Essays on Payment Reform, Physician Compensation and the Clinical Workforce

Essays on Payment Reform, Physician Compensation and the Clinical Workforce

A doctoral dissertation presented by

Adrian Garcia Mosqueira

to

The Committee on Higher Degrees in Health Policy

in fulfillment of the requirements

for the degree of

Doctor of Philosophy

in the subject of

Health Policy

Harvard University

Cambridge, Massachusetts

May 2019

Dissertation Advisor: Thomas McGuire Adrian Garcia Mosqueira

Essays on Payment Reform, Physician Compensation and the Clinical Workforce

Abstract

The purpose of this dissertation is to study specific policies within the recent wave of health care reform and their ground-level impacts on care delivery in the United States. This work analyzes changes in (i) the geographic distribution of the clinical workforce, (ii) the patterns of care-delivery by primary care physicians, and (iii) the collection and usage of information technology by medical practices that serve vulnerable populations.

The first chapter concerns itself with the Affordable Care Act (ACA) specifically the Medicaid expansion, and its effect on the concentrations of physicians and other clinicians in states that chose to expand Medicaid. Using a dataset containing counts of various health care professionals by county over six years, I find that states that expanded Medicaid had, on average significantly higher densities of all clinicians studied, including Primary Care Physicians (PCP), Nurse Practitioners, Physician Assistants, and M.D. Specialists. After accounting for the intensity of the expansion by including county-level measures of Expansion beneficiaries, there was no association with the concentration of clinicians, suggesting that previous research evidence showing increases in health care access and utilization post-Medicaid expansion were not a product of increased clinician headcounts.

Chapter 2 narrows in scope by looking only at PCPs, documenting the overall compensation landscape, as well as changes in care-delivery patterns due to reforms in physician compensation. Using a national dataset from 2012-2015 on ambulatory physician visits, this chapter uncovers evidence that system-level payment reform had little impact on front-line PCP

compensation patterns, and that fee-for-service remains the dominant compensation model. Beyond compensation, I analyze whether physician compensation models are associated with delivery rates of some essential elements of primary care, such as nursing home visits, hospital visits, as well as a series of high and low value care measures. I find little evidence that payment reform and the resulting changes in compensation model impact rates of delivery of these types of care, prompting the need for further study on the topic as alternative payment models and value-based contracting programs take root and mature.

Chapter 3 broadens beyond clinicians by looking at other inputs of care delivery. The collection and use of physician performance on quality metrics and costs is a critical component of a practice's ability to improve the value of care delivered. Safety-net practices (SNPs) face several challenges, including resource constraints, complex and vulnerable patient populations, suggesting that they might face difficulties in collecting these data for the purposes of physician evaluation and internal quality improvement relative to other practices. Moreover, as value-based contracting takes hold, SNPs are under pressure to collect these data and use it for quality and efficiency of care improvements, or risk financial penalties. Using an innovative national data source of primary care and multi-specialty practices, this study finds that SNPs do not have lower rates of physician performance data collection and use for the purposes of providing feedback, internal quality improvement, and physician compensation relative to other practices. Moreover, SNPs do not seem to possess lower health information technology capacities when compared to other sample practices. While SNPs do underperform in programs that provide economic incentives for improvement, these results suggest that these shortcomings are not due to deficits in information technology capabilities.

Table of Contents

Chapter 1: The Medicaid Expansion and the Clinical Workforce

Adrian Garcia Mosqueira and Benjamin D. Sommers

Abstract

Objective: To assess changes in the clinical workforce, as measured by multiple distinct types of clinicians, associated with the Affordable Care Act's Medicaid expansion, and to measure baseline differences in provider capacity between expansion versus non-expansion states.

Data Sources: Area Health Resources File (AHRF) for 2011-2016.

Study Design: Comparison of clinician counts per 100,000 residents (including primary care physicians, specialists, nurse practitioners, and physician assistants) between expansion and non-expansion states in the pre-ACA period. Then we use a Triple Difference (DDD) model exploiting pre-expansion uninsured rates and state Medicaid expansion decisions to estimate the causal impact of the Medicaid expansion on these outcomes.

Principal Findings: Pre-ACA clinical workforce capacity was higher for all clinician types in expansion states than in non-expansion states. Post-ACA, we find no evidence that the Medicaid expansion was associated with changes in the clinical workforce.

Conclusions: States that expanded Medicaid were likely better prepared to handle increases in healthcare demand due to their larger existing stock of clinicians. The Medicaid expansion was not associated with changes in the clinical workforce. Previous research evidence showing increases in healthcare access and utilization associated with the Medicaid expansion does not appear to be due to increases in the numbers of clinicians in expansion states.

Key Words: Medicaid expansion, clinical workforce, healthcare access, payment reform

Introduction

The Affordable Care Act (ACA) amended Medicaid eligibility requirements, expanding Medicaid coverage to all legal residents and U.S. citizens earning less than 138% of the Federal Poverty Level, but a 2012 Supreme Court ruling effectively made the Medicaid expansion optional for states. [1] When the ACA went into effect in 2014, 26 states chose to expand Medicaid, and as of today, that number sits at 36 states and the District of Columbia. However, states that did not expand Medicaid continue to debate the merits of doing so, and some of those arguments include the experience for expansion states. There is strong evidence that the Medicaid expansion led to increased access to health care, use of medication, early detection and management of chronic diseases, and mortality reductions for high-risk populations. [2–8] Moreover, the Medicaid expansion also had economic impacts, including the reduction of hospital uncompensated care, Medicaid increasing its share in provider payer mix, improved hospital finances, and the reduction of health care out-of-pocket expenditures for recipients.[9–12] However, after the passage of the ACA, there were concerns that gains in coverage could lead to spikes in demand for health care that could overrun the available health care resources and potentially dampen any gains in health care access from expanding coverage.[13–15] This largely did not come to pass. Previous studies show that Medicaid beneficiaries have benefitted from increased access to health care, but are not "crowding out" patients with other forms of coverage.[16] But how states managed this increase in demand is not well understood. This paper informs this open question by measuring levels of clinical workforce capacity in expansion vs. non-expansion states at baseline, as well as whether the Medicaid expansion was associated with changes in that capacity over time. One mechanism through which the Medicaid expansion could impact the stock of clinicians in a state (or stock of clinicians treating Medicaid patients) is through policies such as the ACA's temporary increase in reimbursement rates for primary care clinicians treating Medicaid patients. Another possibility rests on the demand for health care induced by the expansion: hospitals and other providers in counties that expected large increase in Medicaid areas could recruit and hire more clinicians. While prior research has examined the short-term impact of that payment increase, and one study examined the effects of Medicaid expansion in a single state on provider participation, [17] a broader examination of the effects of the Medicaid expansion on the clinical labor supply is an untested empirical question that we address here.

This paper also provides evidence on whether the Medicaid expansion had different impacts across areas with varied demographics at baseline. Specifically, we focus on whether these effects varied based on the "intensity" of the expansion, measured as the magnitude change in the population share that was newly-eligible for insurance coverage. We also look at the experiences across different population densities by analyzing whether the Medicaid expansion had different impacts in urban, suburban, and rural counties. Recent studies suggest that health care accessibility varies geographically and it is not clear how the ACA may have influenced provider capacity across different areas.[18]

The topics examined in this paper have several important policy implications. Policymakers considering increasing coverage should be aware of their local health care resource availability and expected beneficiary increases relative to expansion states before expecting similar gains from expanding Medicaid.[19] Moreover, the growing demand for health care is a source of job creation, but whether the Medicaid expansion is an engine for growth of the local clinical workforce is another open question with important economic and policy consequences. Finally, this paper sheds light on how health care systems are tackling the increase in health care demand from the expansion. Previous studies show that Medicaid beneficiaries have benefitted from increased access to health care, but are not "crowding out" patients with other forms of coverage. [16] This suggests that providers are either increasing their clinical capacity or becoming more efficient in their care delivery. This study explores the former possibility by measuring associations between county-level clinical workforce capacity and the Medicaid expansion.

Methods

Data

We use the Area Health Resources Files (AHRF) county-level data for years 2011-2016 for all analyses. The AHRF is a collection of data from multiple sources with counts of health care professionals, resources, and facilities. AHRF has physician counts by specialty, as well as various other clinicians, including nurses, physician assistants, etc. The AHRF also provides population demographics, hospital expenditures, utilization of health care resources, and macroeconomic indicators. Data on state Medicaid expansion status came from the Kaiser Family Foundation's Status of State Action on the Medicaid Expansion Decision. [20] County-level urban and rural designations were obtained from the Center for Disease Control's National Center for Health Statistics.

Our primary outcomes of interest are the per-county number of MDs, primary care physicians, specialists, residents, international medical graduates, physician assistants, and nurse practitioners per 100,000 residents. We calculate these outcomes by using data provided by AHRF for expansion and non-expansion states. We focus on a wide spectrum of clinicians to explore the impact the Medicaid expansion had on health care professionals with different licensing and training requirements, some of which may be more likely to migrate across states and/or increase their prevalence in the work force over short periods of time in response to policy changes.

Our main exposure of interest is a given state's Medicaid expansion program status. We calculate a binary variable for whether the Medicaid expansion is in effect in a county at a given point in time. We control for county-level demographics, including median income, unemployment rate, and shares of the population that attended college, is female, is over 65 years of age, and is non-Hispanic white. Our other main exposure is the baseline county-level uninsured rates, which proxies for the intensity of the Medicaid expansion. [4,21,22]

Statistical Analyses

Our baseline model is a simple Difference-in-Differences specification. Specifically, we estimate

$$Y_{ct} = \beta_0 + \beta_1 Effect_{ct} + \beta_2 \boldsymbol{X'_{ct}} + \tau_t + \alpha_c + \epsilon_{ct} \qquad (1)$$

Where *Effect* denotes whether Medicaid has expanded in county *c* at time *t*, τ_t are year fixed effects, α are county-level fixed effects, X**'** is a vector of economic and demographic controls, and ε is the error term. B_1 measures the effect of the Medicaid expansion on our clinical workforce outcome, which is the change in the number of clinicians in expansion states relative to non-expansion states. Most states that expanded Medicaid did so in 2014, but other states, such as Pennsylvania, did not expand until 2015. As such, the *Effect* variable accounts for whether and when states expanded Medicaid. Standard errors are clustered at the state level, and estimates are weighed by county population.

Equation (1) assumes that the Medicaid expansion has the same effect in all states that expanded, conditional on our other covariates. In addition, it assumes that post-2014, there would be no differential changes in our outcomes between expansion and non-expansion states in the absence of the Medicaid expansion. This assumption is strong – it assumes that there are no other unobserved factors that influenced a state's decision to expand Medicaid that correlate with our outcomes over time. Finally, as in all DD models, it assumes that pre-treatment trends in our outcomes are parallel.

Our preferred specification, equation (2) below, relaxes these assumptions somewhat. We use a difference-in-differences-in-differences (DDD) approach to measure the impact of the Medicaid expansion on our workforce outcomes. Our third difference comes from county-level variation in uninsured rates in 2013, the year before the first set of Medicaid expansions took effect. This source of variation allows us to proxy for the intensity of the Medicaid expansion. The DDD model is our preferred specification, and is as follows:

$$Y_{ct} = \beta_0 + \beta_1 Effect_{ct} + \beta_2 (Unisrd_{c2013} \times Effect_{ct}) + \beta_3 (\tau \times Unisrd_{c2013}) + \beta_4 \boldsymbol{X'}_{\boldsymbol{ct}} + \tau_t + \alpha_c + \epsilon_{ct} \quad (2)$$

Where $Unisrd_{2013}$ is the uninsured rate in county c in 2013, B_2 describes the differential effect of the Medicaid expansion in counties with high uninsured rates relative to counties with low uninsured rates in 2013, including the uninsured rate at baseline serves as a measure of the impact of the Medicaid expansion at the county level. We would expect counties with relatively high uninsured rates pre-expansion would experience a bigger impact from the Medicaid expansion, since the expected coverage gains would be higher relative to counties with low baseline uninsured rates. B_3 is the interaction between baseline uninsured rate and year fixed effects. As before, τ_t denote year fixed effects, α are county-level fixed effects, X**'** is a vector of controls, and ε is the error term.

