Do Hospital-Owned Skilled Nursing Facilities Provide Better Post-Acute Care Quality?

Momotazur Rahman
Brown University

Edward C. Norton
University of Michigan and NBER

David C. Grabowski
Harvard University

Background

NH market has two distinct patient populations

- Chronically ill, long-stay residents, financed by Medicaid and private payments
  - Asset and income tests to qualify for Medicaid
  - Private is largely out-of-pocket; little LTC insurance

- Post-acute, short-stay residents financed by Medicare
  - Medicare requires prequalifying 3-day hospital stay
  - 100-day benefit (avg SNF payment = $411/day), patient cost sharing ($157.50/day) begins at day 20

Medicare & SNF

- In 1981, Medicare accounted for 1.6% of NH expenditures, by 2013, this had increased to 22.2%

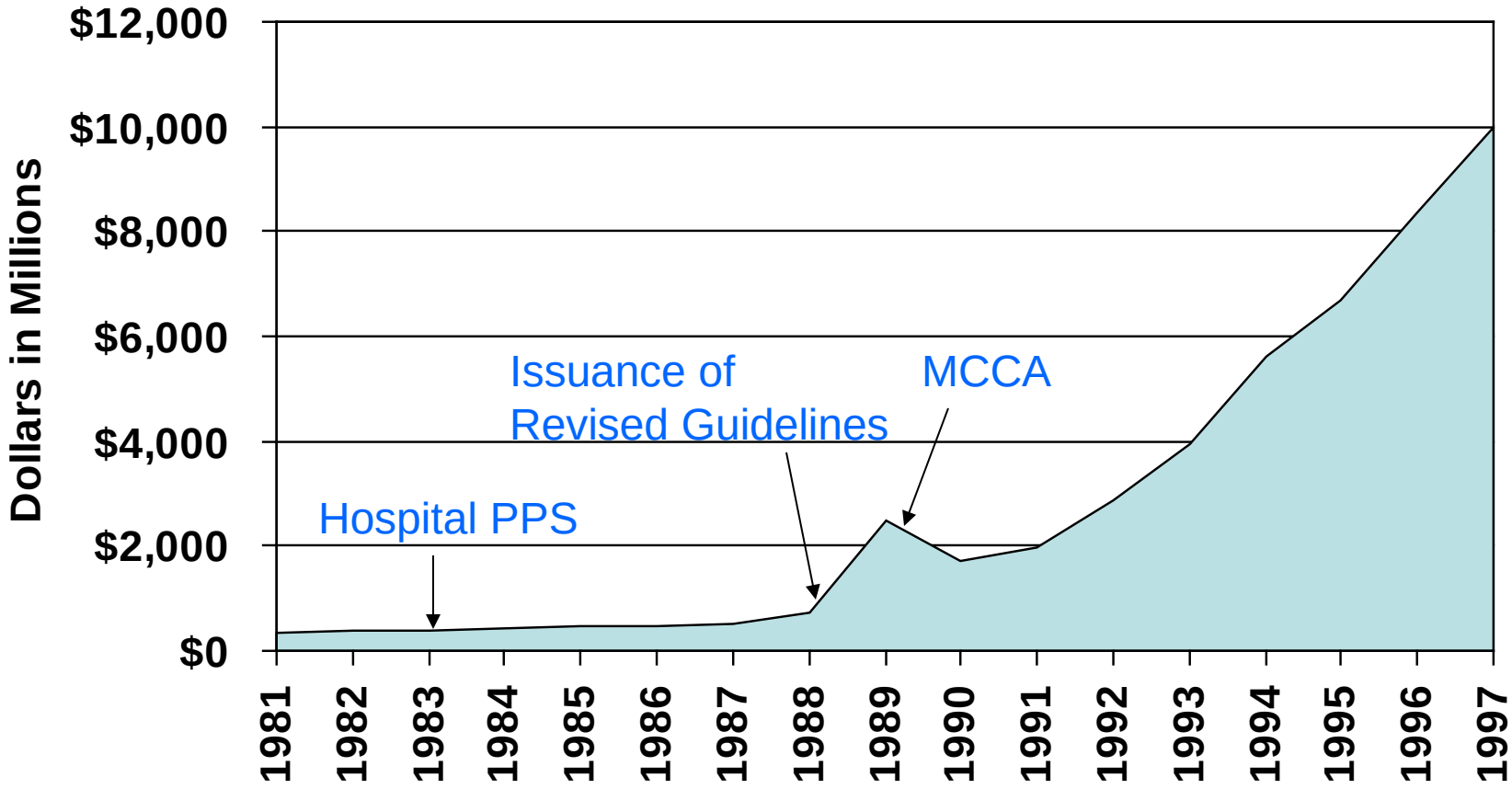
- How did we get here? Four eras
  1. Era 1: Pre Hospital PPS
  2. Era 2: Hospital PPS
  3. Era 3: SNF PPS
  4. Era 4: ACA payment reforms…

