Empirical Evidence – The Demand for Medical Care

Bill Evans Health Economics Fall 2020 Estimating the elasticity demand for medical care

- Key parameter in the previous discussion is the elasticity of demand for medical care
- Empirical question
- How does one go about estimating a model with real world data?

Typical study

- Variation across people in the price they pay for medical care (coinsurance)
- Determined by
 - Deductible
 - Stop loss
 - Coverage
- Comparison is between people with more or less generous health insurance

 $Y_i = \alpha + x_i \delta + COINSURE_i \beta + \varepsilon_i$

 Y_i = spending on medical care

 $x_i = controls$

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 $COINSURE_i = coinsurance \ rate$

think of this as the price of medical care

We anticipate $\hat{\beta} < 0$

 $\hat{\beta}$ unbiased is $E[\varepsilon_i | x_i, COINSURE_i] = 0$



Uninsı	irance	e Rates, 2018	
Ages 15-64	10.6%	By family income, all ag	jes
By Education, 26-64		<\$25K	13.8%
< HS	26.8%	≥\$25K, <\$50K	12.3%
HS grad	14.0%	≥\$50K, <\$75K	10.7%
Some college	10.1%	≥\$75K, <\$100K	7.1%
College	5.6%	≥\$100K, <\$125K	5.6%
Grad degree	2.7%	≥\$125K, <\$150K	4.9%
		≥\$150K	3.2%
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Insurance Stat	us and self reported l 2013-2015 NHIS	nealth status	
Status	% of sample	% w/ Health Insurance	
Poor	4.0%	86.4%	
Fair	11.5%	83.2%	
Good	28.0%	84.1%	
Very Good	32.4%	89.2%	
Excellent	24.2%	90.4%	

RAND Health Ins. Experiment

- 2000 families
- Four sites
 - Dayton, Seattle, MA, SC
- Four coinsurance rates - 0, 25, 50 and 95%
- Also HMO comparison w/ 0% coinsurance
- Various 'caps' on 'maximum dollar expenditures'
 Did not want families to go bankrupt in the experiment

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- · Covered most services w/ some exceptions
- Enrolled for 3-5 years
- Non-Medicare (<63) eligible
- Participants given cash subsidy to enroll
 - Maximum expected loss from participating
 - Less likely to enroll if the already had insurance
 - Goal: enrolling should make them no worse off
- · Claims filed with experiment



А	nnual	Per Cap	oita Mo	edical	Use
Plan	Visits	Outpat. \$	Hosp Admits	Hosp \$	Total \$
Free	4.55	\$630	0.128	\$769	\$1410
25%	3.33	\$489	0.105	\$701	\$1160
50%	3.03	\$421	0.092	\$846	\$1078
95%	2.73	\$382	0.099	\$592	\$1016
Real 2	005 dollars				14



Look at moving from 25% to 95% coinsurance rate. P₂ is 0.95 and P₁ is 0.25
Visits fall from 3.33 to 2.73
ξ = [(2.73 - 3.33)/(2.73+3.33)] /[(0.95-0.25)/(0.95+0.25)] = -0.17



	Individuals	Average out-of-pocket	Share refusing	Share	Share refusing
Plan	(families)	share ^c	enrollment	attriting	or attriting
Free Care	1,894 (626)	0%	6%	5%	12%
25% Coinsurance	647 (224)	23%	20%	6%	26%
Mixed Coinsurance ^a	490 (172)	28%	19%	9%	26%
50% Coinsurance	383 (130)	44%	17%	4%	21%
Individual Deductible ^b	1,276 (451)	59%	18%	13%	28%
95% Coinsurance	1,121 (382)	76%	24%	17%	37%
All plans	5,811 (1,985)	34%	16%	10%	24%
p-value, all plans equal			< 0.0001	< 0.0001	< 0.0001
p-value, Free Care vs. 95%			< 0.0001	< 0.0001	< 0.0001
p-value, Free Care vs. 25%			0.0001	0.5590	0.0001
p-value, 25% vs. 95%			0.4100	0.0003	0.0136