We also repeat our preferred specification analysis on two subsamples. The first subsample analysis is done over counties with baseline uninsured rate in 2013 above and below the median, which we denote as our split sample analysis. This analysis is done to confirm the results from our DDD model and to provide a more straightforward interpretation on the DD coefficients, related to baseline uninsured rates. The second subsample analysis is performed over population density classifications into urban, suburban and rural counties. Our goal with this subsample is to document whether the Medicaid expansion is associated with differential effects in counties with differing population densities, and thus different clinical resources.

Results

Pre-treatment Trends

Figure 1.1 presents visual evidence whether the pre-treatment parallel trends assumption holds for each individual outcome. We see no evidence of differential trends for any of our outcomes between expansion and non-expansion county data before 2014. We formally tested this assumption by interacting the treatment effect, *Expansion*, with dummy variables for all but one of the pre-treatment years and confirmed that that the pretreatment trends are not significantly different from each other across expansion and non-expansion states. Notably, our unadjusted results show that counties in expansion states had higher concentration of all clinician outcomes.

Figure 1.1 – Mean Medical Professionals Over Time, Expansion versus non-Expansion Counties

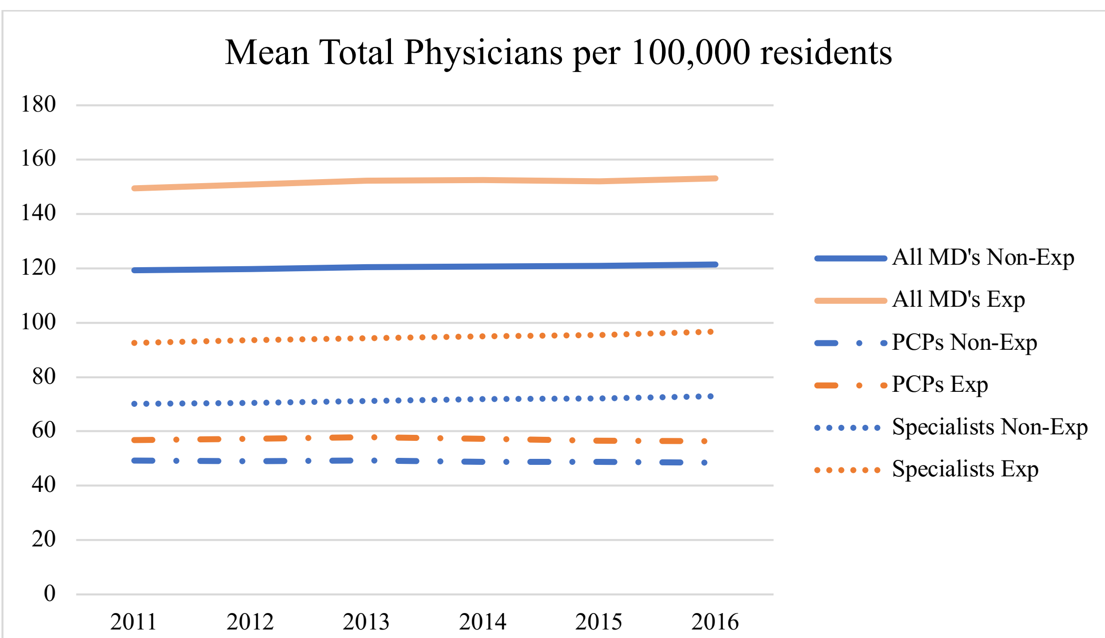
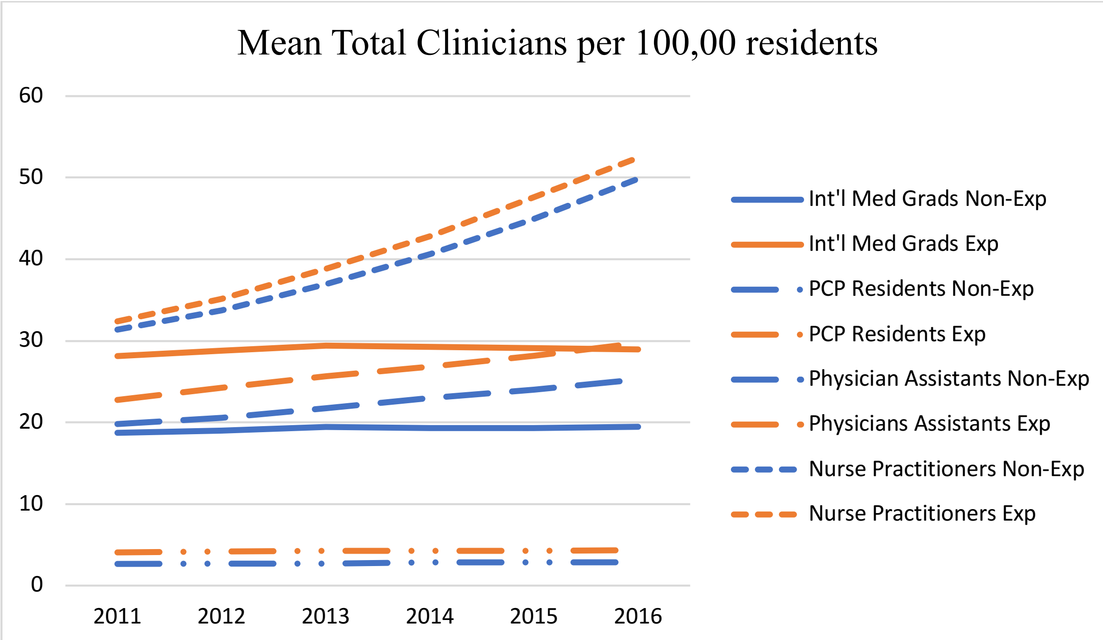


Figure 1.1 (Continued)



Baseline Differences in Clinician Workforce Capacity

Table 1.1 presents the descriptive statistics for each of our outcomes. We present the means and standard deviations for our full sample, expansion versus non-expansion counties, for counties with baseline uninsured rate above and below the sample median (17.3%), and for urban, suburban and rural counties. We confirm the trend seen in **Figure 1.1**: counties in states expanded Medicaid have higher concentrations of all clinicians relative to non-expansion states. For instance, expansion states have about 25.9% more physicians and 32.3% more specialists per 100,000 residents relative to non-expansion states. This is the case across all other clinicians, although the differences are less stark for physician assistants and nurse practitioners, at 17.0 % and 4.8% respectively. We also see that counties with lower uninsured rates at baseline have larger clinical workforces relative to counties with higher shares of their population without insurance coverage. These differences are even more pronounced than those observed in between expansion and non-expansion states, which indicates substantial within-state heterogeneity.

Finally, as expected, we see much higher levels of medical professionals – particularly specialists – in urban counties, with the lowest levels in rural counties, and suburban counties in between the two extremes. As before, the differences in physician assistances and nurse practitioners are much less pronounced relative to physicians of all specialties.

Table 1.1 – Descriptive Statistics on Clinician Workforce Capacity, By Medicaid Expansion Status, Baseline Uninsured Rate, and Geography

OUTCOMES PER 100,000	FULL SAMPLE	EXPANSION	NON-EXPANSION	LOW UNINSURED	HIGH UNINSURED	URBAN	SUB-URBAN	RURAL
ALL PHYSICIANS	135.2	151.7	120.4	161.6	108.1	455.4	190.7	93.3
	(170.3)	(187.6)	(151.6)	(195.4)	(134.7)	(229.0)	(232.9)	(84.6)
PCPS	52.8	57.1	48.9	59.7	45.8	88.3	59.0	48.1
	(35.8)	(36.6)	(34.6)	(37.7)	(32.3)	(22.4)	(38.1)	(33.6)
SPECIALISTS	82.4	94.6	71.5	102.0	62.4	367.1	131.7	45.2
	(145.0)	(161.3)	(127.6)	(167.6)	(114.0)	(213.2)	(201.3)	(61.8)
IMGS	23.8	28.9	19.2	29.8	17.6	89.9	36.5	14.5
	(39.6)	(48.3)	(28.9)	(48.6)	(26.0)	(47.6)	(54.5)	(20.9)
PCP RESIDENTS	3.5	4.2	2.8	4.5	2.4	25.57	6.3	1.1
	(10.8)	(12.1)	(9.5)	(12.3)	(9.0)	(19.0)	(15.1)	(4.6)
PHYSICIAN ASSISTANTS	24.2	26.2	22.4	27.7	20.9	40.6	24.8	23.3
	(32.1)	(35.8)	(28.2)	(36.7)	(26.1)	(23.0)	(38.6)	(27.9)
NURSE PRACTITIONERS	40.5	41.5	39.6	41.4	39.6	73.9	42.1	38.5
	(33.9)	(32.2)	(35.3)	(33.4)	(34.5)	(48.9)	(36.2)	(31.3)

Note: Standard deviations in parenthesis. N = 18,855 for all physicians, PCPs, Specialists, Int'l Medical Graduates, PCP Residents. N = 18,819 for Physician Assistants and Nurse Practitioners.

Effects of Medicaid Expansion on the Clinician Workforce

Table 1.2 shows our regression results for changes in the clinician workforce associated with the Medicaid expansion. The first column presents the results for our simple DD model, comparing pre-post changes for expansion vs. non-expansion states. We find no significant association between the Medicaid expansion and changes in clinical workforce capacity in any of our outcomes of interest.

Table 1.2 – Medicaid Expansion Effects on Clinical Workforce

OUTCOMES PER 100,000	COEFFICIENT OF INTEREST	SIMPLE DD (1)	LOW UNINS (2)	HIGH UNINS (3)	FULL SAMPLE DDD (4)
ALL PHYSICIANS	Expansion In Effect	1.36	1.17	-0.96	**5.59**
		(0.18)	(0.37)	(0.45)	**(0.09)**
	In Effect * Unins13	-	-	-	**-0.33**
		-	-	-	**(0.06)**
PCP	Expansion In Effect	-0.05	-0.29	-0.16	**-0.10**
		(0.85)	(0.51)	(0.67)	**(0.91)**
	In Effect * Unins13	-	-	-	**-0.01**
		-	-	-	**(0.89)**
SPECIALISTS	Expansion In Effect	1.41	1.45	-0.81	**5.68**
		(0.13)	(0.21)	(0.44)	**(0.06)**
	In Effect * Unins13	-	-	-	**-0.33****
		-	-	-	**(0.05)**
INT'L MEDICAL GRADS	Expansion In Effect	-0.35	-0.33	-0.66	**-0.53**
		(0.18)	(0.39)	(0.13)	**(0.52)**
	In Effect * Unins13	-	-	-	**0.003**
		-	-	-	**(0.95)**
PCP RESIDENTS	Expansion In Effect	0.02	0.20	-0.08	**0.44**
		(0.94)	(0.38)	(0.79)	**(0.46)**
	In Effect * Unins13	-	-	-	**-0.02**
		-	-	-	**(0.66)**
PHYSICIAN ASSISTANTS	Expansion In Effect	1.05	1.12	0.01	**4.17****
		(0.127)	(0.144)	(0.980)	**(0.033)**
	In Effect * Unins13	-	-	-	**-0.24****
		-	-	-	**(0.02)**
NURSE PRACTITIONERS	Expansion In Effect	-2.25	-0.92	-4.69**	**2.99**
		(0.103)	(0.505)	(0.014)	**(0.368)**
	In Effect * Unins13	-	-	-	**-0.37**
		-	-	-	**(0.07)**

Note: P-values in parenthesis. ** P<0.05 ***P<0.001. Clustered standard errors at the State level.

Columns 2 and 3 present the results of our split sample analysis based on county-level uninsured rates in 2013. For most outcomes, the results remain insignificant for both groups of counties. However, we did find that the Medicaid expansion was associated with a significant reduction in Nurse Practitioners by 4.7 per 100,000 residents in counties that had high uninsured rates at baseline.

Column 4 contains the results of the DDD model that exploits county-level variation in baseline uninsured rates. Our model finds no difference in the impact of the Medicaid expansion between high and low county-level baseline uninsured rates in most of our outcomes of interest. The estimates for the interaction term, "Expansion in Effect* Uninsured13" are negative in most of our outcomes but this association is only significant for Specialists and Physician Assistants at the 95% confidence level. This is effect is counterintuitive, as it suggests that that the effects from the Medicaid expansion were relatively more pronounced in counties that had lower uninsured rates at baseline. However, the expansion direct effect, "Expansion in Effect," are much larger in magnitude and positive in these two cases, as such offsetting these counterintuitive results.

