Analysis of Pay-For-Performance (P4P) Program for Utilization of Preventive Care Services among Medicaid Population in United States

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Background: Medicaid managed care plans

- Medicaid programs: states used managed care plans to lower program costs:
  - Mainly through capitation payment schemes instead of fee-for-service.
  - The Medicaid managed care enrollment rate continued to increase from 56% in 2000 to 72% in 2009;

- Concerns about the quality of services among low-income beneficiaries:
  - Capitation schemes may lead to under-provision of necessary or beneficial services;

Background: P4P

- CMS promotes quality and value-based purchasing through its Medicaid/SCHIP Quality Initiative.
  - Reimbursement based on quantity → quality, access, efficiency, and successful outcomes;
  - Use of payment methods and other incentives to encourage quality improvement and patient-focused high value care.

- Twenty states adopted P4P strategies for their Medicaid managed care plans by 2010.
  - Different in types of incentives, performance measures and targeted health care providers.

Motivation and research question

- Motivation:
  - Use of preventive care services is low among the low-income population, which could lead to worse health status and higher inpatient costs;
  - Very few papers study the effects of P4P programs.

- Research question: What is the effect of Medicaid P4P programs on the use of preventive care services and on health outcomes?

Introduction: States P4P programs

State	Date	Incentive1	Incentive2	Incentive3
Wisconsin	1996	differentials		
New Mexico	1997	differentials	auto-assignment	withholds
Minnesota	1999	differentials		
Rhode Island	1999	differentials		
New York	2000	differentials	auto-assignment	public reporting
Michigan	2001	differentials	auto-assignment	
Missouri	2001	differentials	auto-assignment	
Maryland	2002	differentials	Public reporting	
Ohio	2002	differentials	auto-assignment	penalties
Washington	2004	withholds		
California	2005	auto-assignment		
Illinois	2006	withholds		
Minnesota	2006	differentials		
Nevada	2006	differentials		
Pennsylvania	2006	differentials		
Tennessee	2006	differentials	withholds	
Colorado	2007	differentials		
Indiana	2008	differentials	public reporting	withholds
Oregon	2008	differentials		
Massachusetts	2010	differentials	withholds	

Introduction: P4P performance measures

- **Health Plan Employer Data and Information Set (HEDIS) and HEDIS-like measures:**
  - Adult immunization status: Hep B, MMR, VZV, Combo2;
  - Cancer screening: breast cancer, cervical cancer, colorectal cancer;
  - Childhood immunization status: DTaP/DT, IPV/OPV, MMR, Hib, Hep B, VZV, Combo 2, and etc;
  - Cholesterol management for cardiovascular conditions;
  - Comprehensive diabetes care;
  - Control of high blood pressure;
  - Prenatal and postpartum care;
  - Use of appropriate medications for asthma;
  - And more….

Introduction: P4P performance measures

- **Structural measures**:
  - Such as accreditation status, health information technology adoption, patients' access to care.
- **Cost/efficiency measures:**
  - Overall savings in the present period as compared to a prior period for a given subpopulation.
- **Measures based on patient experiences:**
  - Such as patient satisfaction measures.

Introduction: P4P incentive types

- **Differential reimbursement**: change in the ongoing reimbursement rate or fee;
- **Auto-assignment**: rewards high-quality providers by assigning beneficiaries who fail to choose a managed care plan to them in greater proportion;
- **Penalties**: repay the state to reflect the failure to meet required performance levels;
- **Withholds**: performance-related funding that Medicaid programs set aside.

Literature Review

- Effect of P4P targeting providers: mixed findings
  - Roski et al. (2003) and Rosenthal et al. (2005): improvements in smoking cessation intervention; cervical cancer screening, mammography, and hemoglobin A1C testing.
  - Hillman et al. (1998) and Hillman et al. (1999): no difference on meeting cancer screening guidelines and use of pediatric preventive care, respectively.
- Effect of P4P targeting Medicaid plans: mixed findings
  - Chien et al.(2010): NY P4P plan improved childhood immunization rate;
  - Guthrie et al. (2009): CA auto-assignment incentive did not improve quality.

Contribution

- National analysis of Medicaid P4P programs:
  - Exploit variation from different adoption years in different states.
  - Kuhmerker and Hartman (2007): summarize existing and new P4P activities in state Medicaid programs.
- One of a few papers that study P4P policies intended for insurance plans;
- Utilize the most up-to-date data.