	MEPS	Rand HIE
Spending	2017	2017\$
Category	18-64	Free Care
Avg. spending	\$4,714	\$1922
Inpatient	\$1,034	\$925
% with inpatient	5.4%	10.3%
Rx	\$1,222	\$139
% RX	58.5%	7.5%
Outpatient	\$469	\$858

Oregon HEI

Oregon Medicaid Lottery

- OHP Plus
 - Serves traditional Medicaid patients
 - Low income pregnant women and children, disabled, families on welfare
- OHP Standard
 - Adults aged 19-64 low income but not eligible for public insurance
 - Uninsured > 6 months (why)
 - Low assets

OHP Standard

- Comprehensive benefits with low cost sharing - Everything but vision and non-emergency dental
- Care provided by managed care groups
- Annual spending/year is \$3000
- Premiums based on income with many paying nothing

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OHP Standard

- Peak enrollment was 100K in 2002
- Stopped taking new enrollees in 2004 due to budget
- By 2008, attrition reduced plan to 19K
- State had money to enroll an additional 10K
- Expected high demand (90K applied)
- Used lottery to determine access

OHP Standard

- \sim 36K were selected in the lottery
- 10K were eligible
 - 60% did not return forms
 - Rest had quarterly income that was too high
- If enrolled, stayed in program indefinitely

 Need to re-certify every 6 month

Data

- Demographic and income data
 From application
- Administrative
 - Measures hospital discharge
 - Rare (<5%) but 25% of costs
- Credit reports
 - Able to match 68.5%

Data

- Survey data
 - Measures dr. visits and health outcomes
 - Only 50% response rate
 - 16 months after notice and 13 months after entry

Demograph	TABL IC CHARACTERISTICS OF ST	E I	
		UDY POPULATION (CONTROL GROUP)	
Variable	Control mean	Variable	Control mea
Panel A: Full sample			
Sex		Language	
% Female	0.557	% English preferred	0.922
Age		ZIP code-level variables	
% 50-64	0.267	% MSA	0.773
% 20-50	0.733	ZIP code median household income	\$39,265
Panel B: Survey responders only			
Lottery list variables			
Sex		Language	
% Female	0.591	% English preferred	0.917
Age		ZIP code–level variables	
% 50-64	0.316	% MSA	0.751
% 20-50	0.684	ZIP code median household income	\$39,225
12-month mail survey variables			
Race		Health status	
% White	0.820	Ever diagnosed with:	
% Black	0.038	Diabetes	0.175
		Asthma	0.276
		High blood pressure	0.399
Ethnicity		Emphysema or chronic bronchitis	0.129
			0.557

	TABL	E I	
ariable	Control mean	Variable	Control mea
Education		Income (% federal poverty line)	
% Less than high school	0.177	<50%	0.406
% High school disploma or GED	0.491	50-75%	0.138
% Vocational training or 2-year degree	0.220	75-100%	0.140
% 4-year college degree or more	0.112	100-150%	0.177
		Above 150%	0.139
Employment			
% don't currently work	0.551	Insurance coverage	
% work <20 hours per week	0.090	Any insurance?	0.325
% work 20–29 hours per week	0.099	OHP/Medicaid	0.117
% work 30+ hrs per week	0.259	Private insurance	0.128
		Other	0.102
Average household income (2008) \$	13,035	# of months of last six with insurance	1.738

	TABLE II Treatment: Contro	l Balance		
	Control mean (std. dev.)	Diffe	rence between treatmen	it and control
	for full sample (1)	Full sample (2)	Credit report subsample (3)	Survey respondent subsample (4)
Panel A: Match/response rates Matched in September 2009 credit data	0.663 (0.473)		-0.0043 (0.0037)	
Responded to survey	0.506 (0.500)		[0.247]	-0.016 (0.0066)
Response time (in days)	53.0 (57.8)			1.638 (1.088)
Panel B: Prerandomization characteristics Lottery list variables F-statistic		1.286	0.553	0.574
[p-value] Pre-randomization outcomes		[0.239]	[0.836]	[0.820]
F-statistic [p-value] Both of the above		0.543 [0.844]	0.921 [0.518]	1.266 [0.281]
F-statistic [p-value] N		0.915 [0.56] 74,922	0.793 [0.726] 49,980	0.782 [0.680] 23,741