Table 1.3 contains the analysis done on a sample stratified by into urban, suburban and rural counties. We present the analysis for our baseline DD specification and the DDD model. Our baseline model suggests that the Medicaid expansion was associated with a decrease of 2.04 international medical graduates in urban areas relative to states that did not expand. However, this result becomes insignificant in our DDD specification. A similar pattern holds for nurse practitioners based in suburban counties, which are associated to a drop by 2.38 per 100,000 residents in states that expanded Medicaid, but again, these results do not hold in our DDD model. The expansion is associated with a 10.3 per 100,000 resident increase in urban physician assistants when compared to non-expansion areas, although this effect was larger in counties with low uninsured rates relative to those that high higher uninsured rates in 2013, as denoted by the negative and significant interaction term.

Discussion

Table 1.3 – Urban, Suburban and Rural Impacts of the Medicaid Expansion

OUTCOMES PER 100,000	COEFFICIENTS OF INTEREST	BASELINE DD			FULL SAMPLE DDD		
		Urban	**Suburban**	**Rural**	**Urban**	**Suburban**	**Rural**
ALL PHYSICIANS	Expansion In Effect	-1.16	1.57	-1.20	14.91	-2.29	0.0007
		(0.69)	(0.21)	(0.19)	(0.20)	(0.56)	(1.00)
	In Effect * Unins13	-	-	-	-0.97	0.20	-0.09
		-	-	-	(0.10)	(0.46)	(0.70)
PCPS	Expansion In Effect	-0.39	-0.16	-0.20	0.98	-1.47	2.00
		(0.40)	(0.60)	(0.62)	(0.57)	(0.10)	(0.31)
	In Effect * Unins13	-	-	-	-0.08	0.08	-0.13
		-	-	-	(0.42)	(0.12)	(0.22)
SPECIALISTS	Expansion In Effect	-0.77	1.73	-1.00	13.94	-0.82	-2.00
		(0.77)	(0.13)	(0.16)	(0.22)	(0.83)	(0.52)
	In Effect * Unins13	-	-	-	-0.89	0.11	0.04
		-	-	-	(0.12)	(0.65)	(0.82)
INT'L MEDICAL GRADS	Expansion In Effect	-2.04**	-0.14	-0.45	-3.24	-1.55	-1.06
		(0.01)	(0.68)	(0.21)	(0.33)	(0.16)	(0.47)
	In Effect * Unins13	-	-	-	0.05	0.09	0.03
		-	-	-	(0.73)	(0.16)	(0.70)
PCP RESIDENTS	Expansion In Effect	-0.16	0.00	-0.09	0.00	0.61	-0.32
		(0.76)	(0.98)	(0.51)	(0.99)	(0.20)	(0.60)
	In Effect * Unins13	-	-	-	0.01	-0.03	0.01
		-	-	-	(0.89)	(0.32)	(0.63)
PHYSICIAN ASSISTANTS	Expansion In Effect	0.55	0.81	0.37	10.27**	1.27	-0.51
		(0.52)	(0.20)	(0.58)	(0.02)	(0.40)	(0.81)
	In Effect * Unins13	-	-	-	-0.64**	-0.05	0.03
		-	-	-	(0.01)	(0.61)	(0.82)
NURSE PRACTITIONERS	Expansion In Effect	-5.44	-2.38**	-0.08	1.01	1.31	-3.35
		(0.08)	(0.05)	(0.96)	(0.91)	(0.73)	(0.41)
	In Effect * Unins13	-	-	-	-0.43	-0.28	0.17
		-	-	-	(0.34)	(0.29)	(0.45)

Note: P-values in parenthesis. ** P<0.05 ***P<0.001. Clustered standard errors at the State level.

In our study of the state clinical workforce from 2012-2016, we found sizable differences in pre-ACA (2014) clinical workforce capacity between states that did expand Medicaid, and those that did not. States that expanded Medicaid had higher concentrations of all clinicians we examined in our study at baseline, and this trend did not change over time. This suggests that health outcome improvements associated with the Medicaid expansion might have been influenced by the larger clinical workforce available in expansion states relative to non-expansion states. Moreover, we did not observe a ramp-up in clinicians counts in anticipation of the expansion as seen in the parallel trends between expansion and non-expansion states prior to 2014, and no consistent pattern of increased workforce numbers after expansion.

With the exception of physician assistants, which had a slight increase of clinicians per 100,000 residents in expansion states, we did not find much evidence that the Medicaid expansion was associated with significant changes in clinician capacity. How did expansion states accommodate increased demand for health care without any changes in provider capacity? One possibility is that our measure of clinical workforce, namely clinician headcounts, do not capture the ways in which clinician capacity has increased in order to meet this new demand. For example, clinicians could improve their delivery efficiency, or simply work longer hours to meet the demand created from expansion.

We also found suggestive evidence that areas with higher uninsured shares of the population pre-expansion had negative workforce effects from the expansion relative to areas with low uninsured rates. This is a counterintuitive finding, but one possibility is that if areas with higher baseline uninsured rates have lower health care capacity, it follows that the expansion would have dampened effects in increasing the clinical workforce relative to areas with higher levels of health care resources and smaller shares of their population being uninsured. Finally, we observe that within physician assistants, the association between the Medicaid expansion and the clinical workforce was positive and significant, but also larger in urban areas. Taken together, our results suggest that the Medicaid expansion was, largely, not a driver of an increase in the available clinical workforce.

Limitations

One of our main limitations is that our measure of clinical workforce capacity, namely, number of clinicians per 100,000 residents, is not equivalent to capacity available to the newly-eligible

Medicaid recipients. While increased clinician counts are likely associated with increased capacity for the newly-eligible, increased access can also be achieved via substitution effects. For example, clinicians could see more Medicaid patients, and less patients from other payers. Moreover, clinician head counts do not account for changes in the number of hours of care delivery from clinicians, so are not equivalent to effective labor supply, or full-time equivalent measures.

In addition, while our study covers an array of clinicians with different roles within an organization, and with different training requirements, it is by no means an exhaustive list. There might be other health care professionals that are not measured here that might be more receptive to the workforce effects from a Medicaid expansion.

Another limitation is that we treat Medicaid and its subsequent expansion equally across states, other than accounting for the baseline uninsured rate in each county. Medicaid coverage, reimbursement rates, and even the form of expansion varies across states. Arkansas and its "private option," where the state uses expansion funds and insurance for eligible Medicaid beneficiaries, via commercial plans. This might have different impacts on the clinical workforce than a more traditional Medicaid expansion.

Conclusion and Policy Implications

Our findings on the Medicaid expansion and the clinical workforce have several policy implications. First, states that expanded Medicaid thus far have larger clinical workforces relative to states that have not expanded. Across all our measures, Medicaid expansion states had higher pre-ACA concentrations of medical professionals (in some cases as high as 30% greater per capita) relative to states that did not expand Medicaid, and that trend remained largely stable through 2016. A concern around the Medicaid expansion was that gains in access to healthcare would be dampened by the surge in demand for care from the newly-eligible population. There is little evidence that this concern manifested in other research to date; however, our research shows that this might have been in part because the states that expanded coverage had higher capacity to handle these health care demand surges. As such, gains in access from future Medicaid expansions might be dampened due to these smaller clinical workforces in the remaining non-expansion states.

Secondly, the Medicaid expansion was not associated with major changes in the stock of clinical workforce. This suggests that the expansion did not produce large enough labor demand increases from hospitals and clinics that would generate changes in the clinical workforce between expansion and non-expansion states. Changes in the workforce over a timeframe of 3-5 years, as studied here, could take two primary forms – first is a reallocation of existing clinicians, though selective job-hiring and migration; second is a change in the overall number of clinicians, due to increased graduation or training rate, or reduced retirement rates. Our findings suggest none of these mechanisms occurred in large enough numbers to produce differential changes in workforce capacity at the county-level. Why this is the case is subject to debate. Clinicians might have a preference to practice in places where larger shares of the patient population have insurance coverage, and thus reduced levels of charity or uncompensated care. The converse is also plausible – some providers might simply prefer not to practice in areas with more Medicaid-insured patients given some of the drawbacks of Medicaid, such as heavier administrative burdens and delays in reimbursements. Or, clinicians may simply be reluctant to move at all in response to policy changes. In terms of newly-minted clinicians, the timeline may simply be too short to detect any changes – though in the case of hiring internal medical graduates or physician assistants, 2-3 years is likely long enough to detect an increase in newly-practicing clinicians in the U.S. Meanwhile, selective retirement is also plausible to occur over such a time frame but does not appear to have happened in our dataset.

Finally, a well-documented empirical finding is that the Medicaid expansion is associated with gains in coverage, access, and health care utilization levels. Our research shows that there is no differential increase in the number of providers in states that expanded Medicaid. Combined with previous research showing that Medicaid beneficiaries have not crowded out patients with other forms of insurance, our study provides evidence that clinicians might be providing care more efficiently or supplying more work hours. Future research can explore these aspects of clinical care to better understand the impacts of coverage expansion.

Chapter 2: Physician Compensation and Patterns of Care Delivery in the U.S., 2012-2015

Adrian Garcia Mosqueira, Meredith Rosenthal and Michael Barnett

Abstract

Importance: As health systems seek ways of transmitting incentives to front-line physicians, the relationship between physician compensation and health care delivery is an increasingly important knowledge gap.

Objective: To examine the national landscape of physician compensation and its relationship with care delivery patterns.

Design: Observational analysis using 2012-2015 cross-sectional data from the nationally representative National Ambulatory Health Care Survey (NAMCS).

Setting: Ambulatory visits from a nationally representative sample of non-federal physicians.

Participants: 175,762 office visits from 3,826 PCPs representing 1.9 billion office visits and 620,631 PCPs nationally.

Exposures: Primary care physician (PCP) compensation (defined as productivity-based, salaried, or "mixed"), practice ownership, including the existence of 6 additional factors affecting compensation (FACs) including patient satisfaction, personal productivity, and overall practice financial success.

Main Outcomes and Measures: The likelihood of PCPs engaging in different types of out-of-visit care (patient home or hospital visits; phone and email consultations) or rates of delivery of 12 high- or 8 low-value care measures (e.g. opioids for back/neck pain, aspirin use in coronary artery disease, treatment for osteoporosis).

Results: Nationally from 2012-2015, 15.4% of PCPs reported being salary-based employees, 4.5% were productivity-based employees, 12.9% were mixed compensation employees, and

61.4% were owners or solo practitioners. After adjustment, delivery of out-of-visit/office care was more common for practice owners and “mixed” compensation PCPs while there was little association between compensation type and 5 types of out-of-visit care or the 20 high- and low-value care measures.

Conclusions and Relevance: Despite early health reform efforts, the overall landscape of physician compensation has remained strongly tethered to fee-for-service. The lack of consistent association between compensation and care delivery raises questions about the potential impact of payment reform on individual physicians’ behavior.

Introduction

In an effort to restrain health care cost growth and improve quality of care, the US Department of Health and Human Services has committed to the ambitious goal of tying 90% of all Medicare provider payments to quality or value-based measures by 2018. [23] This reflects building momentum across the health care system away from fee-for-service (FFS) as the predominant payment model for physician services, motivated by the widespread belief that FFS promotes wasteful use of health care resources. [24,25] One open question in the movement away from FFS, which has largely focused on system-level payment arrangements, is how individual physician compensation models, such as salaried vs. productivity-based payments, are associated with meaningful differences in behavior. Payment reforms continue to broaden their scope via new initiatives such as the Merit-Based Incentive Payment System, which adjusts provider payments based on their performance in quality of care and efficient use of resources and publicly reports provider performance. [26] In light of these changes, we expect that health systems will seek ways of transmitting incentives to front-line physicians, heightening the importance of closing the knowledge gap on the relationship between compensation and health care.

