Aggregate Effects of Public Health Insurance Expansion: The Role of Delayed Medical Care

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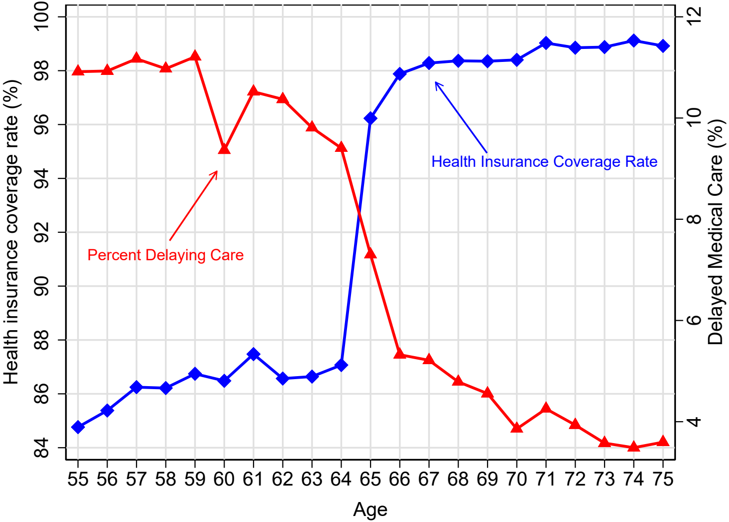
US Health Insurance Coverage Jumps Discretely at Age 65



Source: NHIS data from 2002 to 2012

Does Delayed Care Offset Costs of Public Insurance Expansion?

- Two key novel channels related to delayed care:
  1. Early care is more cost-effective $\Rightarrow$lower total medical expenses
  2. Early care saves lives $\Rightarrow$ higher aggregate medical expenses

- In this paper: Aggregate effects of expanding Medicaid
- Main Result: Expansion is half as costly as previous estimates suggest
  - $40 billion per year vs CBO $80 billion per year
  - CE Welfare -0.4% vs Jung and Tran (2016) -0.7%

Model Ingredients

- OLG model with heterogeneous agents and ABH incomplete markets
- Two dynamic state variables: wealth and health
- Rich insurance market w/ endogenous premiums
- Endogenous health investment $\Rightarrow$ Endogenous mortality
- Use micro estimates to discipline model:
    1. DiD: 2014 ACA expansion led to **decline** in mortality (Miller, Johnson, and Wherry, 2021)
    2. RDD: **increase** in healthcare consumption at age 65 (Card, Dobkin, Maestas, 2008)

Summary of Quantitative Results

- Substantial impact of delayed care:
  - For every \$100 spent on Medicaid expansion, Medicare costs decrease by \$49
  - Life expectancy increases by 0.4 years
  - New insurance recipients gain 6% of consumption
  - Others lose 1% of consumption due to higher healthcare prices and taxes
    - Losses twice as large with delayed care channel

Model

A Macroeconomic Model of Health Expenditure

- N measure of heterogeneous individuals indexed by
  - b: Assets (risk-free)
  - h: Health
  - a: Age
  - z_p: Permanent Productivity
  - z_a: Temporary Productivity

Individual Preferences

- Individual optimization problem:

$$\max \sum \Big[\prod_{j=17}^{a-1} (1-\pi(h_j, j))\Big] \beta^a (\bar{u} + u(c_a, l_{m,a}, l_{c,a}))$$

$$s.t.\ \ c_t + b_{t+1} + \underbrace{p_t \chi(i_t, x_t)}_{\text{Healthcare Spending}} + P_p = R_t b_t + \underbrace{T(z(z_p, z_{s,t}, a)(w_{m,t} l_{m,t} + w_{c,t} l_{c,t}))}_{\text{Post-tax Income}}$$

$$b_{t+1} \geq 0$$

- $\bar{u}$: the additional utility from being alive each period
  - Generates preferences over consumption, labor, and **mortality**

Death is Determined Endogenously

- At end of each period, die with probability $\pi(h, a)$
  - For simplicity $\pi(h, 100) = 1$; maximum age of 100
  - (Exogenous) Measure n of new individuals born each period
    - ⋆ No population growth
    - ⋆ No demographic concerns in public finance