Data

- National Health Interview Survey (NHIS) (1998, 1999, 2000, 2003, 2005, 2008, 2010)
  - Nationally-representative cross-sectional household interview survey .
  - Personal characteristics: sex, age, race, ethnicity, education level, self-reported health status, any limitation of activity;
- National Immunization Survey (NIS) (1999-2010)
  - Nationally-representative sample of children aged 19 to 35 months;
  - Child characteristics: age group dummies, birth parity, race, ethnicity, sex;
  - Mother characteristics: number of children in the household, education level, mobility dummy, mother age;
  - Family income as percentage of federal poverty line: refer to the Medicaid eligibility criteria for each state and each year, and determine Medicaid eligibility status.
- Medicaid MC penetration rate for each state and year
  - From Center for Medicaid and Medicare Services (CMS);
  - Merge onto NHIS and NIS data in order to identify above/below median penetration rate dummy.

Dependent variable and analysis sample:

Data sources	Dependent variable	Survey year	Medicaid sample size	Medicaid+commercially-insured sample
NHIS	Ever had a mammogram for female respondents between 50 and 64;	98,99,00, 03, 05, 08, 10	1,904	18,811
	Ever had a colonoscopy for respondents between 50 and 64;	00, 03, 05, 08	3,003	44,376
	Ever had any colorectal exam for respondents between 50 and 64;	00, 03, 05, 08	3,003	44,376
	Ever had cholesterol checked for respondent between 40 and 64;	98, 03, 08	4,068	60,634
	Ever had the blood pressure taken for respondent between 40 and 64;	98,99, 03,08	5,331	82,704
	Ever had a PSA test for male respondent between 40 and 64;	99, 00, 03, 05, 08, 10.	3,146	59,041
	Ever had a Pap smear test for female respondent between 40 and 64;	98,99,00, 03, 05, 08, 10	9,818	91,638
	Ever received hepatitis B vaccine for respondent between 18 and 64.	00, 03, 05, 08, 10	18,220	189,887

Dependent variable and analysis sample

Data sources	Dependent variable	Survey year	Sample size
NIS	Up-to-date 4 does of diphtheria-tetanus toxoids-pertussis vaccine (**DTP**)	1999-2010	113,641
	Up-to-date 3 does of poliovirus vaccine (**Polio**)	1999-2010	113,641
	Up-to-date 1 does of measles-mumps-rubella vaccine (**MMR**)	1999-2010	113,641
	Up-to-date 3 does of Haemophilus influenzae type B vaccine (**Hib**)	1999-2010	113,641
	Up-to-date 3 does of hepatitis B vaccine (**Hep B**)	1999-2010	113,641
	Up-to-date 1 doe of Varicella at 12+ months (**Varicella**)	1999-2010	113,641
	Up-to-date 4:3:1 vaccine series (**DTP, Polio, MMR**)	1999-2010	113,641
	Up-to-date 4:3:1:3:3 vaccine series (**DTP, Polio, MMR, Hib and Hep B**)	1999-2010	113,641
	Up-to-date 4:3:1:3:3:1 vaccine series (**DTP, Polio, MMR, Hib, Hep B and Varicella**)	1999-2010	113,641

Empirical Strategy

- **Difference-in-difference (DD) strategy:**

$$Outcome_{ijt} = \beta_0 + \beta_1 state_{ij} + \beta_2 year_{it} + \beta_3 P4P_{ij} \times Post_{it} + \beta_4 X_i + \varepsilon_{ijt} \quad (1)$$

- $state_{ij}, year_{it}$: state dummies, year dummies;
- X_i: respondent characteristics;
- $P4P_{ij} \times Post_{it}$: being in a state with a P4P policy after the adoption year;
- Analysis sample: Medicaid-insured respondents.

Empirical Strategy

- **Difference-in-difference-in-difference (DDD) strategy:**

$$Outcome_{ijt} = \beta_0 + \beta_1 state_{ij} + \beta_2 year_{it} + \beta_3 D_i + \beta_4 P4P_{ij} \times Year_{it} + \beta_5 P4P_{ij} \times D_i + \beta_5 D_i \times state_{ij} + \beta_7 D_i \times P4P_{ij} \times Post_{it} + \beta_8 X_i + \varepsilon_{ijt} \quad (2)$$

Two strategies:	D_i	Sample
1	Dummy for being in a state with above-median Medicaid managed care penetration rate	Medicaid respondents
2	Dummy for being covered by Medicaid insurance	Medicaid and commercially-insured respondents