The structure of physician compensation has important implications for health care delivery and spending. The theoretical relationship between physicians' financial incentives and health care utilization is well-founded in the literature. [27–29] Empirically, physician compensation in the U.S. is typically either *salaried,* where physicians are paid a fixed amount per session or other unit of time or *productivity-based*, where physicians are compensated based on volume or a share of practice billings, possibly as an owner or part-owner of a practice. [30] The most recent evidence on physician compensation is over a decade old, but has showed that productivity-based compensation predominated. [30,31] Research suggests that productivity-compensated physicians tend to generate higher annual health care expenditures, and higher spending per episode compared with salaried physicians. [31,32] On the other hand, the relationship between physician compensation model and quality of care is mixed. [31,33,34]

Beyond cost and quality, physician compensation could also influence how primary care is delivered. Effective primary care entails not only the conventional face-to-face visit between physicians and patients, but also out-of-visit care, such as patient follow-up in hospitals or home, care coordination via email or phone consultations. In a purely FFS model, physicians typically are only compensated for care that occurs during the in-person visit, potentially discouraging out-of-visit care. [35] It is possible that primary care physicians (PCPs) under other compensation methods may be more likely to engage in care delivery outside of the office visit, such as patient emails or home visits. However, there is little evidence assessing this question.

We analyzed three waves of a national survey of physician office visits from 2012-2015 to examine the landscape of physician compensation in the US in the current era of health reform. We assessed whether patterns of PCP compensation were associated with out-of-visit care patterns, as well as the provision of high or low-value care. These analyses examining the relationship between physician compensation and patterns of care can provide testable hypotheses about the role of physicians' financial incentives as payment reform advances.

Data & Methods

Study Population and Data

We used data for 2012 through 2015 from the publicly available National Ambulatory Medical Care Survey (NAMCS), which is administered by the National Center for Health Statistics at the Centers for Disease Control and Prevention. NAMCS is a nationally representative, annual survey of non-federal physicians in ambulatory settings (except for community health centers and outpatient hospital departments, which are sampled in different surveys). NAMCS samples a random week of office visits for each of a nationally representative sample of physicians in a multi-stage, probabilistic survey design, with each observation representing an office visit during a physician's sampling period. Data collected includes patient demographics, payer source, patients' reason for visit, physician diagnosis, and treatment choices at the visit-level, but also physician practice-level characteristics, such as type of office setting, compensation type, sources of revenue, specialties available, and electronic health records availability. We only included office visits for adults aged 18 years and older and excluded PCPs without available compensation data (5.7% of sample PCPs without data). We defined PCPs as physicians with a specialty of primary care. Our analysis used publicly available data and was deemed nonhuman subjects research by the institutional review board at the Harvard T. H. Chan School of Public Health.

Defining Physician Compensation

Our main exposure of interest was the self-reported compensation model for PCPs as defined in NAMCS. Physician compensation was defined by three separate questions in the NAMCS survey instrument: 1) physicians' "overall" compensation type (salaried, productivity-based, or mixed; 9% of physicians self-reported "other", which we do not examine), where *mixed* refers to those paid a base salary and a mixture of financial incentives or practice workload share, 2) whether physicians were owners, part owners, or solo practitioners, and 3) questions related to 6 different factors affecting compensation (FACs), including physician productivity, overall practice financial performance, adherence rate to quality measures, patient satisfaction surveys, and practice-level profiling of medical resource use. We separated employed PCPs into three categories compensated via salary, productivity-based, or "mixed" compensation. PCPs that are practice owners (full or partial) or that work in solo practices ("owners") are looked at separately (results in the appendix). This classification incorporates the idea that ownership might influence the delivery of care in a way that differs from employment, where financial incentives are largely captured by compensation arrangements. In particular, owners have a stake in undertaking activities that benefit the bottom line of the organization as a whole.

To examine the sensitivity of our results to the definition of compensation type, we reproduced our analysis using an alternate version of the compensation exposure variable. Our goal was to define compensation types falling into two general categories: purely productivity-based (standard FFS) vs. compensation incorporating clinical performance. In the alternate version, we stratified physicians by their stated FACs alone into two groups: those that cited practice finances or personal productivity FACs alone (standard FFS model), and those citing any clinical FACs such as patient satisfaction or quality measurement.

Out-of-Visit/Office Care

We examined PCPs' likelihood of providing non-visit-based care that is generally uncompensated or undercompensated by insurers relative to physician time (e.g. extra time required for home visits or telephone calls, denoted as "out-of-visit care"). These activities were assessed at the individual physician level as binary indicators for whether a physician provided a given out-of-visit/office service in their last "normal week" of care. These measures included whether physicians visited patients in their hospital, home or nursing home, and whether they performed phone or electronic patient consultations.

Low- and High-Value Care Measures

We used visit-level data to construct a set of low and high-value care measures that have been used in previous research. [36–39] High-value care measures used in this analysis were based on guidelines from the United States Preventative Services Task Force and other professional societies. These included counseling for tobacco cessation; weight-loss counseling among obese patients; appropriate care for coronary heart disease, cardiovascular disease, congestive heart failure, depression, and osteoporosis; anticoagulant use for atrial fibrillation; and statin use for diabetic patients (see **Appendix Table A1** for detailed definitions). [40,41] We based our low-value care measures on published guidelines such as the "Choosing Wisely" initiative, [42,43] existing medical literature, and defined them as: advanced imaging for sinusitis; low-value screening tests in general medical examinations (GME); and inappropriate opioid or imaging use for lower back pain or headaches. [39,44,45] We also estimated a composite measure for any delivery of high or low-value care, which we constructed by calculating the ratio of the number of low - (or high) value services provided in each visit over the total number of low - (or high) value services eligible in that visit. [36] Some visits were eligible for multiple services, in which case we multiplied visit weights by the number of eligible services, yielding the rate at which low (high) value care was provided over all eligible instances of each measure.

Statistical Analysis

We used weighted cross-tabulations to present our descriptive analyses of compensation types in our sample, examining mutually exclusive survey-weighted frequencies of each of the possible combinations of FACs.

For adjusted analyses, we fitted logistic regression models to estimate the association between physician compensation type (employees with productivity, salaried or mixed compensation, and owners/solo practitioners), and patterns of care delivery (out-of-visit/office care or low-/high - value care in a visit). For each outcome, we presented unadjusted results, and subsequently adjusted for patient demographics and practice-level variables, including average age and number of patient chronic conditions, patient sex, race/ethnicity, electronic records usage, rural office setting, practice ownership status, and percentage revenue from Medicare, Medicaid, and private insurers. The adjusted results for our composite measures used the proportion of all eligible visits that had either low- or high-value care delivered as the outcome, and was estimated using fractional logistic regression. [46]

For all analyses, we used robust design–based variance estimators to account for clustering within geographic areas or physicians and NAMCS survey weights to account for survey design and nonresponse. We reported 95% confidence intervals for all estimates. All analyses were executed using STATA version 15.

Results

Our sample included 175,762 office visits from 3,826 PCPs occurring from 2012-2015, representing nearly 1.9 billion office visits and 620,631 PCPs nationally with survey weighting. In our sample 15.4% of PCPs were salaried employees, 4.5% were productivity-based employees, 12.9% were mixed compensation employees, and 61.4% were owners or solo practitioners (**Tables 2.1** and **2.2**).

There are differences in patient mix across compensation types. For example, salaried PCPs' patient mix was more racially diverse relative to other compensation types (non-Hispanic Whites accounted for 59.9% of patients, vs. 78.8% for productivity-based PCPs, 77.3% for mixed compensation PCPs and 64.3% of owners/solo practitioners), and they were more likely to be located in the South (41.7% of patients, vs. 28.8% for productivity-based PCPs, 33.3% for mixed compensation PCPs and 38.9% of owners/solo practitioners, **Table 2.1)**.

Table 2.1 – Patient and Physician Characteristics by PCP Compensation Type

	Salary Emp.		Productivity Emp.		Mixed Emp.	
(n raw)	25,270		8,208		24,281	
(n weighted)	321,403,029		65,975,411		230,843,894	
Age (mean)	**41.4**	[38.9 - 44.7]	**41.6**	[37.6 - 45.5]	**41.6**	[38.9 - 44.3]
Female	**61.4%**	[0.59 - 0.64]	**58.6%**	[0.55 - 0.66]	**60.4%**	[0.58 - 0.63]
Race/Ethnicity						
Non-Hispanic White	**59.9%**	[0.53 - 0.67]	**78.8%**	[0.74 - 0.84]	**77.3%**	[0.74 - 0.81]
Non-Hispanic Black	**13.3%**	[0.09 - 0.17]	**7.6%**	[0.05 - 0.10]	**8.5%**	[0.07 - 0.10]
Hispanic	**19.9%**	[0.16 - 0.24]	**9.3%**	[0.06 - 0.12]	**8.4%**	[0.07 - 0.10]
Non-Hispanic Other	**6.9%**	[0.05 - 0.09]	**4.4%**	[0.03 - 0.06]	**5.8%**	[0.04 - 0.08]
Number of Chronic Diseases						
0	**43.7%**	[0.39 - 0.49]	**45.0%**	[0.39 - 0.51]	**45.2%**	[0.41 - 0.49]
1	**22.7%**	[0.19 - 0.30]	**20.0%**	[0.17 - 0.23]	**19.6%**	[0.18 - 0.21]
2	**14.1%**	[0.12 - 0.16]	**13.6%**	[0.12 - 0.16]	**14.1%**	[0.13 - 0.16]
3	**10.7%**	[0.09 - 0.12]	**10.9%**	[0.09 - 0.13]	**10.5%**	[0.09 - 0.12]
4+	**8.8%**	[0.07 - 0.10]	**10.4%**	[0.07 - 0.14]	**10.5%**	[0.09 - 0.12]
Region						
Northeast	**12.7%**	[0.09 - 0.17]	**8.8%**	[0.03 - 0.15]	**15.2%**	[0.10 - 0.20]
Midwest	**16.7%**	[0.12 - 0.22]	**38.6%**	[0.27 - 0.51]	**32.6%**	[0.25 - 0.40]
South	**41.7%**	[0.32 - 0.51]	**28.8%**	[0.19 - 0.38]	**33.3%**	[0.27 - 0.40
West	**29.0%**	[0.22 - 0.36]	**23.8%**	[0.15 - 0.33]	**18.9%**	[0.14 - 0.24]
Rural Visit Location	**12.9%**	[0.07 - 0.19]	**11.4%**	[0.06 - 0.17]	**12.8%**	[0.09 - 0.17]
Insurance Type						
Private	**54.2%**	[0.50 - 0.58]	**59.2%**	[0.54 - 0.65]	**59.4%**	[0.57 - 0.62]
Medicare	**21.9%**	[0.19 - 0.25]	**24.1%**	[0.19 - 0.29]	**23.4%**	[0.21 - 0.26]
Medicaid/CHIP	**17.0%**	[0.14 - 0.20]	**10.9%**	[0.08 - 0.14]	**13.1%**	[0.10 - 0.16]
Other	**7.0%**	[0.05 - 0.09]	**5.7%**	[0.04 - 0.08]	**4.1%**	[0.03 - 0.05]
Practice Characteristics						
Who Owns the Practice?						
Physician Grp.	**41.6%**	[0.32 - 0.51]	**28.7%**	[0.19 - 0.38]	**33.0%**	[0.26 - 0.39]
Acad/Commty	**18.0%**	[0.13 - 0.23]	**25.5%**	[0.16 - 0.35]	**32.4%**	[0.25 - 0.40]
Insurer/HMO	**33.5%**	[0.26 - 0.41]	**36.1%**	[0.24 - 0.48]	**29.4%**	[0.23 - 0.35]
Capitation Revenue						
0-25% Revenue	**53.9%**	[0.45 - 0.63]	**73.5%**	[0.64 - 0.83]	**59.0%**	[0.52 - 0.66]
26-50% Revenue	**3.9%**	[0.02 - 0.06]	**4.9%**	[0.00 - 0.10]	**4.9%**	[0.02 - 0.08]
51-75% Revenue	**7.4%**	[0.03 - 0.12]	**0.0%**	[0.00 - 0.00]	**2.8%**	[0.01 - 0.05]
Over 75% Revenue	**4.9%**	[0.02 - 0.08]	**0.0%**	[0.00 - 0.00]	**4.0%**	[0.01 - 0.07]
Missing	**29.8%**	[0.22 - 0.37]	**21.6%**	[0.14 - 0.30]	**28.8%**	[0.23 - 0.35]

Note**:** Table presents estimates of sample demographic characteristics stratified by PCP compensation type. 95% CI in brackets.

