The Impact of Health Care Reform on Hospital Care and Preventive Care: Evidence from Massachusetts

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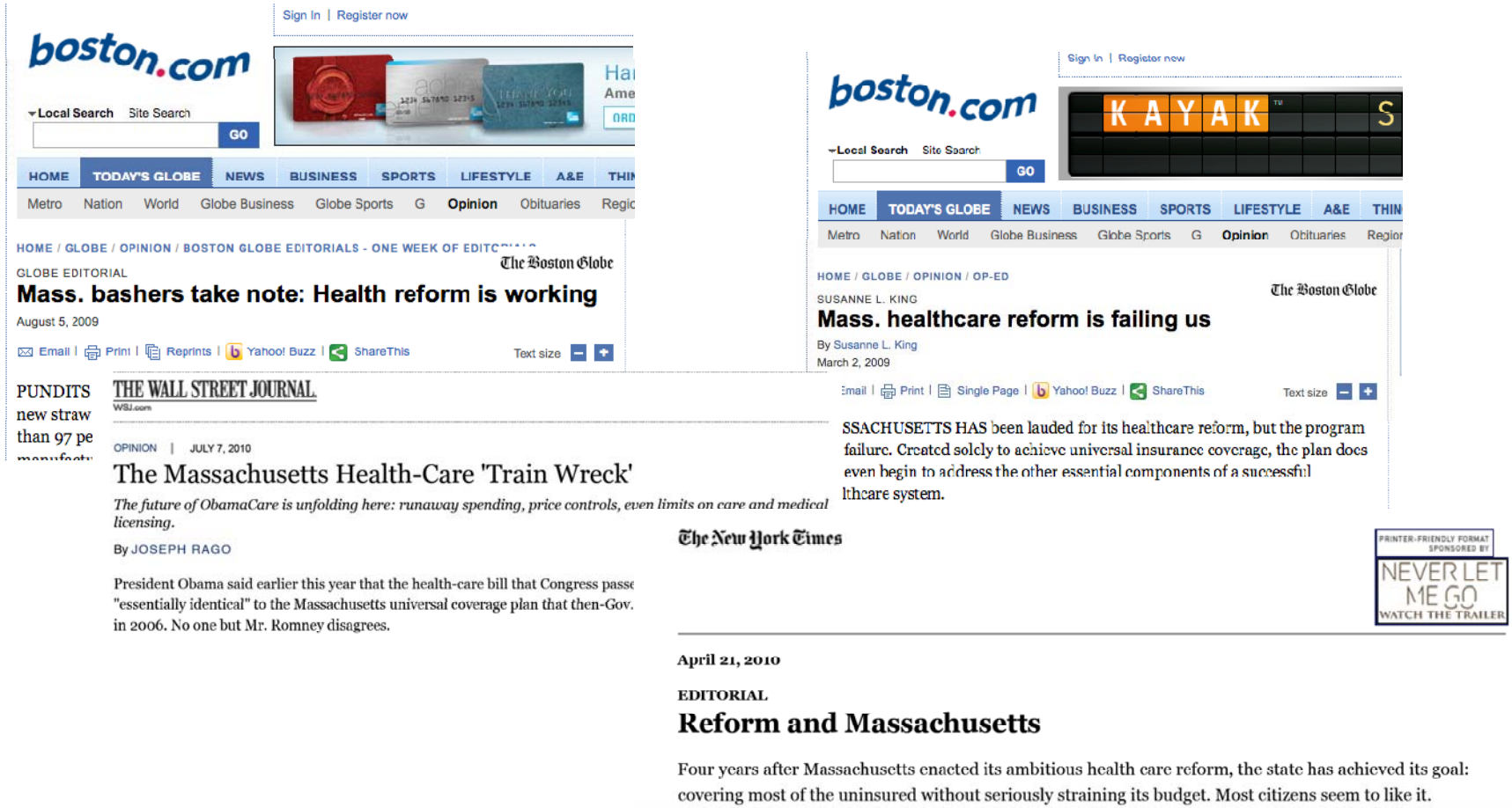
Motivation

What would happen to hospital and preventive care if the US expanded to near-universal coverage?

- Other expansions provide limited evidence on potential impact of expansion to near-universal in US
  - Medicare (Finkelstein, 2007; Card, Dobkin, Maestas, 2008)
    - Only applied to elderly
    - Predated (drove?) cost increases in health care
  - Medicaid expansions (Currie and Gruber, 1996)
    - Only applied to specific populations – children and indigent
  - Universal coverage in other countries
    - Difficult to generalize to the mixed model of coverage in the US
- Massachusetts reform is widely considered to be the model for national reform → natural experiment to study this question

Public Debate on the Impact of the Reform



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The Boston Globe

Mass. bashers take note: Health reform is working

August 5, 2009

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THE WALL STREET JOURNAL.
WSJ.com

OPINION | JULY 7, 2010

The Massachusetts Health-Care 'Train Wreck'

The future of ObamaCare is unfolding here: runaway spending, price controls, even limits on care and medical licensing.