Era 1: Pre Hospital PPS

- In the 1970s and early 1980s, Medicare SNF was an underused benefit (Scanlon and Feder 1982)
- SNFs paid based on routine, ancillary, and capital cost centers
- Medicare hospital PPS adopted in 1983, which led to patients being discharged “sicker and quicker”
- CMS’ stringent interpretation of coverage/eligibility criteria held SNF market growth in check

- Late 1980s, these guidelines were relaxed

Medicare SNF Expenditures, 1981-97



Era 2: SNF Growth in 1990s

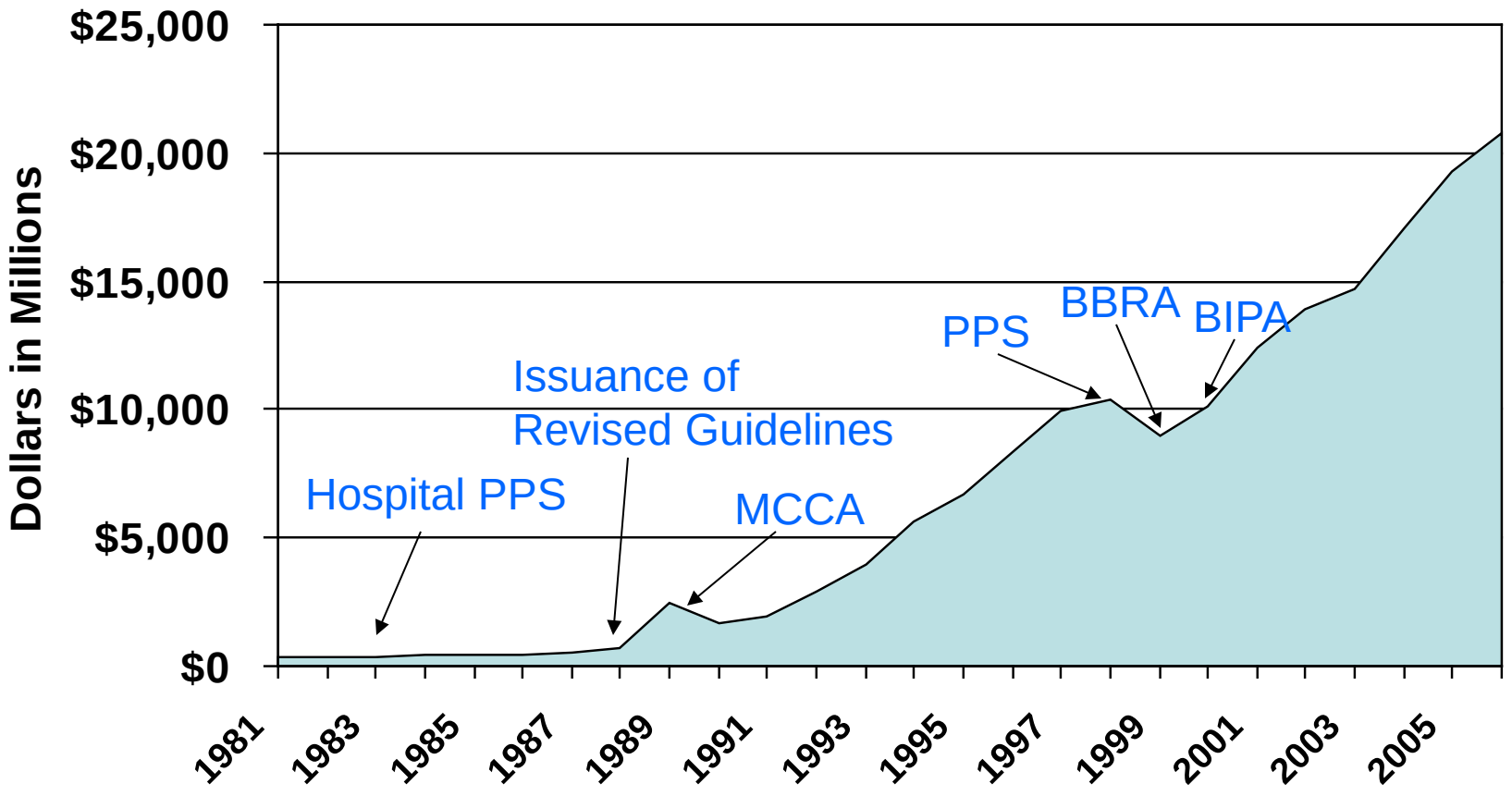
- Freestanding SNF sector expanded, hospital-based SNF sector exploded
- By 1998, ~2,200 (14%) HB-SNFs nationwide
- Cost-based payment and higher capital costs led to costs being twice as high in HB-SNFs (Wiener et al., 1986)
- Hospitals could also siphon off best patients for rehabilitation