	Control mean (1)	ITT (2)	LATE (3)	p-values (4)
Panel A: Extensive margin				
All hospital admissions	0.067 (0.250)	0.0054 (0.0019)	0.021 (0.0074)	[0.004]
Admissions through ER	0.048 (0.214)	0.0018 (0.0016)	0.0070 (0.0062)	[0.265]
Admissions not through ER	0.029 (0.167)	0.0041 (0.0013)	0.016 (0.0051)	[0.002]
Panel B: All hospital admissions				
Days	0.498 (3.795)	0.026 (0.027)	0.101 (0.104)	[0.329] {0.328}
List charges	2,613 (19,942)	258 (146)	1,009 (569)	[0.077] {0.106}
Procedures	0.155 (1.08)	0.018 (0.0083)	0.070 (0.032)	[0.031] {0.059}
Standardized treatment effect		0.012 (0.0067)	0.047 (0.026)	[0.073]
$\pi_1 = \partial \text{Use} / \partial \text{Lottery} =$	0.0054			
$\theta_1 = \partial Medicaid / \partial Lott$	ery =0.	256		

	Health C/	TABLI ARE UTILIZAT	E V 10n (Surve	ey Data)				
		Extensive	margin (ar	ny)	т	otal utiliza	ation (num	ber)
	Control mean (1)	ITT (2)	LATE (3)	p-values (4)	Control mean (5)	ITT (6)	LATE (7)	p-values (8)
Prescription drugs currently Outpatient visits last six months	0.637 (0.481) 0.574	0.025 (0.0083) 0.062	0.088 (0.029) 0.212	[0.002] {0.005} [<0.0001]	2.318 (2.878) 1.914	0.100 (0.051) 0.314	0.347 (0.176) 1.083	[0.049] {0.137} [<0.0001]
ER visits last six months	(0.494) 0.261 (0.439)	(0.0074) 0.0065 (0.0067)	(0.025) 0.022 (0.023)	{<0.0001} [0.335] {0.547}	(3.087) 0.47 (1.037)	(0.054) 0.0074 (0.016)	(0.182) 0.026 (0.056)	{<0.0001} [0.645] {0.643}
LATE for outpa	itient ((total u	ıse)					
$\pi_1 = \partial Use / \partial Lott$	ery =	0.314						
$\theta_1 = \partial Medicaid / \theta_1$	∂Lotte	ery =0	.290					
$\beta_1 = \pi_1/\theta_1 = 0.314$	4/0.29	0 = 1.	083					34

Comparison w. RAND (Inpatient)

- P₂=0, P₁=1, so (P₂-P₁)/(P₂+P₁)=-1
- Arc $\xi_d = \Delta Q / (Q_2 + Q_1) / (-1)$
 - $-\Delta Q$ is LATE
 - Q_1 is without insurance $Q_2 = Q_1 + \Delta Q$
- Hospital
 - $Q_1 = 0.067$
 - $-\Delta Q = 0.021$

 - $\begin{array}{l} \ Q_2 = 0.067 + 0.021 = 0.088 \\ \ \xi_d = \Delta Q / (Q_2 + Q_1) = -0.021 / (0.088 + 0.067) = -0.135 \end{array}$

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- RAND HIE was -0.14

Comparison w. RAND (MD visits)

- $P_2=0, P_1=1, \text{ so } (P_2-P_1)/(P_2+P_1)=-1$
- Arc $\xi_d = \Delta Q / (Q_2 + Q_1) / (-1)$ $-\Delta Q$ is LATE $-Q_1$ is without insurance $-Q_2 = Q_1 + \Delta Q$

		Control mean (1)	ITT (2)	LATE (3)	p-values (4)
Blood cholesterol checked (ever)		0.625	0.033	0.114	[<0.0001]
Blood tested for high blood sugar/o	liabetes (ever)	(0.484) 0.604 (0.489)	(0.0074) 0.026 (0.0074)	(0.026) 0.090 (0.026)	{<0.0001 [0.0004] {<0.0001
Mammogram within last 12 month	as (women ≥ 40)	0.298 (0.457)	0.055	0.187	[<0.0001]
Pap test within last 12 months (w	omen)	0.406	0.051	0.183	[<0.0001]
Standardized treatment effect		(0.431)	0.087 (0.012)	0.300 (0.041)	[<0.0001]