Spending on Medical Care

- Individuals gain health by spending on medical care i
- Law of motion for health h is given by

$$h_{t+1} = \big(1 - (\delta_a + 1\{x > 0\}\delta_x)\big) h_t + \phi_a i_t^{\omega}$$

- ϕ_a is decreasing in age $\Rightarrow$ earlier care is more effective

Emergency Shocks

- Individuals face risk of health emergency each period
- Probability of emergency is $\pi_x(h, a)$
- When hit by emergency, face stochastic medical expenditure x

$$\ln x \sim N\big(\mu(h, a), \sigma(h, a)\big)$$

Individuals can purchase insurance to reduce health risk

- Five types of insurance plans

1. Employer-based Coverage
   - Availablity follows Markov process with matrix M
2. Marketplace Coverage
   - Universally available
3. Uninsurance
   - Universally available
4. Medicaid
   - Available to individuals below productivity threshold $\bar{z}$
5. Medicare
   - Available to individuals 65 or older

Health Insurance

- To pay for i and x, HH with plan p pays $\chi_p(i,x)$

$$\chi_p(i,x) = \upsilon_p i + [\rho_p \max(x - d_p, 0). + \min(x, d_p)] + P_p$$

- υ_p: Copay rate (e.g. for GP visits, prescriptions drugs, etc.)
- d_p: Deductible
- ρ_p: Coinsurance rate (e.g. for hospital stays, ER visits, etc.)
- P_p: Per-period insurance premium

Insurance Companies Operate at Zero Profits

- Insurance firms collect premiums and administer insurance subject to loading factor κ
- For plan p, zero profits implies:

$$(\text{Premiums Collected}) = (1 - s_p)\kappa(\text{Cost of Covered Care})$$

- s_p: government subsidy rate

Individual Productivity Process

- Household period productivity given by

$$z(z_p, z_s, a) = \exp\left(g(a) + z_p + z_s\right)$$

- Life-cycle component of productivity: $g(a)$
- Permanent productivity: $z_{p,t+1} = z_{p,t}$
- Temporary productivity: $z_{s,t+1} = \rho z_{s,t} + \varepsilon_t$

Supply Side

- Consumption and Medical sector labor are imperfect substitutes

$$l = \nu\left((1-\alpha_m)l_m^{\frac{\xi+1}{\xi}} + \alpha_m l_c^{\frac{\xi+1}{\xi}}\right)^{\frac{\xi}{\xi+1}}$$

- Yields constant elasticity relative labor supply curve

$$\frac{l_m^*}{l_c^*} = \left(\frac{1-\alpha_m}{\alpha_m}\right)^{\xi}\left(\frac{w_m}{w_c}\right)^{\xi}$$

- Representative firms use Cobb-Douglas technology and operate in perfect competition
  - $Y_m = A_m K_m^{\alpha} L_m^{1-\alpha}$
  - $Y_c = A_c K_c^{\alpha} L_c^{1-\alpha}$

State Variables

- Individual level:
  1. Assets b
  2. Health h
  3. Age a
  4. Permanent productivity z^p
  5. Temporary productivity z^s
  6. Insurance plan p
  7. Access to employer-provided insurance e
  8. Information status λ
- Aggregate level:
  1. Cross-sectional distribution of (1) - (8) Ω

Bellman Equation

$$
\begin{aligned}
V(b,h,a,z^p,z^s,p,e;\Omega) = & \max \quad \bar{u} + u(c,l) + \\
& + \beta(1-\pi(h,a))\mathbb{E}[V(b',h',a+1,z^p,z^{s'},p',e';\Omega'))
\end{aligned}
$$

$$
\begin{aligned}
c + b' + p_h\chi_p(i,m) = & (1+r(\Omega))b + T((w_m(\Omega)l_m + w_c(\Omega)l_c)z(z^p,z^s,a)) \quad \text{if } a < 65 \\
c + b' + p_h\chi_{\text{MCR}}(i,m) = & (1+r(\Omega))b + y_{a\geq 65}(z^p,\Omega) \quad \text{if } a \geq 65 \\
h' = & (1-\delta_a-\delta_x)h + \phi i^{\psi} \\
l = & \nu\left((1-\alpha_m)l_m^{\frac{\xi+1}{\xi}} + \alpha_m l_c^{\frac{\xi+1}{\xi}}\right)^{\frac{\xi}{\xi+1}}
\end{aligned}
$$