Era 3: Medicare SNF PPS

Medicare adopted a **per diem** prospective payment system (PPS) on July 1, 1998

- Resource Utilization Groups (RUGS-III) places residents into 44 payment categories
- Adjusted for geographic (area wages, non-labor) factors
- Unfavorable for hospital-based SNFs, it leveled payments across all SNFs, leading to closures. Today, there are ~800 (5%) HB-SNFs in operation.

Medicare SNF Expenditures, 1981-2006



SNF PPS constrained HB-SNFs but other issues persist...

- Hospital readmissions
- High mortality
- Frequent transfers to long-stay NH status
- Spending variation across areas (IOM)
- Spending growth…

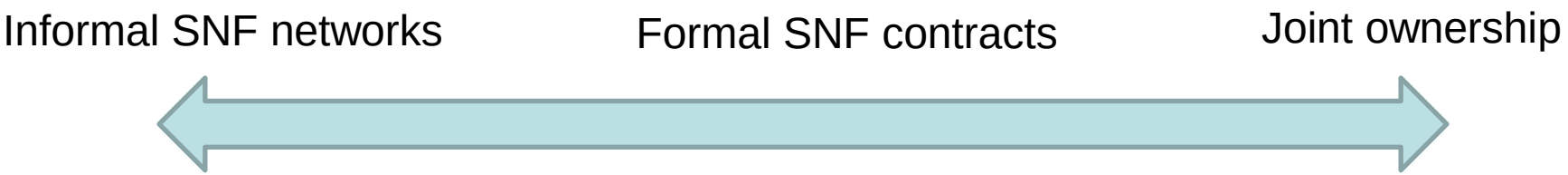
Era 4: ACA Payment Reforms

ACA holds hospitals more accountable for post-acute case

- Accountable Care Organizations (ACOs)
- **Hospital readmission penalties**
- **Hospital value-based purchasing**
  - Rewards hospitals that have low mortality and low spending through 30 days post-discharge

Hospital-SNF Linkages?

In new global payment era, hospitals looking to partner with SNFs



Theory

Two pathways by which HB-SNFs may increase efficiency:

- Economies of scope: If complementarities exist in production, hospitals and SNFs can produce better outcomes at a given cost through joint ownership
- Specialization: HB-SNFs generally specialize in production of Medicare services, prevent readmission to hospital

Selection

- Favorable selection
  - Hospitals choose to keep the least expensive patients to make money
- Adverse selection (after ACA)
  - Hospitals choose patients most at risk for readmission, try to prevent readmission
- Either way, choice of SNF is not random

Prior Literature

- In unadjusted analysis, Liu and Black (2003) found HB-SNFs had lower LOS (13 days vs 27 days), mortality (4% vs 7%), and hospital readmission (23% vs 28%)

- Using propensity matching, Stearns et al (2006) found HB-SNFs had 16.7% shorter stays, a 7.7% greater likelihood of home discharge within 30 days, and 2.3% fewer preventable 30-day hospital readmissions

"One limitation of our analysis is that unobserved selection still may explain the remaining differences in outcomes for patients of hospital-based SNFs. A natural approach to investigate this issue is to use instrumental variables (IV) models." (p 620)

Research Objective

To estimate the causal effect of hospital-based SNF status on post-acute discharge outcomes using IV

Data and Cohort

- Medicare claims within **180 days** of hospital discharge
- Minimum Data Set (MDS) to identify first-time admissions in 2009
- Facility data from CMS Online Survey Certification and Reporting (OSCAR) system.
- Zip code level data from Census 2000 aggregates
- 827,153 beneficiaries discharged from 3,173 acute care hospitals to 14,374 SNFs

General Empirical Approach

$$Y_{in} = HB_n\beta + X_i\delta + v_{HRR} + \varepsilon_{in}$$

Where:

Y_{in} is the outcome for person *i* in SNF *n*

HB_n is hospital-based status at SNF j

X_i is a vector of person and zip-code residential covariates

v_{HRR} = hospital referral region fixed effects

ε_{in} is a randomly distributed error term

Table 2: Summary of (N=827,513)