By JOSEPH RAGO

President Obama said earlier this year that the health-care bill that Congress passe "essentially identical" to the Massachusetts universal coverage plan that then-Gov. in 2006. No one but Mr. Romney disagrees.

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SUSANNE L. KING

The Boston Globe

Mass. healthcare reform is failing us

By Susanne L. King

March 2, 2009

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SSACHUSETTS HAS been lauded for its healthcare reform, but the program failure. Created solely to achieve universal insurance coverage, the plan does even begin to address the other essential components of a successful lthcare system.

The New York Times

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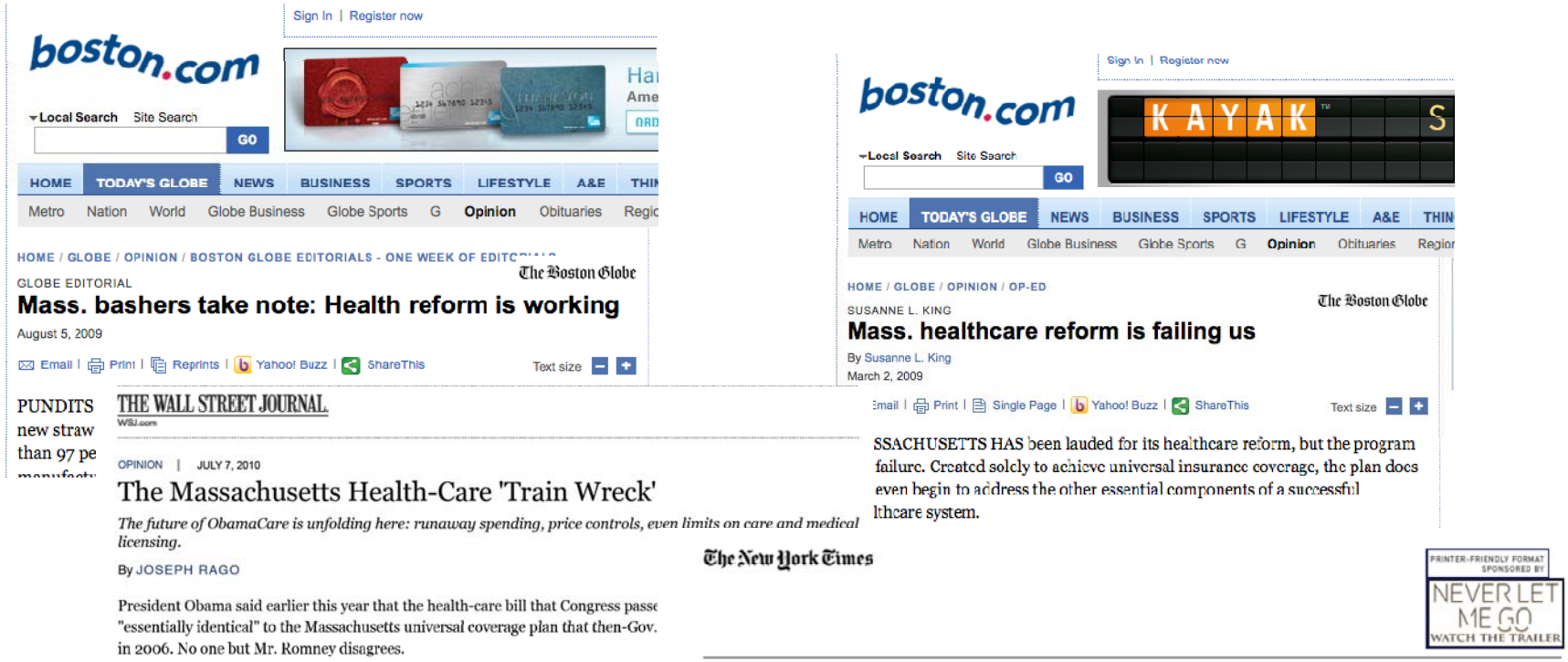
April 21, 2010

EDITORIAL

Reform and Massachusetts

Four years after Massachusetts enacted its ambitious health care reform, the state has achieved its goal: covering most of the uninsured without seriously straining its budget. Most citizens seem to like it.

