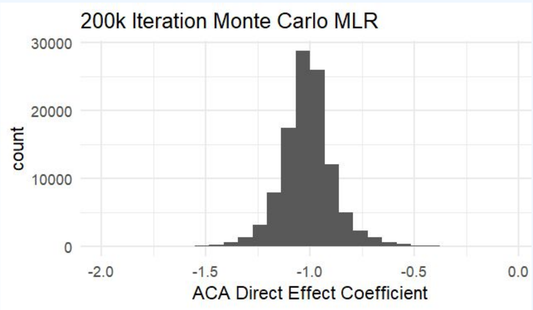


Appalachia



Multiple Linear Regression (National)





Discussion & Conclusions

DiD showed no significant effect of Medicaid expansions on lung cancer mortality, nationally and within Appalachia

MLR showed the Affordable Care Act to have significant total and direct reduction effects on lung cancer mortality nationally.

Citations

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