	Mean	Std. Dev.
Days in different setting in the 180 days following hospital discharge		
Death (# of days)	25.19	52.79
Hospital (# of days)	8.29	18.02
Skilled nursing facility (# of days)	51.01	52.00
Community with home health care (# of days)	28.44	38.47
Community (# of days)	67.06	63.85
Accumulated outcomes in first 30 days following discharge		
Reimbursement for Inpatient hospital care ($)	2,256	6,327
Reimbursement for SNF care ($)	9,160	4,438
Reimbursement for Home health care ($)	415	781
Total reimbursement ($)	11,903	6,815
Death	0.071	0.257
Any hospital readmission	0.201	0.401
Accumulated outcomes in first 180 days following discharge		
Reimbursement for Inpatient hospital care ($)	8,214	16,978
Reimbursement for SNF care ($)	14,413	10,673
Reimbursement for Home health care ($)	2,545	3,299
Total reimbursement ($)	25,790	22,151
Death	0.220	0.414
Any hospital readmission	0.446	0.497

Control Measures

Person-lvl (baseline) vars

- Age; Gender; Race
- Marital status; Dual elig.
- Length of index hosp.
- HH use in prior 30 days
- Deyo>2; Elixhauser>2
- # of ICU days
- Diabetes; CHF
- COPD; Stroke; Cancer
- Hip fracture
- Schizophrenia; Bipolar
- # of meds past 7 days
- ADL score; CHESS score
- Cognitive performance
- RUGS score

Zip Code residential vars

- % Medicare Advantage
- % Black
- % under poverty line
- Population density

IV

Assume hospital-based status has reduced form:

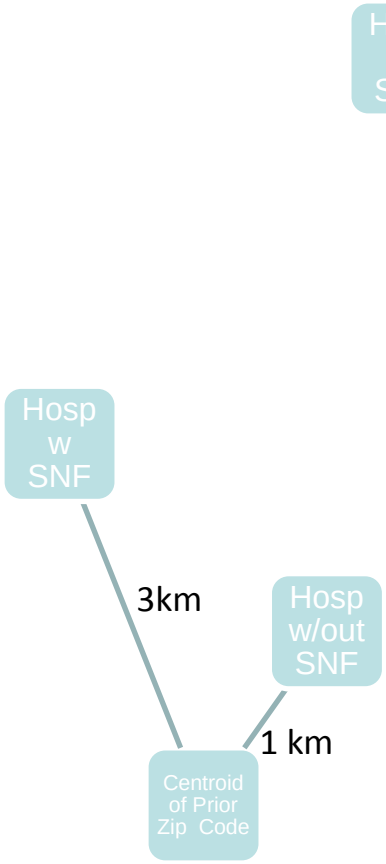
$$HB_n = DD_{in}\lambda + X_i\gamma + \nu_{HRR} + u_{in}$$

Can we identify a variable *DD* that is correlated with hospital-based status, but not ε, the error term in the main equation?

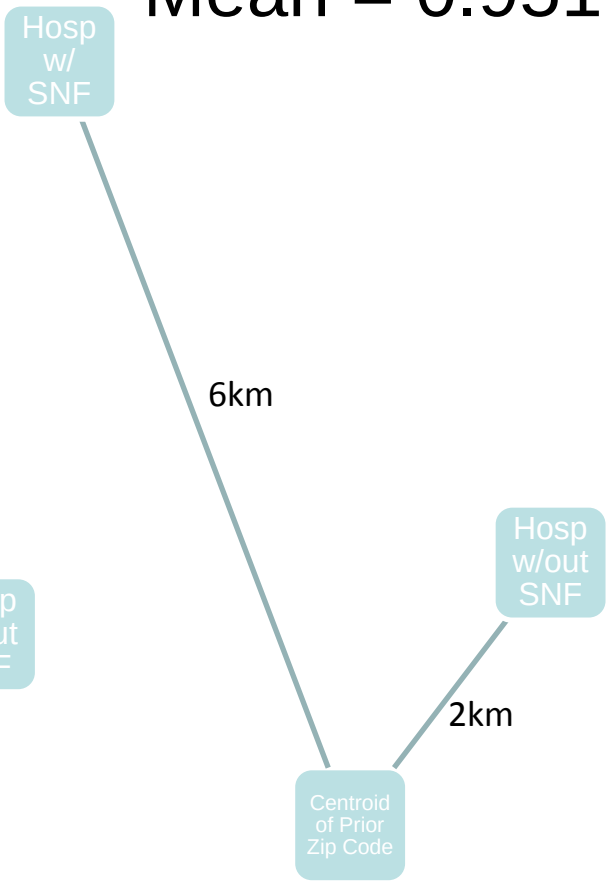
DD Instrument: Rationale

- Distance matters in the choice of hospitals (e.g. McClellan et al., 1994)
- Individuals choose their place of residence without regard to whether surrounding hospitals have a HB-SNF