Public Debate on the Impact of the Reform



- **First paper to assess the impact of the Massachusetts reform on hospital outcomes and preventive care that has a control group**
- **Existing research only addresses coverage**
  - **Yelowitz and Cannon (2010), Long, Stockley, Yemane (2009)**

Key Provisions of Massachusetts and National Healthcare Reform

Massachusetts Reform, April 2006

- Individual mandate
  - Penalty is up to 50% of basic plan by months without coverage
- Employers mandated to provide coverage
  - >10 FTEs
- Medicaid expansions
  - Up to 100% of FPL for adults
  - Up to 300% of FPL for children
- Subsidized private plans through exchanges
  - Subsidies up to 300% of FPL
- Insurance exchange
  - Administered by the “Connector”
  - Benefit tiers Bronze-Gold and Young Adult Plans (YAPs)

Reference: Kaiser Family Foundation

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National Reform, March 2010

- Individual mandate
  - Penalty is higher of 2.5% of income or $2,085
- Employers mandated to provide coverage
  - >50 FTEs
  - >200 FTEs automatically enroll employees
- Medicaid expansions
  - Up to 133% of FPL
- Subsidized private plans through exchanges
  - Subsidies up to 400% of FPL
- Insurance exchanges
  - State level administration
  - Benefit tiers Bronze-Platinum and Catastrophic

Reference: Kaiser Family Foundation

Outline of Today's Talk

- **Empirical Strategy and Predictions**
- Data
- Impact on Coverage
- Overall Impact on Hospital Outcomes
- Incidence
- Robustness
- Conclusions

Our Identification Strategy

- Difference-in-difference strategy
  - Compare MA pre- to post-reform relative to other states
  - Impact on insurance coverage
  - Impact on health care production:
    - LOS, access, prevention, quality, and cost
- Instrumental Variable Strategy
  - Impact of coverage on outcomes
  - Within age, gender, income, and race groups
  - Test for spillovers

Estimating Equation

$$Y_{dht} = \alpha + \beta(MA^{*}Post)_{ht} + \gamma(MA^{*}During)_{ht}$$
$$+ \sum_{t} \theta_{t}(QuarterYear = t) + \sum_{h} \eta_{h}(Hospital = h)$$
$$+ [X_{dht}] + \varepsilon_{dht}$$

Our Outcomes of Interest

- Impact on coverage
- Impact on total volume and patient mix
- Overall impact on hospital outcomes
  - Length of stay
  - Admissions from emergency room
  - Preventive care
  - Costs
- Incidence by age, gender, income, and race

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Data Sources

- Current Population Survey (CPS) March Supplement
  - Representative sample of entire population
  - Information on insurance coverage and demographics
- Behavioral Risk Factor Surveillance System (BRFSS)
  - Representative survey data on health behaviors, prevention, and demographics
- National Inpatient Sample (NIS)
  - Primary data source for the study

Why focus on the hospitalized population?

- Limited population, but of interest in its own right
  - Vulnerable in terms of demographic characteristics and sickness
  - Responsible for most health care costs
  - Differential crowd out of private coverage
  - Data on insurance coverage don't rely on self reporting

We examine hospitalized with NIS data

NIS Data - Introduction

- Approximate 20% sample of all hospitals in US
- Universe of discharges for each hospital in the sample in each year
- Use data on 2004-2008, by discharge quarter
- Total sample includes 36,362,108 discharges
- Each discharge: primary payer, admission from emergency room, length of stay, total charges (costs by hospital)

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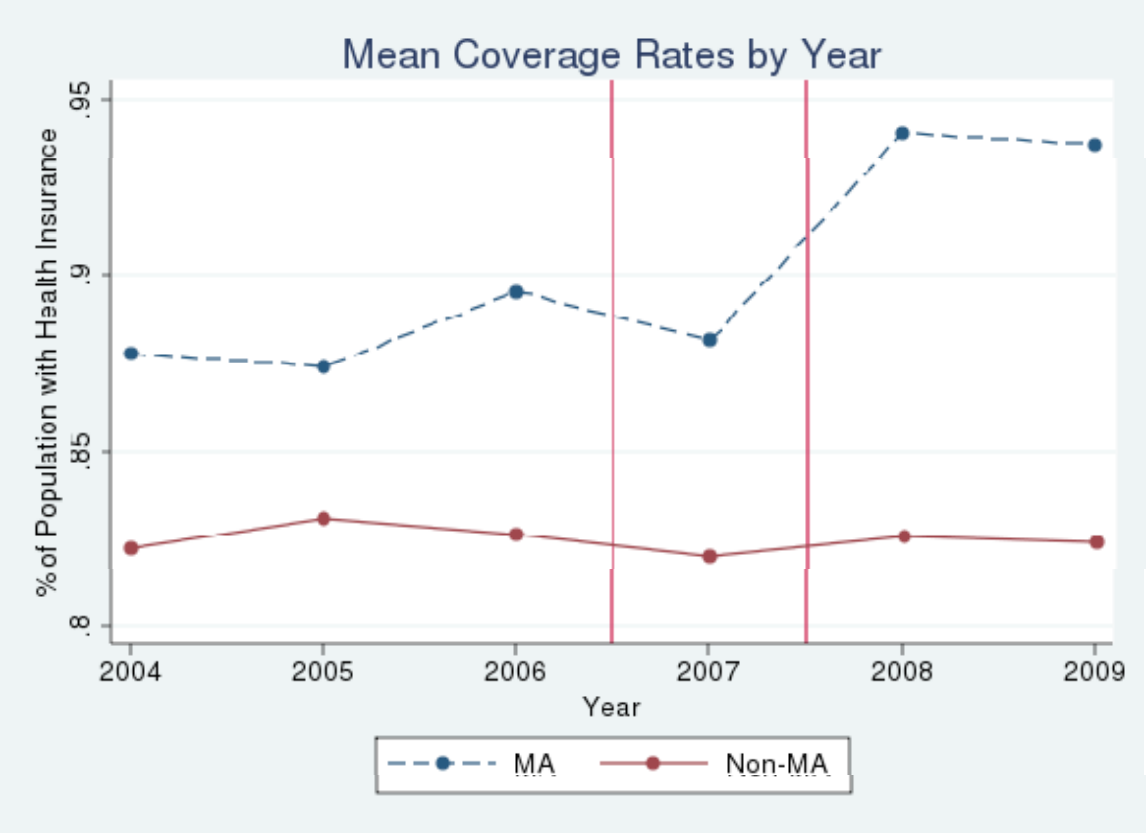
Impact on Coverage of Nonelderly