The most common FACs were personal productivity and practice finances, which was consistent across compensation types. However, productivity-based and mixed compensation employees were more likely to cite productivity-based FACs relative to salaried employee PCPs and owners/solo practitioners (85.9%, 87.1% vs. 55.9%, 45.7% respectively, p<0.001; **Table 2.2**). Fewer PCPs reported having compensation based on clinical performance measures relative to financial measures. Of these, quality was the most frequently cited FAC (18.1%; 95% CI 16.7% - 19.3%), followed by patient satisfaction (14.8%; 95% CI 13.5% - 16.2%), and practice profiling (9.8%; 95% CI 8.0%-11.0%). Fewer than 5% of physicians exclusively cited clinical performance FACs and none of the productivity or financial FACs.

Table 2.2 – Factors Affecting Compensation (FACs)

	Salary Emp.	Productivity Emp.	Mixed Emp.	Total
Observations (raw)	590	172	495	3,826
Observations (weighted)	108,847	23,307	74,311	620,631
Practice Finances	**50.6%** [0.44-0.57]	**41.8%** [0.31-0.53]	**56.1%** [0.49-0.62]	**64.3%** [0.62-0.66]
Personal Productivity	**55.9%** [0.49-0.62]	**85.9%** [0.79-0.93]	**87.1%** [0.83-0.91]	**53.9%** [0.52-0.56]
Patient Satisfaction	**25.3%** [0.20-0.31]	**19.4%** [0.12-0.26]	**38.2%** [0.32-0.44]	**14.8%** [0.13-0.16]
Quality Measures	**22.1%** [0.17-0.27]	**36.1%** [0.25-0.48]	**46.1%** [0.40-0.52]	**18.1%** [0.16-0.19]
Practice Profiling	**12.3%** [0.08-0.16]	**7.7%** [0.03-0.13]	**21.5%** [0.17-0.26]	**9.8%** [0.08-0.11]

Note: Chi squared p-value for differences in FACs across compensation types is 0.00 at the 95% C.I. Physicians could check more than one FAC in the survey, thus these totals are not mutually exclusive.

Rates of out-of-visit/office care delivery such as phone consults tended to be higher for physician owners than productivity-based employees (58.0% vs. 38.0% for owners vs. productivity-based employees, respectively, adjusted OR [aOR] 3.40, 95% CI 1.67-6.93, **Table 2.3**), though not for email consults (14.6% vs. 14.6%, aOR 1.52, 95% CI 0.66-3.48). Mixed compensation PCPs were more likely to engage in out-of-visit care via phone and electronic consults relative to productivity employee PCPs, which remained significant after adjustment (phone aOR 2.50; 95% CI 1.18 – 5.30; email aOR 2.37; 95% CI 1.04 – 5.35) (**Table 2.3**).

Table 2.3 – Out-of-Visit/Office Care by PCP Ownership and Compensation Type

	Percentage [95% C.I.]	Unadjusted O.R. [95% C.I.]	Adjusted O.R. [95% C.I.]
Home Visits			
Productivity Emp.	**3.6%** [0.02 - 0.08]	-	-
Salary Emp.	**4.3%** [0.04 - 0.09]	**1.22** [0.40 – 3.72]	**0.72** [0.18 – 2.91]
Mixed Emp.	**2.6%** [0.01 - 0.05]	**0.73** [0.26 – 2.03]	**0.46** [0.11 – 1.91]
Nursing H Visits			
Productivity Emp.	**17.1%** [0.11 - 0.26]	-	-
Salary Emp.	**8.1%** [0.05 - 0.12]	**0.43*** [0.21 – 0.86]	**0.34*** [0.12 - 0.93]
Mixed Emp.	**8.7%** [0.06 - 0.12]	**0.46*** [0.25 – 0.87]	**0.45** [0.19 - 1.08]
Hospital Visits			
Productivity Emp.	**30.5%** [0.22 – 0.40]	-	-
Salary Emp.	**32.1%** [0.26 – 0.38]	**1.07** [0.65 – 1.77]	**1.01** [0.47 – 2.15]
Mixed Emp.	**37.2%** [0.32 – 0.43]	**1.35** [0.82 – 2.21]	**1.67** [0.91 – 2.90]
Phone Consults			
Productivity Emp.	**38.0%** [0.28 – 0.49]	-	-
Salary Emp.	**51.8%** [0.46 – 0.58]	**1.75*** [1.06 – 2.90]	**1.53** [0.71 – 3.29]
Mixed Emp.	**52.4%** [0.46 – 0.59]	**1.79*** [1.08 – 2.99]	**2.50*** [1.18 – 5.30]
Email Consults			
Productivity Emp.	**14.6%** [0.09 – 0.23]	-	-
Salary Emp.	**22.9%** [0.18 – 0.28]	**1.73** [0.91 – 2.28]	**2.19** [0.96 – 4.97]
Mixed Emp.	**30.9%** [0.25 – 0.37]	**2.62**† [1.38 – 4.97]	**2.37*** [1.04 – 5.35]
Observations (raw/weighed)	**7,595/623,039**		

Note: *p<0.05 †p<0.01
*Adjusted model uses productivity-based employee physicians as reference category. Adjusters are patient demographics, such as racial/ethnic, urban/rural, age, gender and number of chronic conditions, as well as practice-level characteristics including percentage of revenue from Medicare, Medicaid and private insurance, revenue subject to capitation, and electronic health records availability.

Examining the delivery of high- or low-value care across different compensation models, unadjusted estimates showed sizable heterogeneity (**Table 2.4**). There was no clear pattern in quality towards one model vs. another and some quality measures had low sample sizes (**Table**

2.4). In adjusted estimates, there was no difference in the rate of high-value care delivery for salaried employees (aOR: 1.07; 95% CI 0.75-1.54) or mixed compensation employees (aOR: 1.01; 95% CI 0.74-1.38) relative to productivity-based employee PCPs (**Table 2.5**). There was similarly no meaningful difference in composite rates of low-value care delivery by productivity-based employee PCPs vs. salaried (aOR: 0.82; 95% CI 0.59-1.12) or mixed employee PCPs (aOR: 0.94; 95% CI 0.70-1.27; **Table 2.5**).

Examining our alternate definition of compensation type, there were differences in the delivery of out-of-visit/office care. After adjustment, physicians with only productivity-based FACs reported higher rates of home visits and lower rates of e-mail consults vs. physicians with any clinical performance FACs (**Appendix Table A2**). As with our main analysis, there was no significant association between our alternate compensation definition and the delivery of high/low value care measures (**Appendix Table A3**).

Table 2.4 – Overuse and Quality Measures by PCP Compensation Type

Quality/Overuse Measure	Employee Salary N	%	95% CI	Employee Productivity N	%	95% CI	Employee Mixed N	%	95% CI
Overuse Composite	2280	**36.5**	[31.9-41.0]	763	**39.1**	[33.4-44.8]	2321	**36.9**	[31.8-42.0]
Antibiotics for "never" URIs	193	**49.5**	[39.2-59.7]	57	**46.3**	[28.9-63.6]	224	**51.8**	[40.2-63.3]
Screening EKG in GME	800	**5.8**	[2.1-9.6]	235	**9.9**	[3.0-16.9]	828	**6.7**	[3.4-9.6]
Screening CBC in GME	1145	**32.0**	[25.5-38.4]	374	**35.2**	[26.7-43.9]	1166	**32.9**	[25.4-40.7]
Screening UA in GME	1163	**19.2**	[12.2-26.3]	377	**17.7**	[8.7-26.7]	1205	**18.1**	[12.3-23.8]
Opioids for back/neck pain	681	**32.1**	[26.1-38.1]	240	**39.9**	[30.8-48.9]	584	**32.0**	[26.4-37.6]
CT/MRI for back/neck pain	681	**4.1**	[2.1-6.0]	240	**5.5**	[2.3-8.7]	584	**7.2**	[3.8-10.5]
Opioids for headache	169	**17.8**	[8.7-26.9]	70	**7.4**	[0.5-14.4]	228	**17.9**	[10.9-24.9]
CT/MRI for headache	169	**2.2**	[0.0-5.2]	70	**0.4**	[0.0-1.2]	228	**3.0**	[0.5-5.4]
High Value Composite	5140	**34.9**	[30.1-39.7]	1700	**40.2**	[35.5-45.0]	5073	**37.8**	[34.9-40.7]
Tobacco cessation counseling	1429	**9.2**	[6.0-12.3]	472	**8.7**	[3.9-13.4]	1442	**12.8**	[9.2-16.4]
Weight reduction counseling	2649	**18.3**	[13.6-23.2]	877	**21.0**	[16.5-25.5]	2629	**20.6**	[17.1-24.0]
Anticoagulant use in Afib	112	**49.6**	[38.0-61.2]	43	**73.7**	[55.1-92.4]	95	**71.7**	[61.7-81.7]
Aspirin use in CAD	292	**48.3**	[41.4-55.1]	89	**57.6**	[36.1-78.9]	251	**47.1**	[37.4-56.9]
Beta blocker use in CAD	238	**40.4**	[25.4-55.2]	74	**66.1**	[53.3-78.8]	218	**45.0**	[33.3-56.6]
Statin use in CAD	291	**54.3**	[45.5-63.1]	89	**61.6**	[46.8-76.4]	251	**54.5**	[46.3-62.6]
Beta blocker use in CHF	135	**41.6**	[30.4-52.6]	57	**37.0**	[20.5-53.4]	146	**53.9**	[40.6-67.2]
ACE/ARB use in CHF	187	**21.0**	[9.9-32.0]	71	**12.5**	[4.6-20.3]	209	**23.0**	[11.5-34.5]
Antiplatelet use in CVD	206	**29.7**	[16.4-42.9]	64	**71.3**	[59.6-82.9]	197	**40.3**	[28.7-51.7]
Statin use in DM	1157	**38.6**	[32.6-44.6]	409	**38.5**	[29.7-47.1]	1136	**39.9**	[35.0-44.8]
Depression counseling	1219	**50.1**	[44.1-56.1]	450	**52.0**	[44.8-59.0]	1245	**53.4**	[48.3-58.4]
Treatment for osteoporosis	380	**18.7**	[13.7-23.8]	103	**20.7**	[10.5-30.8]	421	**20.4**	[14.2-26.5]

Note: Abbreviations: confidence interval (CI), upper respiratory tract infection (URI), computed tomography (CT), electrocardiogram (ECG), complete blood count (CBC), urinalysis (UA), general medical examination (GME), magnetic resonance imaging (MRI), atrial fibrillation (AF), coronary artery disease (CAD), congestive heart failure (CHF), angiotensin-converting enzyme inhibitor (ACE), angiotensin receptor blocker (ARB), cerebrovascular disease (CVD), diabetes mellitus (DM).
*All estimates are survey-weighted proportions accounting for NAMCS sample design.
** Low- and high-value care composites calculated at the visit level as the proportion of low- or high-value services delivered at a visit. To account for visits qualifying for more services than others, survey weights were multiplied by the number of eligible low- or high-value measures.

Table 2. 5 – Overuse and Quality Measures by PCP Compensation Type – Adjusted Results

	High Value Composite		Low Value Composite	
(n raw)	16,071		18,451	
(n weighted)	343,345,160		365,902,345	
	Unadjusted O.R. [95 % CI]	Adjusted O.R. [95 % CI]	Unadjusted O.R. [95 % CI]	Adjusted O.R. [95 % CI]
Productivity Employee	Ref	Ref	Ref	Ref
	-	-	-	-
Salary Employee	0.89	1.07	0.79	0.82
	[0.66-1.22]	[0.75-1.54]	[0.60-1.06]	[0.59-1.12]
Mixed Compensation Employee	0.91	1.01	0.90	0.94
	[0.66-1.26]	[0.74-1.38]	[0.71-1.14]	[0.70-1.27]

Note: Results are odds ratios and 95% confidence intervals in brackets. Compensation reference group is productivity-based employee PCPs. Full adjusted results in Appendix Table A3
*Low- and high-value care composites calculated at the visit level as the proportion of low- or high-value services delivered at a visit. To account for visits qualifying for more services than others, survey weights were multiplied by the number of eligible low- or high-value measures.