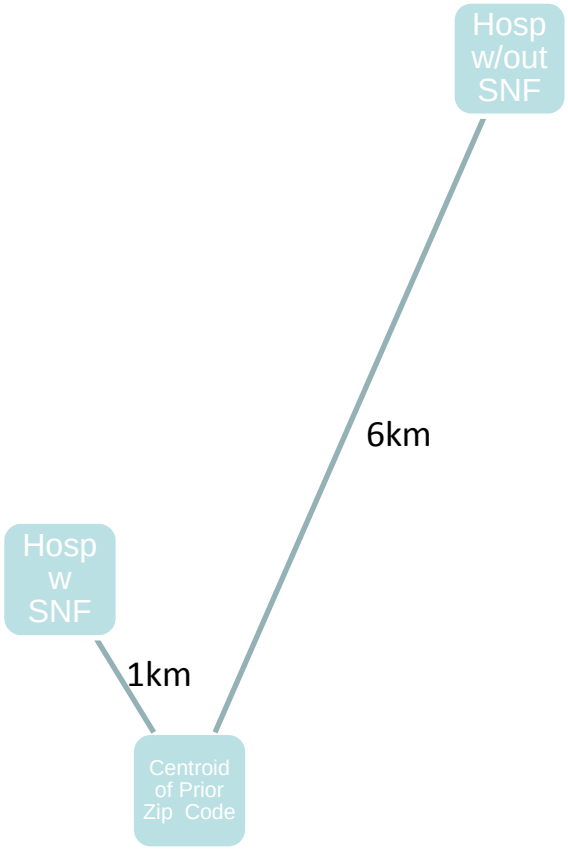
DD = ln(km to nearest hospital with a SNF) minus ln(km to nearest hospital without a SNF)
Mean = 0.951



DD = ln(3km)-ln(1km)
DD = 1.1



DD = ln(6km)-ln(2km)
DD = 1.1



DD = ln(1km)-ln(6km)
DD = -1.79

Literature Using DD as IV

Has been used going back to McClellan et al. (JAMA 1994)

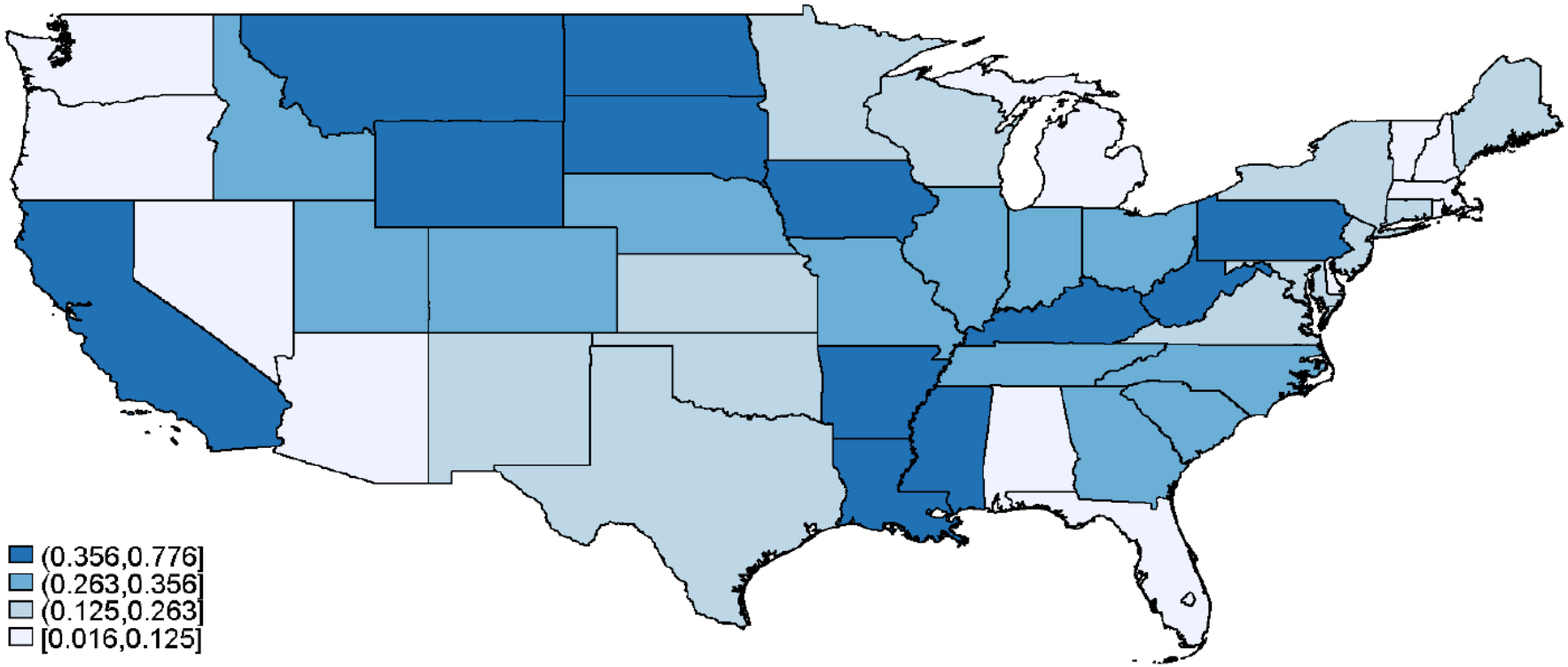
Specifically has been used for nursing homes