TABL	EIX				
ПКА	LTH				
	Control				
	mean (1)	1TT (2)	LATE (3)	p-value (4)	
Panel A: Administrative data	(1)	(-)	(6)		
Alive	0.992	0.00032	0.0013	[0.638	
	(0.092)	(0.00068)	(0.0027)		
Panel B: Survey data					
Self-reported health good/very good/excellent (not fair or poor)	0.548	0.039	0.133	[<0.000	
	(0.498)	(0.0076)	(0.026)	{<0.000	
Self-reported health not poor (fair, good, very good, or	0.86	0.029	0.099	[<0.000	
excellent)	(0.347)	(0.0051)	(0.018)	{<0.000	
Health about the same or gotten better over last six months	0.714	0.033	0.113	[<0.000	
	(0.452)	(0.0067)	(0.023)	{<0.000	
# of days physical health good, past 30 days*	21.862	0.381	1.317	[0.019	
	(10.384)	(0.162)	(0.563)	{0.018	
# days poor physical or mental health did not impair usual	20.329	0.459	1.585	[0.009	
activity past 20 days	(10.939)	(0.175)	(0.606)	{0.01	

	Control			
	mean (1)	ITT (2)	LATE (3)	p-values (4)
Panel A: Overall				
Any bankruptcy	0.014 (0.119)	0.0022 (0.0014)	0.0086 (0.0053)	[0.106] {0.358}
Any lien	0.021 (0.144)	0.0012 (0.0014)	0.0047 (0.0056)	[0.406] {0.698}
Any judgment	0.064 (0.244)	0.0014 (0.0024)	0.0054 (0.010)	[0.573] {0.698}
Any collection	0.500 (0.500)	-0.012 (0.0041)	-0.048 (0.016)	[0.003] {0.013}
Any delinquency (credit accounts)	0.366 (0.482)	0.0016 (0.0042)	0.0063 (0.017)	[0.704] {0.698}
Standardized treatment effect		0.0022 (0.0049)	0.0086 (0.019)	[0.653]
Panel B: Medical debt				
Any medical collection	0.281 (0.449)	-0.016 (0.0040)	-0.064 (0.016)	[<0.0001] {<0.0001}
Amount owed in medical collections	1,999 (6733)	-99 (45)	-390 (177)	[0.028] {0.025}
Standardized treatment effect		-0.026 (0.0061)	-0.100 (0.024)	[<0.0001]

Impact of Oregon on Clinical Outcomes

- 2nd year followup of the Oregon experiment
- Participants Interviewed from 9/09 to 10/10
 - 25 months after the lottery
 - Survey data on health status
 - Anthropomorphic data
 - Blood spots
 - Short form depression survey

Risky levels for biomarkers

- High total cholesterol, ≥240 mg/dl
- Low HDL, <40 mg/dl
- High glycated hemoglobin, $\geq 6.4\%$
- High systolic, \geq 140 mm Hg
- High diastolic, $\geq 90 \text{ mm Hg}$

Characteristic	Controls	Lottery Winners (N = 6387)*	P Value
characteristic	(11-3012) ner	cent	, vulue
Female sex	56.9	56.4	0.60
Age group‡			
19–34 yr	36.0	35.1	0.38
35—49 yr	36.4	36.6	0.87
50–64 yr	27.6	28.3	0.43
Race or ethnic group∫			
Non-Hispanic			
White	68.8	69.2	0.68
Black	10.5	10.6	0.82
Other	14.8	14.8	0.97
Hispanic	17.2	17.0	0.82
Interview conducted in English	88.2	88.5	0.74