Discussion

We also found that despite early health reform efforts, the overall landscape of physician compensation has remained strongly tethered to fee-for-service compared to previous research a decade ago. Productivity and practice-level financial factors dominated clinical factors such as patient satisfaction and quality benchmarks where performance-based payments were reported. Moreover, 70% of physicians in our sample were either practice owners or paid entirely on productivity, with another 12% of physicians with “mixed” compensation which could have a strong reliance on productivity. This is largely unchanged from prior survey data which found that 82% of PCPs in 1994 and 88% in 2005 were either owners or paid based on productivity or a mix of productivity and salary. [32,33] Four years after passage of the Affordable Care Act, the movement towards payment reform appears to have had limited influence on physician-level compensation.

Our findings on the relationship between out-of-visit/office care and compensation model were mixed. While typically uncompensated or undercompensated, these forms of care are deemed essential elements of effective primary care. [49] Though we hypothesized that employee salaried PCPs would have higher rates of participation in these types of care relative to other PCPs, our results are inconsistent with this hypothesis. Salaried physicians were somewhat more likely to deliver certain types of care, such as phone or email consults, vs. productivity-based physicians, but these associations were not significant after adjustment. The most consistent patterns were for practice owners and "mixed" compensation PCPs, who were more likely to deliver hospital visits, phone and email consults than productivity-based PCPs, though not all of these associations were significant after adjustment. These results might reflect that institutional and practice-level factors are more important for the delivery of out-of-visit/office care than compensation strategy.

At first glance, the lack of relationship between compensation and low-value care or some forms of out-of-visit/office care could be viewed as inconsistent with a positive relationship between FFS and overuse. However, we do not interpret this analysis as contradicting this relationship. Physicians may describe their compensation as "salaried" with or without performance-based factors in their compensation, but they may still operate in a largely FFS culture. This is likely to be particularly true for physicians with an ownership stake in their practice. Most salaried physicians reported that their practices received little revenue from capitated contracts, suggesting that at the practice level FFS payments remain an important factor.

This study has several limitations. First, our analysis is cross-sectional and observational in nature, precluding the establishment of causality between physician compensation models and patterns of care delivery explored above. Selection concerns are also important: PCPs might selfselect into practices or compensation arrangements based on factors that are correlated with our outcomes. In addition, we perform many hypothesis tests in this analysis without correction for multiple testing, but our results should be regarded as exploratory and our interpretation focuses on broader patterns beyond individual significant results. A second issue is that our measure of physician compensation type is self-reported, subject to recall or measurement error. However, a physician's perceived compensation type and reported set of FACs is arguably a more accurate reflection of the incentives under which they provide care. Put differently, the formal compensation arrangement might be less relevant relative to what a physician believes it is, as perceived incentives are what will presumably affect care delivery. In addition, our compensation measures are binary, limiting our ability to stratify by intensity of each factor that affects compensation and provide more precise estimates. NAMCS, as any survey, is subject to sampling and measurement error. [50] We addressed this concern by pooling three years of NAMCS data and using several measures for each outcome of interest. Another issue is that NAMCS is nationally representative of community-based independent physician practices but does not sample hospital outpatient departments or community health centers (as of 2012, the first year of our data). Therefore, our results may not generalize to physicians employed by hospitals working in outpatient departments or community health centers. Finally, our quality/overuse measures lack comprehensive exclusion criteria given that a patient's full clinical history is unavailable. However, we do not expect systematic differences in this lack of information between our PCP and patient subgroups.

Spurred by Medicare policy changes and demonstration projects, payment reform continues to unfold across the U.S. While these efforts were underway during our study period, we observed few changes in front-line physician compensation and few differences between practice patterns of physicians with different self-reported compensation. The dominance of productivity-based compensation and its lack of consistent association with care delivery suggests that payment reform might have an attenuated impact for individual physicians. It remains to be seen whether financial incentives will trickle down to primary care physicians as alternative payment models and value-based purchasing programs take root and mature.

Chapter 3: Clinician Performance Data Collection and Use in Safety Net Organizations

Adrian Garcia Mosqueira, Steve Shortell, Nilay Shah, David Peiris, Jacob Barrera, Valerie Lewis, and Meredith Rosenthal

Abstract

Objective: To measure whether Safety-Net Practices (SNPS) face barriers in the collection and use of physician performance data for the purposes of improved quality and efficiency of health care delivery.

Data Sources: National Survey of Healthcare Organizations and Systems (NSHOS) for our analysis. NSHOS is a cross-sectional national survey of 2,190 physician practices fielded during 2017 and 2018.

Study Design: We designate SNPs based on Medicaid revenue share, but that do not have FQHC status. We use multivariate regression analysis to compare the collection and use of physician clinical performance data on cost and quality of care measures between SNPs, FQHCs and other sample practices. We adjust for local demographics, and other practice characteristics.

Principal Findings: We find no systematic evidence that SNPs collect and use physician performance data differentially relative to other practices. SNPs have similar HIT capacities and participation rates in value-based contracting as other sample practices. Finally, SNPs and FQHCs participate in VBP programs at rates similar to that of other practices.

Conclusions: In the age of value-based contracting and other programs incentivizing quality of care delivery and cost-reduction, it is important to recognize the limitations faced by different providers in meeting program benchmarks. SNPs face risk from value-based contracting because of their financial and clinical constraints, in addition to the complex nature of the population they serve. However, this study provides evidence that SNPs are not limited as has been hypothesized in their HIT capabilities, as well as the acquisition and use of clinical performance data to

improve their care delivery. As such, our analysis suggests that policy efforts aimed at improving the capacities of this critical set of providers might consider focusing elsewhere, in areas where the evidence of SNP limitations are much more concrete.

Introduction

Safety Net Practices (SNPs) face challenges delivering health care to their patients, including insufficient clinical staff and resources to meet demand for care, revenue constraints due to their large shares of charity care, and more recently, increased competition from other providers for Medicaid-insured patients.[51,52] SNPs are typically located in areas with higher shares of low-income residents, socioeconomic deprivation, foreign-language speakers, higher morbidity, and patient complexity; all factors associated with reductions in health care access, and subsequently health outcomes. [53–56] In response, SNPs rely on community health initiatives and coordinated care models to reduce disparities in health care access, generating attachment to the health care system, and improving health. [57] SNPs also provide services including transportation, translation, insurance enrollment assistance, and other services not found elsewhere, further stretching financial resources. [58] As a result, many SNPs underperform on health outcomes and other quality metrics, which might have financial consequences as value-based contracting becomes the norm in the reimbursement landscape. [59–66]

Recent evidence suggests that safety net providers are vulnerable to financial penalties due to participation in value-based contracting, as these fail to effectively risk-adjust for patient mix and local socioeconomic conditions.[65,67,68] Typically referred to as value-based purchasing (VBP) programs, initiatives like the Merit-based Incentive Payment System (MIPS), and Accountable Care Organizations (ACOs) are designed to improve quality of care and reduce medical expenditures, and they do so by tying payments to performance on several benchmarks.[47,69–71] One important component in improving quality and efficiency is an organization's capacity to collect, analyze, and act on clinician performance data.[72,73] Safety net practices (SNPs), which are notably resource-constrained, might have limited ability to collect and use this information for the purposes of providing feedback to clinicians, adjusting physician compensation, or for internal quality improvement. SNPs might then be impaired in their ability to improve care delivery, leading to inability to participate in voluntary programs or compounding financial penalties from participation in VBP programs. As these programs become increasingly widespread, assessing SNP's capacity to measure and improve their health care delivery quality and efficiency has emerged as an important policy question.

Providers that qualify as Federally Qualified Health Centers (FQHCs) face many of the same challenges as SNPs; however previous research suggests that they are much better prepared to handle these challenges.[74] The reasons behind these are twofold. Firstly, applying for FQHC status requires providers to outline and implement processes that are associated with improvements in efficiency, better performance management, and quality of care delivery. Furthermore, obtaining FQHC status comes with some benefits, including higher reimbursement rates, access to lower drug prices, and capacity-development grants. [75] The literature on FQHC performance on quality and cost of care, health-care disparity reductions, as well as health outcomes is generally positive, and we found no evidence that FQHCs carry outsized financial penalties from participation in value-based contracts. [74,76–79] As such, it is important to highlight not only whether SNPs are vulnerable to financial penalties from value-based contracting, but whether they are receiving adequate resource support like that available for practices with FQHC status.

These questions are important from a policy perspective. First, SNPs face shortages on labor and capital inputs that limit their ability to provide high-quality care to their patients. While the ACA has relied on the FQHC program as a main provider for vulnerable populations, SNPs continue to play a critical role in the health care system. As such, it is important to document the limitations faced by SNPs and examine the need to provide them with additional resources. Second, VBP and other payment incentive programs are designed to improve quality of care, but evidence suggests that the gains in quality of care are smaller in SNPs relative to other providers.[80,81] It is crucial to understand why and how these quality gains from incentive programs are attenuated for SNPs. Obtaining evidence on the first-order obstacles within SNPs would allow the tailoring of policy proposals to maximize the gains in quality of care, health outcomes, and delivery efficiency.

To better inform VBP policies and their effects on SNPs (including but not limited to FQHCs), we conducted a national analysis of physician practices that examines participation in VBP and performance management capabilities. Performance management denotes a practice's ability to collect, analyze and act on data related to clinician performance on a set of quality and care delivery metric. The data allow us to compare SNPs with other practices, while assessing both market and practice characteristics. Based on the previous literature summarized above, we propose and test three hypotheses: (1) SNPs will have lower rates of participation in VBP programs, (2) conditional on participation in VBP programs, SNPs will undertake less performance management, and (3) compared to SNPs, FQHCs will have greater performance management capabilities.

Methods

Data Sources and Variables of Interest

We use the National Survey of Healthcare Organizations and Systems (NSHOS) for our analysis. NSHOS is a cross-sectional national survey of 2,190 physician practices fielded during 2017 and 2018, with a response rate of 46.9%. NSHOS uses a stratified-cluster sampling design to select multi-specialty physician practices working in a variety of organizational structures, from independent solo practices to practices with more than 50 physicians and attached to health systems. NSHOS collects data on practice characteristics, including practice size and ownership, finances, payment models, attachment to independent physician organizations or health systems, share revenue by payer, practice culture, participation in payment reform initiatives, management of chronic conditions and high-needs patients, as well as health information technology capacity, and prescription patterns.

County-level demographic data was obtained from the Area Health Resources File (AHRF). AHRF collects data from various sources such as the Census Bureau, the Environmental Protection Agency, the American Medical Association, and others. We use 2017 county-level data for our analysis, including poverty and unemployment rates, median household income, education levels, age, population counts, and some measures of clinical resource availability. We also include the Area Deprivation Index (ADI) in our analyses to measure any association between deprivation and our outcomes of interest. The ADI is a measure that ranks counties' relative levels of socioeconomic disadvantages. The ADI is composed of 17 factors, including measures of income, education, employment, housing status, and family composition. [82,83] The ADI has been widely used in studies addressing the role of socioeconomic disadvantage in health outcomes and interacting with health systems, and often used as a policy targeting tool aimed at improving health and socioeconomic outcomes in impoverished areas. [84,85] To further control for local resource scarcity, we adjust for the Health Professionals Shortage Area (HPSA) status, which designates areas with too few primary care physicians, and other health providers. HPSA status areas are eligible for certain federal programs and resources to fight these shortages. [86] Finally, we construct a practice-level Health Information Technology (HIT) index that measures the collection capabilities, availability and use of electronic health records and other information sharing processes, following Pimperl et al 2018, which we use for supplementary analyses that stratify SNPs based on their HIT capabilities. [87]

Defining Safety Net Practices

The Institute of Medicine defines Safety Net practices (SNPs) as "those providers that organize and deliver a significant level of health care and other needed services to uninsured, Medicaid and other vulnerable patients." [88] However, there is no standard definition of a SNP.[89] Empirically, SNPs are defined on Medicaid revenue measures, levels of uncompensated care, or other provider and patient caseload characteristics. Researchers often use a Low-Income Utilization Ratio (LIUR) higher than 25%, certain facility characteristics, and in the case of hospitals, Medicare or Medicaid Disproportionate Share Hospital status to define SNPs. [61,65,90,91] Because of data limitations, we use the sample median share of Medicaid revenue (10.1%) as the cutoff for SNP status. In addition, we compare our designated SNPs to practices designated as Federally Qualified Health Centers (FQHCs) and to all sample practices.