Quantification

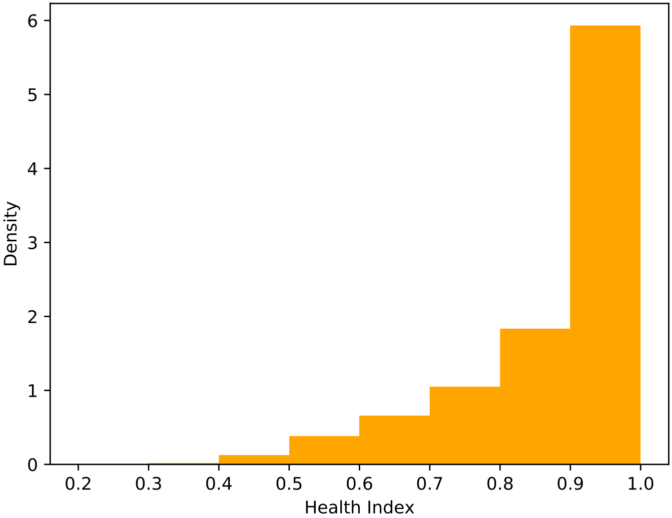
Data From Medical Expenditure Panel Survey

- Medical Expenditure Panel Survey (MEPS) provides data on
  - Detailed individual health status
  - Health insurance coverage
  - Healthcare expenditure paid OOP and **paid** by insurance
    - Collected from medical provider component
    - $\Rightarrow$ **Actual**, not "guessed", expenditure and coverage
  - Panel structure $\Rightarrow$ Observe outcomes (e.g. hospitalization, mortality)
- Separate spending into emergency and non-emergency

How to Measure Health?

- Following Hosseini et al. (2021), use **frailty index**
- Have battery of varied health questions
  - Diagnoses: "Have you ever been diagnosed with diabetes?"
  - Self-reported: "Do you have difficulty lifting 10 pounds?"
  - Activities of Daily Living: "Do you need help using the telephone?"
  - Objective measures: BMI, K6 score
- Intuition: sum up number of "Yes"'s and normalize so that $f_i \in (0, 1)$
- Health index $h_i = 1 - f_i$
  - $h_i = 1$: Maximally healthy, no health deficits
  - $h_i = 0$: Minimally healthy

Distribution of Measured Health



Model Estimation

- Parameters fall broadly into 3 categories

  1. Health parameters estimated using SMM
  2. Directly estimated health parameters
  3. Standard macro parameters

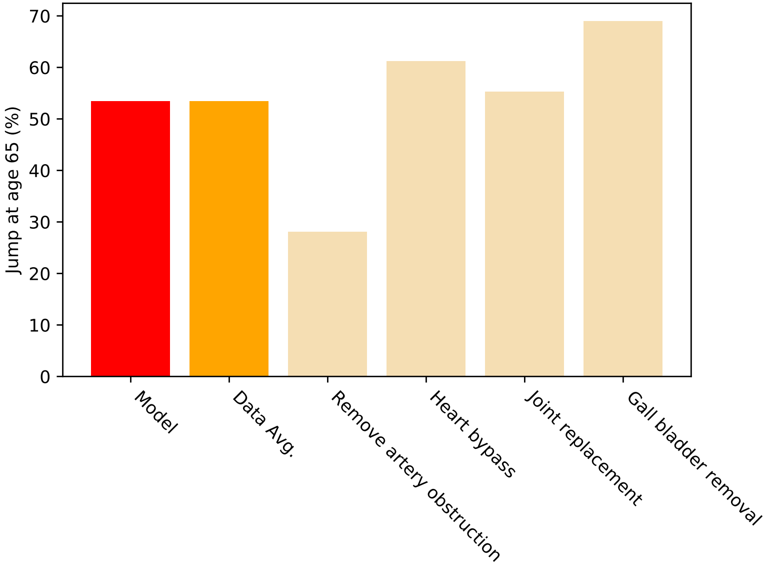
Two Key Parameters for Delayed Care

- Returns to scale parameter for health investment ψ
  - Governs intertemporal substitution of healthcare
- Productivity of health investment $\phi_a = \phi_0 + \phi_1 a$
  - Level parameter ϕ_0 determines overall importance of health spending
- Discipline using two quasi-experiments from health economics literature