88.2% nonelderly insured in MA Before, 93.9% nonelderly insured in MA After
89.5% all ages insured in MA Before, 94.5% all ages insured in MA After

MA ranked 7th in terms of coverage before the reform
National nonelderly average before reform: 82.8% (31 states + DC above average)

Impact on Coverage in NIS
Results by Type of Coverage

Table 1: Results by Type of Insurance Coverage in NIS

	Mutually Exclusive Types of Coverage				
	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	**Uninsured**	**Medicaid**	**Private**	**Medicare**	**Other**
MA*After	-0.0231	0.0389	-0.0306	0.0042	0.0106
	(-0.0300,-0.0162)***	(0.0265,0.0512)***	(-0.0378,-0.0233)***	(0.0013,0.0070)***	(0.0041,0.0171)***
	(-0.0299,-0.0166 ***	(0.0293,0.051 ***	(-0.0385,-0.0236)***	(0.0014,0.0068)***	(0.0050,0.0181)***
MA*During	-0.0129	0.0365	-0.0224	-0.0003	-0.0009
	(-0.0176,-0.0083)***	(0.0293,0.0437)***	(-0.0274,-0.0173)***	(-0.0024,0.0017)	(-0.0043 0.0026)
	(-0.0177,-0.0084)***	(0.0302,0.0438)***	(-0.0277,-0.0168)***	(-0.0025,0.0018)	(-0.0049 0.0026)
N (Nonelderly)	23,860,930	23,860,930	23,860,930	23,860,930	23,860,930
R Squared	0.0659	0.1148	0.1532	0.0341	0.0689
Mean MA Before	0.0643	0.2460	0.5631	0.1073	0.0193
Mean Non-MA Before	0.0791	0.2876	0.4978	0.0928	0.0427
Mean MA After	0.0352	0.2594	0.5518	0.1177	0.0360
Mean Non-MA After	0.0817	0.2790	0.4923	0.1020	0.0450
MA*After	-0.0228	0.0374	-0.0275	0.0021	0.0107
with risk adjusters	(-0.0297,-0.0158)***	(0.0235,0.0514)***	(-0.0361,-0.0190)***	(-0.0007,0.0050)	(0.0047,0.0168)***
R Squared	0.0939	0.2232	0.2381	0.2006	0.0761

- Smaller (40%) increase in coverage in hospitalized population than in CPS
- Consistent with adverse selection
- Medicaid expansions happened rapidly
- Evidence of crowd out of private coverage

Impact on Coverage in NIS CommCare and No Coverage Info

	(6)	(7)
Dependent Variable:	CommCare	No Coverage Info
MA*After	0.0124	0.0015
	[0.0123,0.0124]***	[0.0000,0.0030]**
	[0.0124,0.0125]***	[0.0001,0.0029]**
MA*During	0.0029	-0.0017
	[0.0029,0.0029]***	[-0.0065,0.0031]
	[0.0029,0.0029]***	[-0.0076,0.0014]*
N (Nonelderly)	23,860,930	23,913,983
R Squared	0.0249	0.0662
Mean MA Before	0.0000	0.0002
Mean Non-MA Before	0.0000	0.0020
Mean MA After	0.0165	0.0040
Mean Non-MA After	0.0000	0.0017
MA*After	0.0124	0.0014
with risk adjusters	[0.0123,0.0124]***	[0.0000,0.0028]**
R Squared	0.0249	0.0666