Variable	Mean Value in Control Group	Change with Medicaid Coverage (95% CI)†	P Value
Blood pressure			
Systolic (mm Hg)	119.3±16.9	-0.52 (-2.97 to 1.93)	0.68
Diastolic (mm Hg)	76.0±12.1	-0.81 (-2.65 to 1.04)	0.39
Elevated (%):	16.3	-1.33 (-7.16 to 4.49)	0.65
Hypertension			
Diagnosis after lottery (%)∬¶	5.6	1.76 (-1.89 to 5.40)	0.34
Current use of medication for hypertension (%)§	13.9	0.66 (-4.48 to 5.80)	0.80
Cholesterol**			
Total level (mg/dl)	204.1±34.0	2.20 (-3.44 to 7.84)	0.45
High total level (%)	14.1	-2.43 (-7.75 to 2.89)	0.37
HDL level (mg/dl)	47.6±13.1	0.83 (-1.31 to 2.98)	0.45
Low HDL level (%)	28.0	-2.82 (-10.28 to 4.64)	0.46

Table 2. Mean Values and Absolute Change in Clinical Measures	s and Health Outco	omes with Medicaid Cover	age.*
Variable	Mean Value in Control Group	Change with Medicaid Coverage (95% CI)†	P Value
Hypercholesterolemia			
Diagnosis after lottery (%)∬¶	6.1	2.39 (-1.52 to 6.29)	0.23
Current use of medication for high cholesterol level (%)§	8.5	3.80 (-0.75 to 8.35)	0.10
Glycated hemoglobin			
Level (%)	5.3±0.6	0.01 (-0.09 to 0.11)	0.82
Level ≥6.5% (%)††	5.1	-0.93 (-4.44 to 2.59)	0.61
Diabetes			
Diagnosis after lottery (%)§¶	1.1	3.83 (1.93 to 5.73)	< 0.001
Current use of medication for diabetes (%)§	6.4	5.43 (1.39 to 9.48)	0.008
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Table 3. Mean values and Absolute Change in Heal	th-Related Quality of Life a	and Happiness with Medicaid	Coverage.*
Variable	Mean Value in Control Group	Change with Medicaid Coverage (95% CI)†	P Value
Health-related quality of life			
Health same or better vs. 1 yr earlier (%)	80.4	7.84 (1.45 to 14.23)	0.02
SF-8 subscale‡			
Mental-component score	44.4±11.4	1.95 (0.03 to 3.88)	0.05
Physical-component score	45.5±10.5	1.20 (-0.54 to 2.93)	0.18
No pain or very mild pain (%)	56.4	1.16 (-6.94 to 9.26)	0.78
Very happy or pretty happy (%)	74.9	1.18 (-5.85 to 8.21)	0.74

Table 4. Mean Values and Absolute Change in Financial Hardship with Medicaid Coverage.*

Variable	Mean Value in Control Group	Change with Medicaid Coverage (95% CI)†	P Value
Any out-of-pocket spending (%)	58.8	-15.30 (-23.28 to -7.32)	<0.001
Amount of out-of-pocket spending (\$)	552.8±1219.5	-215.35 (-408.75 to -21.95)	0.03
Catastrophic expenditures (%)‡	5.5	-4.48 (-8.26 to -0.69)	0.02
Any medical debt (%)	56.8	-13.28 (-21.59 to -4.96)	0.002
Borrowed money to pay bills or skipped payment (%)	24.4	-14.22 (-21.02 to -7.43)	<0.001