- Grabowski et al. (2013) and Hirth et al. (2014) used a DD instrument to examine FP-NFP nursing home outcomes

- **Marginal person** is someone who choses HB-SNF because they happen to live close to hospital with HB-SNF

Exposure to HB-SNFs Varies Based on Residence

Figure 1: Fraction of skilled nursing facility (SNF) patients in state who were treated in a hospital that owned a SNF



IV Assumptions

Assumption 1: IV correlated with HB-SNF

- Expected negative sign and strongly significant in first stage

Assumption 2: IV is uncorrelated with the error

- Balance test
- Falsification test

Comparison of Observables by Value of Instrument (Table 3)

	DD>median	DD<median
Hospital-based	**7%**	**17%**
Age	81.5	81.2
Female	66%	65%
White	90%	89%
Medicaid	19%	19%
CHF	21%	21%
# meds last 7 days	12.1	12.3
ADL score	16.6	16.5

Falsfication Test

- Doyle (2011) examines effect of health spending on outcomes for individuals on vacation

- DD Instrument should only work for individuals entering hospital near their residence
  - For individuals on vacation or entering hospital near an adult child, instrument will only work if DD correlated with unobservables

Table 4: First-stage results, regression of a hospital with a skilled nursing facility (SNF) on differential distance

	All	All	Entered hospital 100km+	Entered hospital 200km+	Entered hospital 500km+
Differential Distance (natural log of nearest hospital w/ SNF – natural log of nearest w/out)		-0.0579***	-0.0135***	-0.0044***	-0.00184
Differential Distance (nearest hospital w/ SNF – nearest w/out)	-.0017***				
t-statistics	8.78	20.06	6.77	3.31	1.21
F-statistics	77.01	402.40	45.87	10.98	1.47
Partial *R*-squared	0.031	0.057			
Observations	826,485	826,485	48,287	27,449	17,996
R-squared	0.0927	0.104	0.041	0.037	0.035

Note: All the regressions include patients and residential zip-code level explanatory variables listed in table 3 and hospital referral region (HRR) fixed effects. Test statistics are based on robust standard error.

Estimation

- Least squares to replicate previous literature with endogenous hospital-based status

- Two-stage least squares (2SLS)

Results – Marginal Effects

Outcome (days)	**OLS**	**IV**
Death	0.55***	
Hospital	0.47***	
SNF	-16.91***	
Home w/ home health	5.04***	
Home w/out home health	10.85***	
N	827,513	

*** p<.001, ** p<.01, * p<.05

180-Day Results – Marginal Effects

Outcome (days)	**OLS**	**IV**
Death	0.55***	0.85
Hospital	0.47***	-0.61**
SNF	–16.91***	–5.71***
Home w/ home health	5.04***	0.70
Home w/out home health	10.85***	4.76***
N	827,513	827,513