Card, Dobkin, and Maestas (2008)

- Estimate jumps in various healthcare outcomes at age 65 using RDD framework
- Use hospital admin data to estimate increase in utilization of various procedures
- 54% increase in average utilization
- Observed jump disciplines returns to scale ψ

Jump in Expenditure at Age 65: Model and Data



Miller, Johnson, and Wherry (2021)

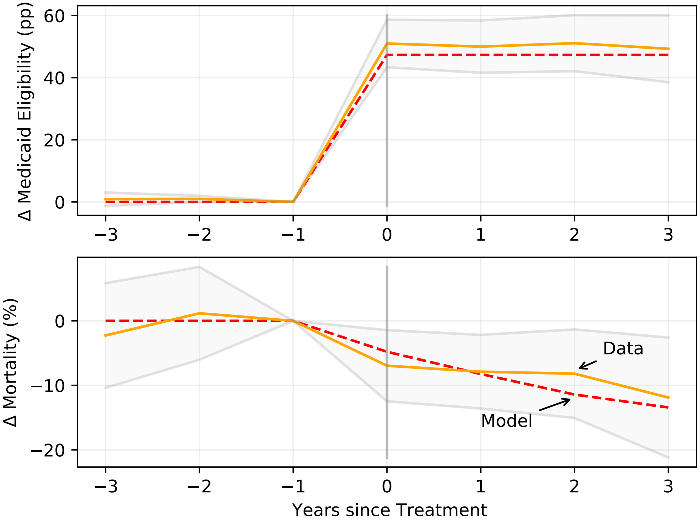
- Use state-level Diff-in-Diff to estimate impact of Medicaid expansion on mortality of low income adults ages 55-64
- Mortality measured using Social Security admin data
- 9.4% decline in mortality
- Decline disciplines productivity of health spending ϕ_0

Replicating MJW (2021) in Model

1. Calculate pre-expansion steady-state with eligibility cutoff $\bar{z}_{\text{PRE}}$
2. Select sample of adults age 55-64 with productivity less than $\bar{z}_{\text{POST}}$
   - Sample is measure 0
3. Simulate outcomes in (a) world where cutoff remains $\bar{z}_{\text{PRE}}$ and (b) changes to $\bar{z}_{\text{POST}}$
4. The model DiD estimator can be calculated as (b) - (a)

- Choose $\bar{z}_{\text{PRE}}$ and $\bar{z}_{\text{POST}}$ to match
  - estimated change in eligibility
  - post-expansion income cutoff of 138% of FPL

Decline in Morality due to Expansion: Model and Data



Estimating Other Health Parameters

- Market-based insurance plan parameters from data
- Government-provided insurance plan parameters from administrative numbers
- Mortality risk $\pi(h, a)$ estimated using logit regression
- Emergency risk $\pi_x(h, a)$ and expenditure mean $\mu(h, a)$/variance $\sigma(h, a)$ directly from data