Fable 5. Mean Values and Absolute Change in Health Care Utilization and Spending, Preventive Care, Access to and Quality of Care, and Smoking and Obesity with Medicaid Coverage. ^e			s
Variable	Mean Value in Control Group	Change with Medicaid Coverage (95% CI)†	P Value
Utilization (no. of visits or medications)			
Current prescription drugs	1.8±2.8	0.66 (0.21 to 1.11)	0.004
Office visits in past 12 mo	5.5±11.6	2.70 (0.91 to 4.49)	0.003
Outpatient surgery in past 12 mo	0.1±0.4	0.03 (-0.03 to 0.09)	0.28
Emergency department visits in past 12 mo	1.0±2.0	0.09 (-0.23 to 0.42)	0.57
Hospital admissions in past 12 mo	0.2±0.6	0.07 (-0.03 to 0.17)	0.17
Estimate of annual health care spending (\$)‡	3,257.3	1,171.63 (199.35 to 2,143.91)	0.018
Preventive care in past 12 mo (%)			
Cholesterol-level screening	27.2	14.57 (7.09 to 22.04)	<0.001
Fecal occult-blood test in persons ≥50 yr	19.1	1.26 (-9.44 to 11.96)	0.82
Colonoscopy in persons ≥50 yr	10.4	4.19 (-4.25 to 12.62)	0.33
Flu shot in persons ≥50 yr	35.5	-5.74 (-19.31 to 7.83)	0.41
Papanicolaou smear in women	44.9	14.44 (2.64 to 26.24)	0.016
Mammography in women ≥50 yr	28.9	29.67 (11.96 to 47.37)	0.001
PSA test in men ≥50 yr	21.4	19.18 (1.14 to 37.21)	0.037
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Variable	Mean Value in Control Group	Change with Medicaid Coverage (95% CI)†	P Value
Perceived access to and quality of care (%)			
Had a usual place of care	46.1	23.75 (15.44 to 32.06)	< 0.001
Received all needed care in past 12 mo	61.0	11.43 (3.62 to 19.24)	0.004
Care was of high quality, if received, in past 12 mo	78.4	9.85 (2.71 to 17.00)	0.007
Smoking status and obesity (%)			
Current smoker	42.8	5.58 (-2.54 to 13.70)	0.18
Obese	41.5	0.39 (-7.89 to 8.67)	0.93
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Medicare

• Part A

- Hospital care
- Mandatory
- Part B
 - Ambulatory visits
 - Voluntary (although nearly all sign up)
- Part D
 - Prescription drugs
 - voluntary

Out of pocket costs in Medicare

- Part A
 - Each hospital stay, \$1,156 deductible
 - Hospital stays > 60 days (\$289 OOP/day 61-90, \$578 OOP/day 91-150, all costs >151 days)
 - Home health care, 20% coinsurance
- Part B
 - Monthly premium of \$99.9
 - \$140 annual deductible
 - 20% coinsurance on MD visits

Retiree health plans

- · Were covered by employer when working
- Many cases, when you retire, firm continues to provide health insurance
- Once turn age 65, Medicare picks up almost all costs
- Retiree plans then pay the "gaps" in Medicare coverage (deductibles, coinsurance, copays)

CalPERS

- CA Public Employees Retirement System
 - 1.2 million employees and families
 - 3rd largest insurance plan in nation
- Retirees, provides gap coverage in Medicare
- Two plans
- HMO

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- PPO
- Early 2000s, mounting fiscal concerns
- Instituted copays in plans



Model

$$UTIL_{pt} = \alpha + \beta HIPAY_{pt} + \delta_p + \lambda_t + \varepsilon_{pt},$$

- p measures plan, t is month
- UTIL is measure of utilization
- Δ and λ are plan and time effects
- HIPAY =1 for high copay, =0 otherwise
- Standard difference-in-difference model

Independent variable		(Interfort of o	Utilization office visits per member per month)	
	(1)	(2)	(3)	(4)
HIPAY	\$10.06** (0.05)	-0.132** (0.018)		-0.095** (0.012)
HIPAY _{t-4}			0.016 (0.018)	
HIPAY _{t-3}			0.0002 (0.016)	
$HIPAY_{t-1}$			0.130** (0.016)	
HIPAY			-0.036** (0.016)	
HIPAY _{t+1}			-0.094** (0.016)	
HIPAY _{t+2}			-0.071** (0.016)	
HIPAY _{t+3}			-0.082** (0.021)	
HIPAY _{t+4}			-0.101** (0.016)	
HIPAY ₁₊₅			-0.113** (0.016)	
$HIPAY_{t+6}$			-0.029** (0.016)	









	2002 Policy change			
	(1) Office visit payments (Dollars)	(2) Drug payments (Dollars)	(3) Hospital payments (Dollars)	(4) Offset (Percent)
All sources	-13.16** (1.18)	-23.06** (1.85)	7.23** (2.60)	20.0
Medicare	-10.53** (0.95)	_	5.58 ⁴⁰⁴ (2.25)	53.0
Supplemental insurance	-11.24 (0.26)	-29.20** (1.67)	1.49** (0.38)	3.7
Ν	104	100	104	