- CommCare covered about 1.2 percent of the population
- Small change in the number of admissions w/o coverage info

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- **Overall Impact on Hospital Outcomes**
  - Length of Stay
  - Admissions from Emergency Room
  - Preventive Care
  - Costs
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Impact on Length of Stay

- Partial equilibrium
  - Increase in LOS if insurance induces moral hazard through decreased price and LOS indicates more care
  - Decrease in LOS if insurance decreases quantities through management of care or price reductions
  - Decrease in LOS if insurance impacts treatment decisions
    - Doctors are reticent to release uninsured patients due to lack of access to outpatient follow up
- General equilibrium
  - Hospitals alter production function following near-universal coverage
  - Potential spillovers across groups

Impact on Outcomes Beyond Insurance

Table 2: Outcomes Beyond Insurance Coverage

	(1)	(2)	(3)
Dependent Variable:	Length of Stay	Log Length of Stay	Emergency Admit
MA*After	0.050[illegible]	0.0012	0.0202
	[-0.0599,-0.0008]**	[-0.0111,0.0086]	[-0.0397,-0.0007]**
	[-0.1026,-0.0065]**	[-0.0113,0.0066]**	[-0.0351,0.0011]*
MA*During	-0.0037	0.0037	-0.0317***
	[-0.0369,0.0294]	[-0.0022,0.0095]	[-0.0449,-0.0184]***
	[-0.0367,0.0238]**	[-0.0026,0.0084]**	[-0.0409,-0.0166]***
N (Nonelderly)	23,913,183	23,913,183	23,913,983
R Squared	0.0335	0.0458	0.1088
Mean MA Before	5.4256	1.4257	0.3868
Mean Non-MA Before	5.0770	1.3552	0.3591
Mean MA After	5.3717	1.4355	0.4058
Mean Non-MA After	5.0958	1.3536	0.3745
MA*After	-0.1037	-0.0105	-0.0220
with risk adjusters	[-0.1471,-0.0603]***	[-0.0186,-0.0023]**	[-0.0427,-0.0012]**
R Squared	0.3801	0.4038	0.2907

- Length of stay decreases
  - 1% in levels
  - 0.1% in logs – gives more weight to shorter stays – bigger reduction in longer stays
  - Consistent with more management of care, changes in treatment patterns or capacity constraints
  - Not consistent with moral hazard
- LOS reductions not driven by selection into hospitals
  - Larger reductions after including controls for patient severity → if anything, sicker patients received care in MA after reform
- LOS not driven by capacity constraints → new capacity greater increase in discharges

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Impact on Admissions from Emergency Room (ER)

- Hospitals cannot turn patients away from ER
- Uninsured use ER as point of access
- Inefficient for a number of reasons
  - Wait to receive care until illness is acute (also observe in prevention indicators)
  - Care is more costly in ER (due both to prices and focus)
- Insurance lowers prices/barriers to outpatient care → Expect a reduction in inpatient admissions originating in the ER after the reform
- Cannot examine ER directly with our data

Impact on Outcomes Beyond Insurance

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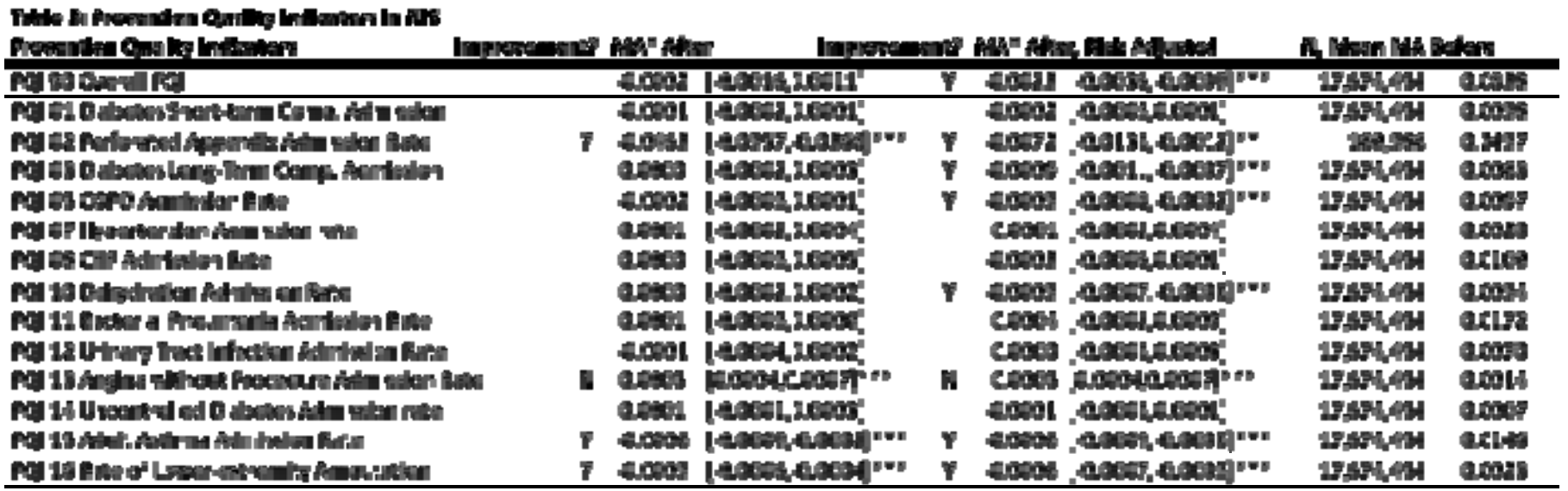
- Inpatient admissions from the ER decrease significantly
  - 2 percentage points less likely to be admitted from the ER
  - 5% decline in admissions originating in the ER relative to baseline
- Lowest income quartile ER admissions declined by 12% relative to baseline
- Reduction is 5x larger in lowest income zip code relative to third income quartile
- No significant effect in the highest income zip