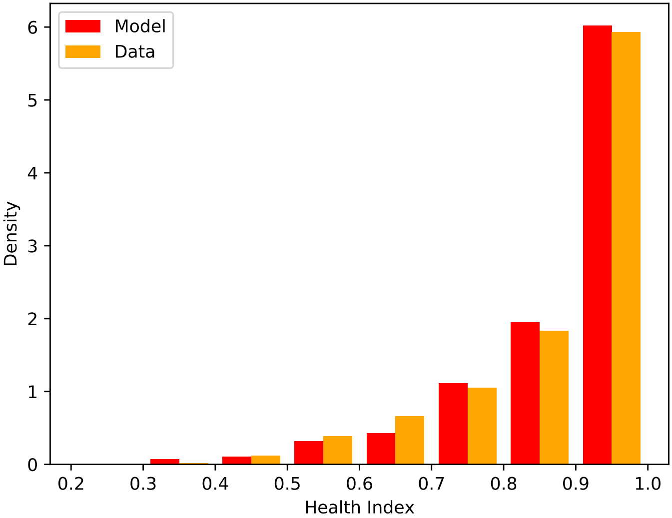
Standard Macro Parameters

Description	Parameter	Value
(Effective) Discount Factor	$\beta\pi(a, h)$	0.96
CRRA	σ	2
Frisch Elasticity of Labor	ν	1
Disutility of Labor	κ	0.15
Income Persistence	ρ	.91
Income SD	σ	.04
Life-cycle Income	$g(a)$	Lagakos et al. (2018)
Labor Share	α	0.66
Tax Function	$T(y)$	$\lambda_\tau y^{1-\tau}$
Tax Progressivity	τ	0.181
Tax Level	λ_τ	0.73
Social Security Function	$y_{a\geq 65}(z_p)$	Statutory

Moments Targeted by SMM

Moment	Model	Data	Source
Avg. VSL of Medicaid Recipient	\$2 million	\$2.25 million	
Jump in Medical Exp. at 65	Discussed Previously		
Mortality Response to Medicaid	Discussed Previously		
Mean of Health Spending	\$6,220	\$6,086	MEPS
SD of Health Spending	\$4,359	\$10,047	MEPS
Avg. Health	0.886	0.877	MEPS
cov(Health, Age)	-1.11	-1.21	MEPS
Emerg. vs Non-Emerg Health	-0.045	-0.090	MEPS

Model Validation: Distribution of Health in Data and Model

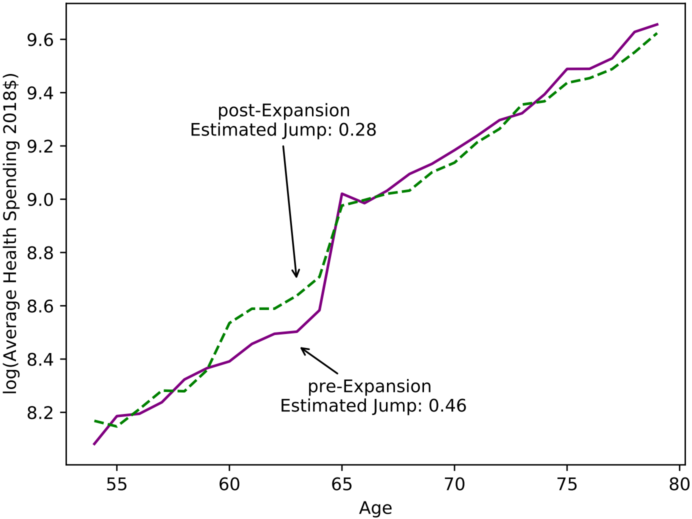


Quantitative Results

Main Quantitative Experiment: Medicaid Expansion

- Increase Medicaid eligibility cutoff from $\bar{z}_{\text{PRE}}$ to $\bar{z}_{\text{POST}}$
  - Same $\bar{z}_{\text{PRE}}$ and $\bar{z}_{\text{POST}}$ as Miller et al. Diff-in-Diff
  - Effectively simulating Medicaid expansion portion of ACA
- Expansion funded by adjusting tax **level** $\lambda_{\tau,t}$ each period

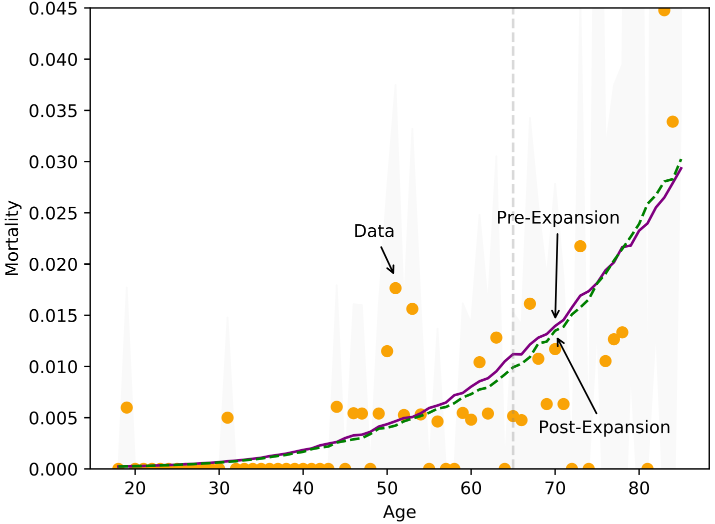
log(Healthcare Expenditure) by Age in Model