Outcomes

Our outcomes of interest pertain performance management, which is define as practices' ability to collect, analyze, and act on clinician performance data. In our first outcome specification, we classify clinician performance data into quality of care delivery measures (preventative services, patient satisfaction, underuse of medical procedures, and clinical quality procedures) and cost-containment measures (overuse of medical tests or procedures, acute services utilization rates, and total impatient cost of care), for the purposes of (a) providing feedback to clinicians, (b) internal quality improvement, and (c) physician compensation, yielding six outcome measures. In our second specification, we simply aggregate all clinical performance data collection into the three purposes detailed above, yielding three outcomes.

Statistical Approach

Our outcomes are ordinal in nature and have differing distributions. We use a multivariate logistic regression approach as our baseline model, but then verify our results using linear regress to test associations between SNPs, FQHCs and other practices with use of clinician performance data on cost and quality of care delivery for the purposes of feedback, internal QI, and physician compensation. Specifically, we estimate

$$y_i = \beta_0 + \beta_1 SNP + \beta_2 FQHC + \beta_3 ADI + \beta_n X_i' + u_i \qquad (1)$$

Where y_i is practice i's clinician cost and quality performance data for the purpose of feedback, quality improvement, and physician compensation. β_1 estimates the effect of SNPs, β_2 measures the impact of FQHC status on the outcomes, β_3 is the area deprivation index effect, and β_n is a vector of *n* estimates for each of our practice-level controls. These include practice size, attachment to a health system, type of ownership, and participation in VBP programs, including one and two-sided risk contracts, as well as Medicare and Medicaid ACOs. In supplementary analyses, we stratify the estimation of equation (1) by high and low performers in our HIT index based on its median- this reflects the notion that HIT capabilities are strongly correlated with data collection capabilities. This allows us to measure whether there are heterogeneous effects of SNP and FQHC status over practices that score high and low on HIT capabilities.

Results

Table 3.1 presents the distribution of respondent practices' characteristics with respect to their available resources, size and other features, as well as the demographics and resource availability in their geographic location. We present these statistics for SNPs (measured by the median Medicaid income share of 10.1% of revenue), FQHCs, and our full sample of practices. Relative to all practices, SNPs are slightly smaller in size, have smaller shares of revenue from Medicare and private payers, serve more disadvantaged and vulnerable populations measured by the standardized ADI, and are more likely to be owned by a hospital or health system. They participate VBP programs, include Medicare and Medicaid ACOS at similar rates to FQHCs and other practices. FQHCs have higher levels of information technology use, measured by their HIT index, are less likely to have physician, hospital or health system ownership relative to all practices. FQHCs also rely much more on Medicaid revenue relative to other practices and have corresponding lower shares of revenue from Medicare and commercial insurers.

Table 3.2 presents summary data stratified by practice types. Each panel of **Table 3.2** represents a domain of performance data collection – namely for the purposes of feedback to clinicians, internal quality improvement, and physician compensation. We present each domain data disaggregated into quality of care delivery and cost containment processes. Overall, FQHCs collect and use data at lower rates for feedback and physician compensation purposes relative to other practices, with the largest differences coming from cost-containment performance data (1.01 versus 1.21 and 1.26 respectively). However, FQHCs have much higher rates of performance data use for internal quality improvement relative to other practices (4.31 versus 3.83 and 3.97 respectively). We do not see significantly large differences in the collection and use rates of performance data between SNPs and all practices.

Table 3.1 – Practice Characteristics

VARIABLES		FQHC	SNP	ALL PRACTICES
PRACTICE CHARACTERISTICS	n	308	606	2190
MEAN PRACTICE PHYSICIANS		**12.35**	**11.18**	**12.43**
		(20.8)	(17.53)	(70.4)
SOLO PRACTICE		**0.01**	**0.04**	**0.03**
		(0.11)	(0.19)	(0.16)
SMALL PRACTICE (<10 PHY)		**0.60**	**0.67**	**0.70**
		(0.49)	(0.47)	(0.46)
MED PRACTICE (<20 PHY)		**0.25**	**0.16**	**0.16**
		(0.43)	(0.37)	(0.37)
LARGE PRACTICE (21+ PHY)		**0.13**	**0.13**	**0.11**
		(0.34)	(0.34)	(0.32)
ATTACHED TO A SYSTEM		**0.73**	**0.77**	**0.72**
		(0.44)	(0.42)	(0.45)
MEDICAID REVENUE SHARE		**34.54**	**26.70**	**16.29**
		(25.1)	(14.04)	(18.06)
MEDICARE REVENUE SHARE		**25.94**	**30.16**	**32.14**
		(17.7)	(13.38)	(17.36)
COMMERCIAL REVENUE SHARE		**25.50**	**33.73**	**41.70**
		(19.50)	(16.07)	(21.15)
CURRENTLY IN MEDICARE ACO		**0.45**	**0.50**	**0.50**
		(0.50)	(0.50)	(0.50)
CURRENTLY IN MEDICAID ACO		**0.50**	**0.42**	**0.34**
		(0.50)	(0.49)	(0.47)
CURRENTLY IN ANY P4P		**0.61**	**0.66**	**0.65**
		(0.49)	(0.48)	(0.48)
HIT INDEX		**4.40**	**4.13**	**4.13**
		(1.64)	(1.64)	(1.64)
OWN INDEPENDENT		**15.31**	**21.36**	**28.1**
		(0.36)	(0.41)	(0.45)
OWN PHYSICIAN GROUP		**7.82**	**9.11**	**12.26**
		(0.26)	(0.29)	(0.33)
OWN HOSPITAL		**7.20**	**20.86**	**14.14**
		(0.26)	(0.41)	(0.35)
OWN SYSTEM		**36.8**	**46.0**	**39.0**
		(0.48)	(0.50)	(0.49)
DEMOGRAPHICS				
STANDARDIZED ADI		**0.11**	**0.25**	**0.00**
		(0.99)	(0.91)	(1.00)
HPSA DESIGNATION		**92.11**	**88.24**	**92.69**
		(0.28)	(0.55)	(0.53)

Table 3.2 – Crosstabulations on Outcomes, by Practice Type

VARIABLES	FQHCS	MEDICAID MEDIAN	ALL PRACTICES
OBSERVATIONS	308	606	2190
USE FOR FEEDBACK			
COST INDICATORS	**1.01**	**1.21**	**1.26**
	(1.16)	(1.22)	(1.26)
QUALITY INDICATORS	**1.88**	**1.97**	**1.90**
	(1.62)	(1.60)	(1.65)
TOTAL FEEDBACK	**2.89**	**3.19**	**3.16**
	(2.45)	(2.58)	(2.71)
USE FOR QUALITY IMPROVEMENT			
COST INDICATORS	**1.48**	**1.42**	**1.49**
	(1.23)	(1.23)	(1.28)
QUALITY INDICATORS	**2.83**	**2.41**	**2.47**
	(1.37)	(1.50)	(1.56)
TOTAL QI	**4.31**	**3.83**	**3.97**
	(2.33)	(2.48)	(2.64)
USE FOR PHYSICIAN COMPENSATION			
COST INDICATORS	**0.24**	**0.25**	**0.26**
	(0.67)	(0.69)	(0.70)
QUALITY INDICATORS	**1.03**	**1.15**	**1.13**
	(1.36)	(1.36)	(1.36)
TOTAL PHYSICIAN COMPENSATION	**1.27**	**1.41**	**1.40**
	(1.78)	(1.80)	(1.84)

Note: Estimates are practice-type average counts of each type of data collection. Range is 0-4 for quality indicators, 0-3 for cost indicators, and 0-7 for each total. Standard errors in parenthesis. Each panel represents a data use purpose, stratified by cost-reduction and quality improvement data types.

We show the results of our main specification in **Table 3.3**. We find no systematic evidence that SNPs or FQHCs collect data for feedback, quality improvement or physician compensation purposes at a different rate than other practices. FQHCs are more likely to use quality data for the purpose of internal quality improvement (OR 1.68; P-val 0.001). A robust result is the association between pay for performance participation with some of our data-collection outcomes. P4P participation is positively associated with quality data for feedback (OR: 1.20; P-val 0.03), cost data (OR 1.40; P-val 0.001), quality data (OR: 1.52; P-val 0.00) for internal QI, and quality data for the purposes of physician compensation (OR: 2.16; P-val 0.005).

Table 3.3 – Ordered Logistic Regression Results – Main Specification

	FEEDBACK		QI		PHYSICIAN COMPENSATION	
	Cost	Quality	Cost	Quality	Cost	Quality
SNP STATUS	**1.10**	**1.14**	**0.95**	**0.93**	**0.95**	**0.94**
	(0.11)	(0.11)	(0.11)	(0.11)	(0.17)	(0.12)
FQHC STATUS	**0.84**	**0.93**	**1.29**	**1.68*****	**1.27**	**0.97**
	(0.16)	(0.16)	(0.16)	(0.16)	(0.23)	(0.17)
ADI	**0.97**	**0.96**	**0.985**	**0.94**	**0.95**	**0.92**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.07)	(0.05)
MEAN PHYSICIANS	**1.00**	**1.00**	**0.99**	**1.00**	**1.00**	**1.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SOLO PRACTICE	**0.71**	**0.70**	**1.09**	**1.43**	**0.80**	**0.81**
	(0.29)	(0.29)	(0.28)	(0.29)	(0.45)	(0.32)
IN SYSTEM	**1.03**	**1.10**	**0.97**	**0.99**	**0.94**	**1.77*****
	(0.13)	(0.12)	(0.12)	(0.12)	(0.20)	(0.14)
COMMERCIAL REVENUE	**1.01****	**1.01****	**1.00**	**1.00**	**1.00**	**1.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MEDICARE ACO	**1.13**	**1.08**	**1.28*****	**1.16**	**1.48*****	**1.48*****
	(0.10)	(0.09)	(0.09)	(0.09)	(0.15)	(0.10)
MEDICAID ACO	**1.05**	**1.11**	**1.14**	**1.17**	**1.20**	**1.19**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.15)	(0.11)
PAY FOR PRFMNC	**1.21**	**1.20****	**1.40*****	**1.52*****	**1.24**	**2.16*****
	(0.10)	(0.10)	(0.10)	(0.10)	(0.16)	(0.11)
OWN – PHY. GRP.	**0.90**	**1.03**	**1.29**	**1.12**	**1.65****	**1.68*****
	(0.17)	(0.17)	(0.22)	(0.17)	(0.24)	(0.18)
OWN - HOSPITAL	**0.83**	**0.98**	**0.81**	**0.81**	**0.94**	**1.98*****
	(0.16)	(0.16)	(0.13)	(0.16)	(0.26)	(0.18)
OWN - SYSTEM	**1.12**	**1.49*****	**1.04**	**0.97**	**1.20**	**3.02*****
	(0.14)	(0.14)	(0.14)	(0.14)	(0.21)	(0.15)
OWN - OTHER	**0.77**	**1.41**	**0.50*****	**0.78**	**0.26*****	**0.97**
	(0.22)	(0.21)	(0.11)	(0.21)	(0.50)	(0.26)
SOUTH CENSUS	**1.01**	**0.81**	**0.94**	**0.96**	**1.09**	**0.71****
	(0.13)	(0.13)	(0.12)	(0.13)	(0.20)	(0.14)
MIDWEST CENSUS	**0.88**	**0.79**	**0.86**	**0.89**	**1.09**	**0.82**
	(0.13)	(0.12)	(0.13)	(0.12)	(0.19)	(0.13)
NORTHEAST CENSUS	**0.88**	**0.75****	**0.72****	**0.66*****	**0.83**	**0.61*****
	(0.14)	(0.14)	(0.14)	(0.14)	(0.22)	(0.15)
OBS.	1723	1723	1723	1723	1723	1723

ESTIMATES ARE ODDS RATIOS. STANDARD ERRORS ARE IN PARENTHESIS.
***** P<0.01, ** P<0.05**

Table 3.4 contains the results of our alternate specification, were we aggregate practices' use of clinical performance data for the purposes of feedback, internal quality improvement and physician compensation. Our analysis of this specification yield many of the same results as our main specification. Most of our exposure practices do not collect or use clinician performance data in ways that differ from the rest of our sample practices, but FQHCs status is positively associated with the use of data for the purposes of internal quality improvement (OR: 1.48; P-val: 0.003). Practices that belong to a system are more likely to use data for determining physician compensation (OR: 1.69; P-val: 0.000). Other practice characteristics are associated with our outcomes. Participation in pay for performance, and Medicare ACOs are generally associated with greater collection and use of clinical performance data.