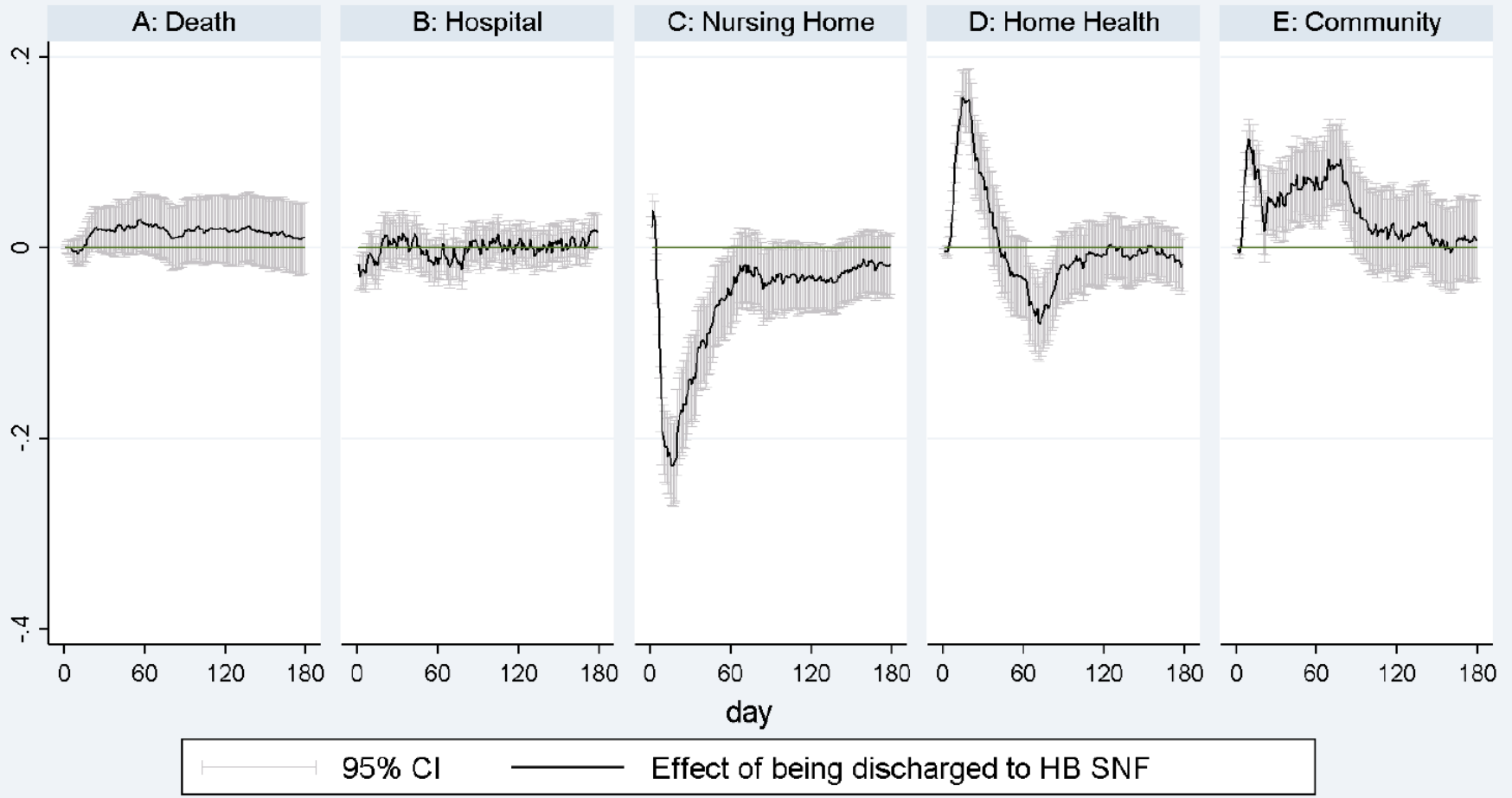
*** p<.001, ** p<.01, * p<.05

Magnitude of IV Estimates

Relative to dependent variable means, hospital-based SNFs:

- Decrease hospital days by 7%
- Decrease SNF days by 11%
- Increase home days (w/out HHA) by 7%
- (No stat significant impact on HHA days or mortality)

Instrumented Difference in HB versus FS Patients



180-Day Spending Outcomes

Outcomes (spending)	**OLS**	**IV**
Hospital	-$327***	$43
SNF	-$4,677***	-$3,858***
Home Health	$414***	-$57
Total	-$4,550***	-$4,196***
N	827,513	827,513

*** p<.001, ** p<.01, * p<.05

180-Day Spending Outcomes

Outcomes (spending)	**OLS**	**IV**
Hospital	-$327***	$43
SNF	-$4,677***	-$3,858***
Home Health	$414***	-$57
Total	-$4,550***	-$4,196***
N	827,513	827,513

16% Decline in Medicare spending

*** p<.001, ** p<.01, * p<.05

180-Day Outcomes

Outcomes	**OLS**	**IV**
Rehospitalization (0/1)	-0.027***	-0.040***
Death (0/1)	0.001	0.002
N	827,513	827,513