Impact on Preventive Care

- Cannot measure outpatient preventive care with inpatient data
- Can use measures developed by AHRQ to measure frequency of diagnoses that should not appear in inpatient setting if adequate preventive care has been obtained
  - Ex: perforated appendix, adult asthma, lower-extremity amputation
- We expect improvements in prevention quality since newly insured should be able to access outpatient care

Impact on Preventive Care



Prevention Quality Indicators	Improvement?	MA* After	Improvement?	MA* After, Risk Adjusted	N, Mean MA Riders	
PQI 90 Overall PQI		-0.0002	Y	-0.0013	17,571,494	0.0285
PQI 91 Diabetes Short-term Comp. Admission		-0.0001		-0.0002	17,571,494	0.0039
PQI 92 Perforated Appendix Admission Rate	Y	-0.0061	Y	-0.0072	169,266	0.3427
PQI 93 Diabetes Long-Term Comp. Admission		0.0003	Y	-0.0006	17,571,494	0.0069
PQI 94 COPD Admission Rate		-0.0002	Y	-0.0003	17,571,494	0.0057
PQI 97 Hypertension Admission Rate		0.0001		0.0001	17,571,494	0.0049
PQI 98 CHF Admission Rate		0.0003		-0.0001	17,571,494	0.0169
PQI 10 Dehydration Admission Rate		0.0003	Y	-0.0002	17,571,494	0.0054
PQI 11 Bacterial Pneumonia Admission Rate		0.0001		0.0001	17,571,494	0.0172
PQI 12 Urinary Tract Infection Admission Rate		-0.0001		0.0003	17,571,494	0.0059
PQI 13 Angina without Procedure Admission Rate	N	0.0005	N	0.0005	17,571,494	0.0014
PQI 14 Uncontrolled Diabetes Admission rate		0.0001		-0.0001	17,571,494	0.0067
PQI 15 Adol. Asthma Admission Rate	Y	-0.0006	Y	-0.0006	17,571,494	0.0149
PQI 16 Rate of Lower-extremity Amputation	Y	-0.0003	Y	-0.0006	17,571,494	0.0019

- Significant improvements in 3 of 13 measures without risk adjustment
- Little decline in overall measure
- Overall PQI corrects for multiple hypothesis testing
- Including risk adjusters significantly increases estimated impact
- Reduction in overall volume of preventable admissions and 6 of 13 specific measures

Impact on Costs

- Cost is a major issue in any reform
- Focus on the impact of insurance on hospital cost but there are additional issues w.r.t cost in any health policy proposal
  - Cost of subsidizing plans
  - Impact of reform on dynamic incentives to innovate
- Alternate predictions for the cost impact of increases in coverage:

Cost Increases

- More care is provided after reform (moral hazard effects dominate)
- Hospitals make capital investments to attract patients ("Medical Arms Race" model)

Cost Decreases

- Less care is provided after reform (LOS findings)
- Outside factors (insurer bargaining position) lead to lower prices and/or quantities
- Insurance changes production in the hospital to lower cost