Expansion Successfully Reduces Delayed Care

- RDD-estimated jump in health expenditure at age 65 shrinks from 46% to 28%
- Spending for younger-than-65 increases
  - +2.9% for individuals between 18 and 60
  - +13.0% for individuals between 60 and 64
- Spending for older-than-65 decreases by 2.7%

Expansion Successfully Reduces Mortality



How Much Does Expansion Reduce Medicare Costs?

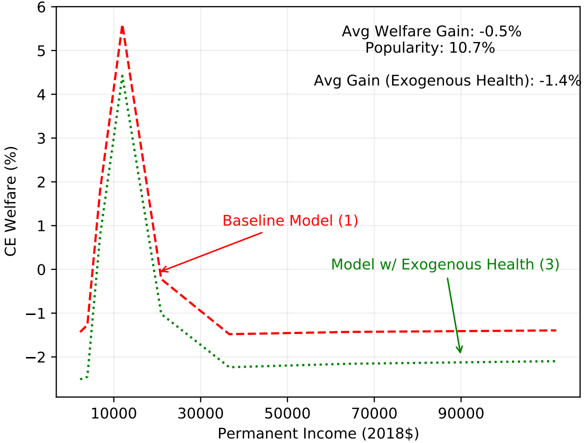
- For every \$100 spent on expansion, Medicare costs fall by \$49.63
  - Expansion increase Medicaid outlays by 1.37% of GDP
  - Reduces Medicare outlays by 0.68% of GDP
  - Taxes increase by 0.40% of GDP

Contribution of the Two Channels

Variable	(1) Post-Expansion	(2) Exo. π	(3) Exo. i
Medicaid Coverage (% Population)	+15.7%	+12.3%	+15.7%
Medicare Savings per $100 Spent	$49.63	$56.93	$0
Total Medicaid Spending (% of GDP)	+1.37%	+1.37%	+1.29%
Total Medicare Spending (% of GDP)	−0.68%	−0.78%	−0.00%
Total Tax Receipts (% of GDP)	+0.40%	+1.04%	+1.13%

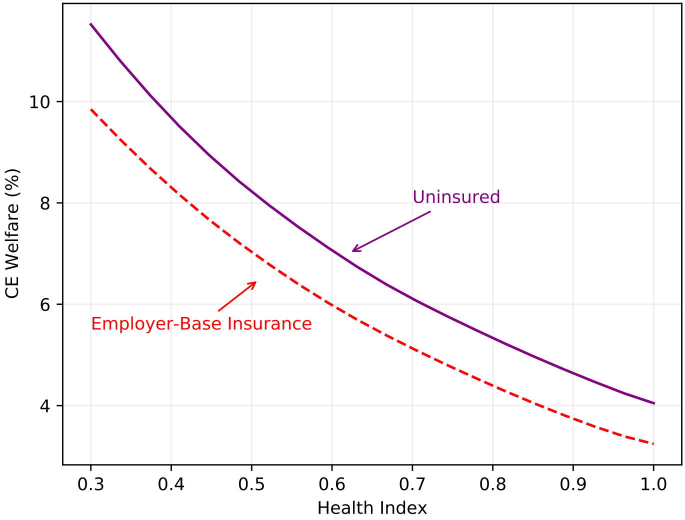
- Early care channel: $56.93 savings for every $100 spent
- Mortality channel: $7.30 increase in costs for every $100 spent

CE Welfare Gain as a Function of Permanent Income



- Losses twice as large without delayed care channels

CE Welfare Gains as a Function of Ex-Post Age 40 Health



Conclusion

- Delayed care represents large potential cost savings
- Public health insurance expansion can reduce delayed care and save money
  - For every $100 spent on Medicaid expansion, Medicare costs fall by $49
- Substantial impact on welfare
  - Those who lose would lose twice as much without delayed care channels