Results: NHIS data with Medicaid sample

Table 1: Impact of P4P program on cancer screen rate and other preventive care services								
	mammography	colonoscopy	colorectal	cholesterol	blood pressure	PSA test	Pap smear test	adult Hep B
DD								
P4P X post	**0.0517***	0.0125	-0.0111	**0.0559***	0.0408	0.0092	0.0210	-0.0036
	(0.028)	(0.025)	(0.026)	(0.029)	(0.026)	(0.021)	(0.021)	(0.011)
R squared	0.082	0.079	0.076	0.091	0.130	0.095	0.041	0.057
DDD with above median MC pen rate								
Above Median MC X P4P X post	0.0709	0.0749	0.0599	**0.1595****	**0.1124****	-0.0583	**0.1145****	**0.0415***
	(0.055)	(0.060)	(0.060)	(0.062)	(0.055)	(0.042)	(0.049)	(0.022)
R squared	0.094	0.083	0.080	0.093	0.132	0.099	0.045	0.059
Obs.	1904	3003	3003	4068	5331	3146	9818	18220
Mean of outcome	0.8656	0.1607	0.1828	0.4484	0.4817	0.1576	0.5190	0.1479
Std. Dev.	[0.008]	[0.007]	[0.007]	[0.009]	[0.008]	[0.007]	[0.006]	[0.003]

Results: NHIS data with Medicaid and commercially-insured sample

Table 1: Impact of P4P program on cancer screen rate and other preventive care services (cont'd)								
	mammography	colonoscopy	colorectal	cholesterol	blood pressure	PSA test	Pap smear test	adult HepB
DDD								
Medicaid X P4P X post	**0.0542****	0.0037	-0.0079	**0.0630****	**0.0463***	0.0013	0.0155	0.0030
	(0.025)	(0.020)	(0.023)	(0.029)	(0.025)	(0.021)	(0.019)	(0.009)
R squared	0.033	0.035	0.033	0.021	0.095	0.059	0.018	0.035
DDD with state specific linear trend								
Medicaid X P4P X post	**0.0598****	0.0070	-0.0069	**0.0652****	**0.0548****	0.0019	0.0137	0.0009
	(0.025)	(0.020)	(0.023)	(0.029)	(0.025)	(0.021)	(0.019)	(0.009)
R squared	0.036	0.037	0.035	0.023	0.096	0.060	0.019	0.036
Obs.	18811	44376	44376	60634	82704	59041	91638	189887
Mean of outcome	0.9332	0.1500	0.1867	0.3864	0.3588	0.1711	0.4411	0.1357
Std. Dev.	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]

Results: NIS data with Medicaid sample

Table 2: Impact of P4P on the childhood immunization rate									
	DTP	Polio	MMR	Hib	Hep B	Varicella	431	43133	431331
DD									
P4P X post	**0.0162****	0.0042	0.0057	**0.0161*****	0.0024	0.0007	**0.0159***	**0.0215****	0.0075
	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.008)	(0.009)	-0.009
R squared	0.043	0.022	0.014	0.027	0.017	0.097	0.042	0.039	0.067
DD with state specific linear trend									
P4P X post	**0.0289****	0.0053	**0.0155***	0.0074	0.0081	0.0088	**0.0253****	0.0164	-0.0018
	(0.012)	(0.009)	(0.009)	(0.008)	(0.008)	(0.011)	(0.012)	(0.013)	-0.014
R squared	0.045	0.023	0.016	0.031	0.019	0.104	0.044	0.042	0.072
DDD with above median MC pen rate									
Above Median MC X P4P X post	0.0053	-0.0113	0.0035	0.0151	-0.0107	**0.0274****	0.0021	0.0153	**0.0334****
	(0.012)	(0.009)	(0.009)	(0.009)	(0.009)	(0.011)	(0.013)	(0.013)	-0.014
R squared	0.043	0.023	0.014	0.028	0.018	0.098	0.043	0.040	0.068
Obs.	113641	113641	113641	113641	113641	113641	113641	113641	113641
Mean of outcome	0.8148	0.9069	0.9055	0.9059	0.9096	0.8249	0.7899	0.7472	0.6703
Std. Dev.	[0.002]	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]

Conclusion

- Medicaid P4P programs have increased the use of preventive care services;
  - cancer screening rate: mammogram, Pap smear test
  - cholesterol check,
  - blood pressure test,
  - adult Hep B vaccine rate
  - childhood immunization rate: up-to-date 4:3:1:3:3:1 vaccine series.

- Greater impact for respondents in the state with a higher Medicaid managed care penetration rate.

Future research

- Which P4P plan feature is most efficient in improving performance?
  - Incentive types: differential reimbursement rate, auto-assignment or penalty.
  - Accreditation status, etc.

- Examine the effect of P4P programs on other outcomes, such as:
  - Hospitalization which could be avoided through preventive care;
  - Mortality and health status which could be improved through preventive care.

- Study whether programs have unintended policy effects such as increased racial disparity;
  - Casalino et al. (2007).