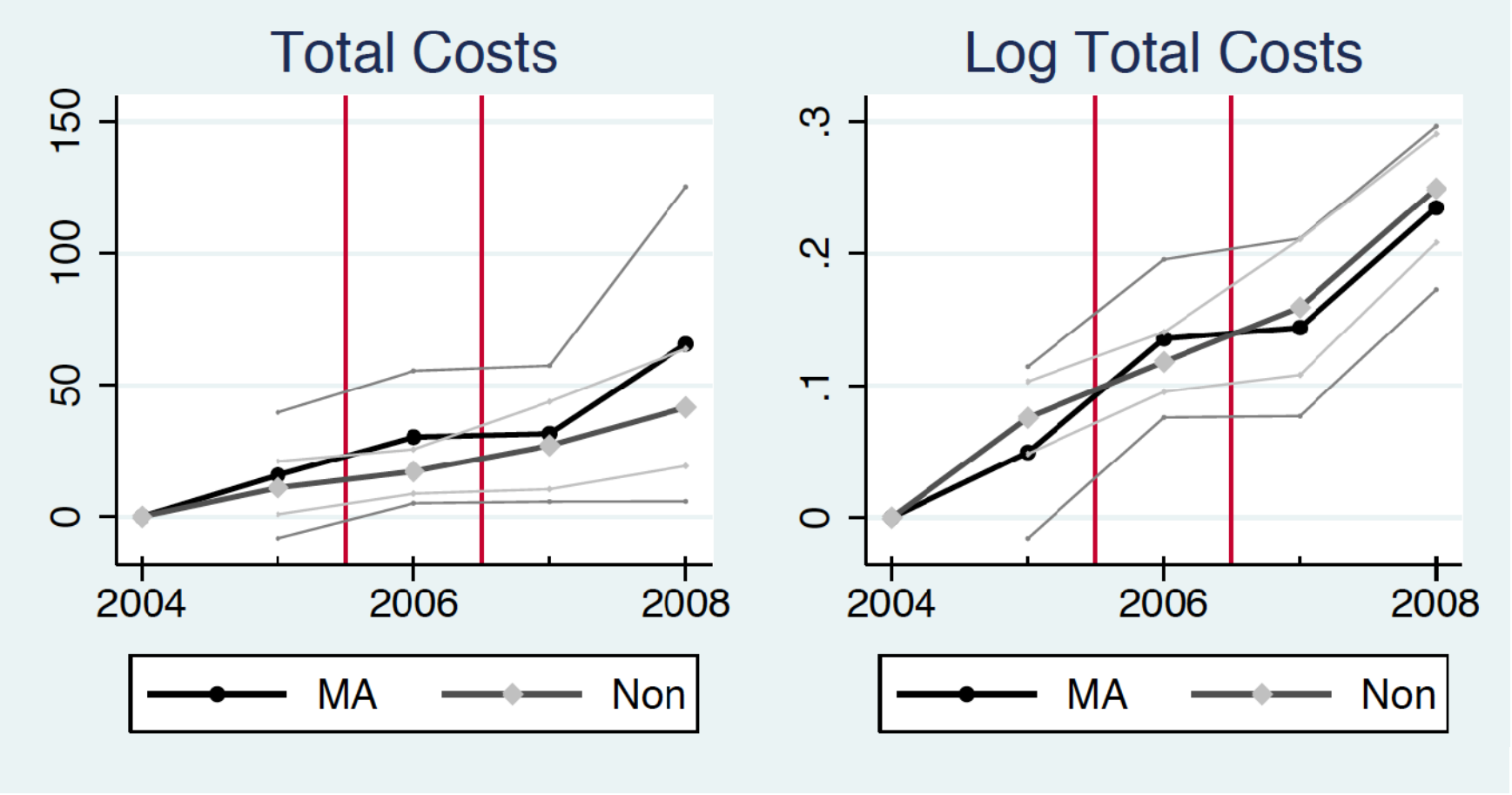
Hospital Cost Results

Table 4: Cost and Charges After Discounts: Regressions on the Hospital-Year Level, Excluding Q3

	[1] Total Costs, $Mill	[2] Log Total Costs	[3] Total Costs/LOS	[4] Total Costs/Disch.
MA* After 2006	9.544	-0.003	16.123	154.602
	[-4.669,23.758]	[-0.043,0.037]	[-32.972,65.218]	[-181.444,490.648]
N (All Ages)	3,869	3,869	3,869	3,869
Mean MA Before 2006	152.292	18.491	1,328.481	7,844.672
Mean Non-MA Before 2006	121.030	18.178	1,318.436	7,451.341
Mean MA After 2006	230.174	18.798	1,629.457	9,576.684
Mean Non-MA After 2006	152.690	18.381	1,557.693	8,728.628
MA*After 2006 Divided by Year to Investigate Dynamics				
MA* 2008	22.441	-0.006	19.677	231.422
	[3.310,41.572]**	[-0.043,0.032]	[-41.922,81.276]	[-199.535,662.380]
MA*2007	1.869	-0.001	14.008	108.884
	[-10.152,13.890]	[-0.052,0.050]	[-36.777,64.793]	[-231.317,449.085]