*** p<.001, ** p<.01, * p<.05

Table 8: Specification checks (N=827,513 unless otherwise noted)

	Number of days in a given setting				
	Death	Hospital	SNF	HHA	Home
Baseline model	0.853	-0.607**	-5.711***	0.704	4.761***
	[0.760]	[0.276]	[0.748]	[0.574]	[0.819]
Linear differential distance	-2.445**	-1.371***	-6.207***	2.535***	7.488***
	[1.045]	[0.404]	[0.983]	[0.780]	[1.137]
Binary DD measure (above/below) median	-0.174	-0.708*	-7.111***	1.255	6.738***
	[1.080]	[0.387]	[1.068]	[0.810]	[1.165]
Urban SNFs only (N= 690,991)	2.166*	-1.122**	-2.900**	0.231	1.625
	[1.221]	[0.454]	[1.195]	[0.927]	[1.328]
Rural SNFs only (N= 136,010)	-1.02	0.246	-10.15***	3.750***	7.170***
	[1.195]	[0.395]	[1.256]	[0.897]	[1.262]
High competition markets (N= 768,508)	0.737	-0.570*	-5.134***	0.57	4.396***
	[0.882]	[0.318]	[0.874]	[0.667]	[0.957]
Low competition markets (N= 58,493)	0.303	-0.701	-5.731**	2.906	3.223
	[2.354]	[0.845]	[2.483]	[1.792]	[2.441]
Hip fracture patients (N=69,352)	-1.375	-2.523***	-7.158***	4.399**	6.656**
	[2.397]	[0.937]	[2.740]	[2.040]	[2.743]
Acute myocardial infarction patients (N=19,068)	3.346	-1.755	-2.803	-2.966	4.178
	[6.892]	[2.196]	[5.944]	[4.549]	[6.562]
Stroke patients (N=27,397)	2.418	1.473	-10.49**	-0.286	6.881*
	[4.245]	[1.362]	[4.660]	[2.950]	[3.896]

Note: All the regressions include patients and residential zip-code level explanatory variables listed in table 3 and hospital referral region (HRR) fixed effects. Standard errors are based on robust standard error.

*** p<.001, ** p<.01, * p<.05

Summary

- In 180 days following discharge, hospital-based SNF patients have:
  - Fewer days in institution, more in community
  - Lower Medicare spending
  - Fewer hospital readmissions
  - No difference in mortality
- 30-day outcomes largely consistent with these 180-day findings
- IV results differ from the OLS, confirming importance of instrumenting for hospital-based status

Implications

- Payment policies
  - In “make or buy” decision under ACA reforms, our results suggest hospital systems may wish to “make” these services rather than “buy” these services from freestanding SNFs
  - In era of site-neutral payments, should CMS look to increase payments to HB-SNFs?
- Care-planning
  - Could aid patients/families in choosing SNFs
  - Hospital-based status is reported on NH Compare report card

Step 2: Choose Nursing Home to Compare

Print This Page

Your Search Results

Your search resulted in **1** nursing homes available in **Massachusetts** matching your search criteria.

Select up to 3 Nursing Homes from the results table below and select the "Compare" button to compare your selections in more detail.

These results are sorted by **Nursing Home Name**.

Five Star Quality Rating

Nursing homes are rated overall and on health inspections, nursing home staffing and quality measures. More stars are better.

Much Above Avg.	★★★★★
Above Avg.	★★★★
Average	★★★
Below Avg.	★★
Much Below Avg.	★

Your Search Criteria

You have selected the following criteria for your search:

Name: hebrew

State: Massachusetts

- New Search
- Modify Search

Refine Your Results:

- Nursing Homes within a Continuing Care Retirement Community
- Nursing Homes within a hospital
- Nursing Homes with Resident and Family Councils

Show Information **View Nursing Home Locations on a Map** What is this?

Choose up to 3 nursing homes to Compare **Sort Table By:** Nursing Home Name Sort

Nursing Home Name and General Information ▲	Overall Rating [What is this?]	Health Inspections [What is this?]	Nursing Home Staffing [What is this?]	Quality Measures [What is this?]	Program Participation	Number of Certified Beds [What is this?]	Type of Ownership
RECUPERATIVE SERVICES UNIT-HEBREW REHAB CENTER 1200 CENTRE STREET BOSTON, MA 02131 (617) 363-8695 *Located in a Hospital* Mapping & Directions	★★★ 3 out of 5 stars	★★★★ 4 out of 5 stars	★★★★ 4 out of 5 stars	★ 1 out of 5 stars	Medicare	50	Non profit - Corporation

Choose up to 3 nursing homes to Compare

Page Last Updated: January 15, 2009