- No evidence that hospital costs increased overall in levels, logs, per day or per discharge
- Log takes into account MA cost trends relative to control states before the reform
- Disaggregating by year we find similar effects though the level of cost appears to be rising by 2008
- The Massachusetts Reform did not increase cost though it also did not change the rate of growth in MA relative to other states

Hospital Cost Trends



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- **Incidence**
  - Age
  - Gender
  - Income
  - Race
- Robustness
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Incidence – Summary of Results

- See tables in paper for estimates within every age, gender, income, and race group
  - Largest gains in insurance among age 19-54, males, lowest income, black and Hispanic
  - Gains in outcomes may occur through spillovers
    - One group's change in coverage is not necessarily proportional to that group's change in outcomes
    - Can't rule out heterogeneous effects of coverage across demographic groups

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  - Key findings
  - Implications for national reform
  - Preview of next paper

What happened in MA? Key Findings

- Overall Impact
  - Coverage
    - Uninsurance among nonelderly decreased by 50% relative to initial level
    - Among the hospitalized population the decline was smaller (40%)
  - Hospital Care and Preventive Care
    - Declines in length of stay
    - Declines in admissions for the ER – particularly among the poor
    - Some evidence for improved health from increased outpatient preventive care
    - No evidence that hospital costs increased
- Incidence
  - Age, gender, income, race
    - Largest gains in insurance among age 19-54, males, lowest income, black and Hispanic
    - Gains in outcomes appear to occur through spillovers

What does this suggest about national reform?

- Expansions to near universal coverage
  - Likely to reduce admissions from ER and may improve preventive care
  - Unlikely to raise hospital costs substantially
- Presence of some benefits is a precursor to the reform satisfying a cost-benefit analysis

Preview of Next Paper

- Labor Market Impact of an Individual Health Insurance Mandate

Extra Slides

IV Strategy to Estimate Impact of Coverage

- To obtain IV effect of coverage on any outcome, divide outcome diff-in-diff coefficient by diff-in-diff coverage coefficient
  - Differentiate impact of impact of hospital vs. population coverage using first stage from from NIS (hospital) or CPS (population)
- For example, a one percentage point increase in *hospital* insurance coverage
  - Decreases length of stay by .022 days (=.050/2.31)
    - *Population* coverage: .009 days (=.050/5.71)
  - Decreases emergency admissions by .87 percentage points (=2.02/2.31)
    - *Population* coverage: .37 pct. points (=2.02/5.71)
- However, IV strategy relies on exclusion restriction that reform only affected outcome through changes in coverage
  - Changes in type of coverage could violate exclusion restriction
  - Spillovers from one groups gains in coverage to another group's outcomes could violate exclusion restriction

Nonelderly Coverage by State Before Reform

State	mean
Texas	0.7340198
New Mexico	0.7642894
Florida	0.7720209
Oklahoma	0.7732717
Louisiana	0.7841962
Montana	0.7865729
California	0.7899033
Nevada	0.7970259
Arizona	0.7980788
Arkansas	0.8073828
West Virginia	0.8081919
Mississippi	0.8093094
Georgia	0.8113096
Alaska	0.8136149
Oregon	0.8136251
Colorado	0.8189809
North Carolina	0.8228661
South Carolina	0.8229301
Idaho	0.8233711
Wyoming	0.8273299
New Jersey	0.8420131
Alabama	0.8461496
Illinois	0.8499317
New York	0.8501763
Indiana	0.8505023
Washington	0.8509954
Utah	0.8529139
Kentucky	0.847085
Tennessee	0.8487412
Maryland	0.8497846
District of Col	0.8520028
Virginia	0.8550426
Delaware	0.8619352
South Dakota	0.8651907
Missouri	0.8679624
Ohio	0.8714404
Pennsylvania	0.8758497
Connecticut	0.8766646
North Dakota	0.8777829
Michigan	0.8784831
Nebraska	0.8788076
Rhode Island	0.8799503
Kansas	0.8800129
Vermont	0.8807085
Massachusetts	0.8824279
Wisconsin	0.8847879
Maine	0.8899257
New Hampshir	0.8907806
Iowa	0.8913788
Hawaii	0.8971143
Minnesota	0.9061694
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Total	0.8279953
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CPS Strengths

- Official source for estimates of health insurance coverage
- Nationally representative sample of individuals
- Includes a detailed set of questions on health insurance coverage
- 1,253,145 individuals within households

CPS Limitations

- Survey data
  - Difficult to verify accuracy
  - Response: Also Use NIS hospital discharge data with payer
- Labeling Chapter 58 public plans
  - The Census Bureau coded any respondent who had CommCare or CommChoice coverage as “Medicaid”
  - Response: Use income level to separate the impact of these different mechanisms
- March survey about past year of coverage
  - 2007 CPS was during the implementation of Chapter 58
  - Response: code as “during” time period in estimation