Table 3.4 – Ordered Logistic Regression Results – Specification 2

	FEEDBACK	QI	PHYSICIAN COMPENSATION
SNP STATUS	1.14	0.94	0.95
	(0.12)	(0.11)	(0.12)
FQHC STATUS	0.92	1.48***	1.00
	(0.15)	(0.22)	(0.17)
ADI	0.97	0.95	0.93
	(0.05)	(0.05)	(0.05)
MEAN PHYSICIANS	1.00	1.00	1.00
	(0.00)	(0.00)	(0.00)
SOLO PRACTICE	0.68	1.25	0.81
	(0.28)	(0.35)	(0.25)
IN SYSTEM	1.08	0.98	1.69***
	(0.12)	(0.12)	(0.14)
COMMERCIAL REVENUE	1.01***	1.00	1.00
	(0.00)	(0.00)	(0.00)
MEDICARE ACO	1.11**	1.25**	1.45***
	(0.09)	(0.11)	(0.15)
MEDICAID ACO	1.09	1.17	1.18
	(0.10)	(0.11)	(0.13)
PAY FOR PRFMNC	1.23**	1.50***	2.01***
	(0.09)	(0.10)	(0.22)
OWN – PHY. GRP.	0.99	1.21	1.72***
	(0.17)	(0.17)	(0.18)
OWN - HOSPITAL	0.94	0.79	1.81***
	(0.16)	(0.16)	(0.17)
OWN - SYSTEM	1.38**	0.99	2.70***
	(0.14)	(0.13)	(0.15)
OWN - OTHER	1.18	0.67**	0.83
	(0.20)	(0.20)	(0.25)
SOUTH CENSUS	0.87	0.96	0.73
	(0.13)	(0.13)	(0.10)
MIDWEST CENSUS	0.82	0.88	0.87
	(0.12)	(0.12)	(0.11)
NORTHEAST CENSUS	0.79	0.68***	0.66***
	(0.13)	(0.13)	(0.09)
OBS.	1723	1723	1723

ESTIMATES ARE ODDS RATIOS. STANDARD ERRORS ARE IN PARENTHESIS.
***** P<0.01, ** P<0.05**

Discussion

In our nationally representative study of primary care and multi-specialty practices, we found no systematic evidence that SNPs collect and use management performance data to a lesser degree relative to FQHCs and other practices. Our results are consistent with previous research of safety net providers overall – namely, that SNPs face patients with higher deprivation rates, including lower income, education levels, employment rates, higher rates of chronic poverty, as well as other socioeconomic indicators including more fragmented households, and higher rates of homeless. However, we found tentative evidence that SNPs do not appear to be constricted in their HIT capacities or their ability to collect and use performance data relative to other practices in our sample, especially FQHCs. Previous research shows that SNPs are resource constrained and are often low performers in programs like the Hospital Readmission Reduction Program, but our research suggests that these shortcomings are not due to the lack of performance data collection and quality improvement processes. Finally, our study shows that SNPs participate in VBP and other programs using economic incentives to promote better care delivery ar rates similar to FQHCs and other practices.

FQHCs perform well on use of data for internal quality improvement. This is likely in part because of the requirements involved in applying for and obtaining FQHC designation, which emphasize the establishment and adherence to series of internal quality and cost measurement processes. We also find that FQHCs rely very heavily on Medicaid revenue as a share of their overall revenue stream. This result is consistent with improved Medicaid reimbursement rates - a FQHC-designation benefit compared to other practices. In the post-Medicaid expansion world, some studies have pointed out that private providers now pursue newly-covered Medicaid patients that previously constituted charity care, generating concern for the financial sustainability of SNPs and FQHCs. Our study confirms the importance of these Medicaid patients for their bottom line, as SNPs and FQHCs rely on this revenue source much more heavily relative to other practices.

Finally, we show that SNPs participate in value-based contracting in the form of pay-for-performance and ACOs at similar rates to other practices. Whether this similarity in participation rates is due to voluntary or compulsive regulations is an open question. Monitoring the financial impact of value-based contracting on SNPs remains an important policy consideration, given the population they serve. However, while VBP might have negative implications for SNPs, our study does not find evidence that SNPs will face an uphill battle on their internal monitoring, quality and cost-containment efforts in order to meet pay-for-performance programs' requirements.

Limitations

Our study is subject to certain limitations. Our analysis is cross-sectional and descriptive in nature, so we are unable to make causal statements in the links between our practices and their collection and use of clinical performance data across all our domains. Reverse causality matters to some extent – it could be that practices that were well suited to invest into the requirements for FQHC status did so, and as such, are naturally going to perform better in our performance data collection outcomes, instead of performing better because of the benefits from FQHC status. We attempt to minimize this issue by stratifying our analyses along high and low performers on HIT capacities. A second issue pertains to the survey, which is subject to sampling and measurement error due to the fact that it relies on self-report from a single respondent. Moreover, our outcomes are counts of binary questions. It could be that each type of activity is adopted with differing degrees of intensity across practices, or only in certain subsets of patients, clinical cases, or other dimensions. Finally, our classification of SNPs relies on a reported share of Medicaid revenues for practices; respondents were not asked to quantify their uninsured patient shares.

Conclusion

In the age of value-based contracting and other programs incentivizing quality of care delivery and cost-reduction, it is important to recognize the limitations faced by different providers in meeting program benchmarks. SNPs face risks from VBP because of their financial and clinical constraints, in addition to the complex nature of the population they serve. However, this study provides evidence that SNPs are not limited as has been hypothesized in their capabilities related to the acquisition and use of clinical performance data to improve care delivery. As such, our analysis suggests that policy efforts aimed at improving the capacities of this critical set of providers might consider focusing elsewhere, in areas where the evidence of SNP limitations are much more concrete.

Works Cited

1. Musumeci M. Implementing the ACA's Medicaid-related health reform provisions after the Supreme Court's Decision. *Washington, DC Kaiser Comm Medicaid Uninsured*. 2012.

2. Miller S, Wherry LR. Health and access to care during the first 2 years of the ACA Medicaid expansions. *N Engl J Med*. 2017;376(10):947-956.

3. Sommers BD, Blendon RJ, Orav EJ, Epstein AM. Changes in utilization and health among low-income adults after Medicaid expansion or expanded private insurance. *JAMA Intern Med*. 2016;176(10):1501-1509.

4. Courtemanche C, Marton J, Ukert B, Yelowitz A, Zapata D. Early impacts of the Affordable Care Act on health insurance coverage in Medicaid expansion and non-expansion states. *J Policy Anal Manag*. 2017;36(1):178-210.

5. Sommers BD, Baicker K, Epstein AM. Mortality and access to care among adults after state Medicaid expansions. *N Engl J Med*. 2012;367(11):1025-1034.

6. Christopher AS, McCormick D, Woolhandler S, Himmelstein DU, Bor DH, Wilper AP. Access to care and chronic disease outcomes among Medicaid-insured persons versus the uninsured. *Am J Public Health*. 2016;106(1):63-69.

7. Ghosh A, Simon K, Sommers BD. *The Effect of State Medicaid Expansions on Prescription Drug Use: Evidence from the Affordable Care Act*. National Bureau of Economic Research; 2017.

8. Kaufman HW, Chen Z, Fonseca VA, McPhaul MJ. Surge in newly identified diabetes among Medicaid patients in 2014 within Medicaid expansion states under the Affordable Care Act. *Diabetes Care*. 2015;38(5):833-837.

9. Blavin F. Association between the 2014 Medicaid expansion and US hospital finances. *Jama*. 2016;316(14):1475-1483.

10. Dranove D, Garthwaite C, Ody C. Uncompensated care decreased at hospitals in Medicaid

expansion states but not at hospitals in nonexpansion states. *Health Aff*. 2016;35(8):1471-1479.

11. Golberstein E, Gonzales G, Sommers BD. California's early ACA expansion increased coverage and reduced out-of-pocket spending for the state's low-income population. *Health Aff*. 2015;34(10):1688-1694.

12. Hempstead K, Cantor JC. State Medicaid expansion and changes in hospital volume according to payer. *N Engl J Med*. 2016;374(2):196-198.

13. Ku L, Jones K, Shin P, Bruen B, Hayes K. The states' next challenge—securing primary care for expanded Medicaid populations. *N Engl J Med*. 2011;364(6):493-495.

14. Gold R, Bailey SR, O'Malley JP, et al. Estimating demand for care after a Medicaid expansion: lessons from Oregon. *J Ambul Care Manage*. 2014;37(4):282.

15. Fertig AR, Carlin CS, Ode S, Long SK. Evidence of pent-up demand for care after Medicaid expansion. *Med Care Res Rev*. 2018;75(4):516-524.

16. Joynt KE, Chan D, Orav EJ, Jha AK. Insurance expansion in Massachusetts did not reduce access among previously insured Medicare patients. *Health Aff*. 2013;32(3):571-578.

17. Tipirneni R, Rhodes K V, Hayward RA, Lichtenstein RL, Reamer EN, Davis MM. Primary care appointment availability for new Medicaid patients increased after Medicaid expansion in Michigan. *Health Aff*. 2015;34(8):1399-1406.

18. Schnake-Mahl AS, Sommers BD. Health care in the suburbs: an analysis of suburban poverty and health care access. *Health Aff*. 2017;36(10):1777-1785.

19. Kenney GM, Zuckerman S, Dubay L, et al. Opting in to the Medicaid expansion under the ACA: Who are the uninsured adults who could gain health insurance coverage? *Washington, DC Urban Institute http//www urban org/publications/412630 html*. 2012.

20. Foundation KF. Status of state action on the Medicaid expansion decision. *Kff org*. 2016.

21. Miller S. The effect of insurance on emergency room visits: an analysis of the 2006 Massachusetts health reform. *J Public Econ*. 2012;96(11-12):893-908.

22. Finkelstein A. The aggregate effects of health insurance: Evidence from the introduction of Medicare. *Q J Econ*. 2007;122(1):1-37.

23. Burwell SM. Setting value-based payment goals--HHS efforts to improve US health care. *N Engl J Med*. 2015;372(10):897-899.

24. Fisher ES, Bynum JP, Skinner JS. Slowing the growth of health care costs—lessons from regional variation. *N Engl J Med*. 2009;360(9):849-852.

25. Fisher E, Goodman D, Skinner J, Bronner K. Health Care Spending, Quality and Outcomes: More Isn't Always Better. *Dartmouth Inst Heal Policy Clin Pract Dartmouth, New Hampsh*. 2009;27.

26. Doherty RB. Goodbye, Sustainable Growth Rate—Hello, Merit-Based Incentive Payment SystemGoodbye, Sustainable Growth Rate. *Ann Intern Med*. 2015;163(2):138-139.

27. McGuire TG. Physician agency. *Handb Heal Econ*. 2000;1:461-536.

28. Clemens J, Gottlieb JD. Do Physicians' Financial Incentives Affect Medical Treatment and Patient Health? *Am Econ Rev*. 2014;104(4):1320-1349.

29. Gruber J, Owings M. Physician Financial Incentives and Cesarean Section Delivery. *Rand J Econ*. 1996:99-123.

30. Landon BE, Reschovsky JD, Pham HH, Kitsantas P, Wojtuskiak J, Hadley J. Creating a parsimonious typology of physician financial incentives. *Heal Serv Outcomes Res Methodol*. 2009;9(4):219-233.

31. Landon BE, O'Malley AJ, McKellar MR, Reschovsky JD, Hadley J. Physician compensation strategies and quality of care for Medicare beneficiaries. *Am J Manag Care*. 2014;20(10):804-811.

32. Landon BE, Reschovsky JD, O'malley AJ, Pham HH, Hadley J. The relationship between physician compensation strategies and the intensity of care delivered to Medicare beneficiaries. *Health Serv Res*. 2011;46(6pt1):1863-1882.

33. Conrad DA, Maynard C, Cheadle A, et al. Primary care physician compensation method in medical groups: does it influence the use and cost of health services for enrollees in managed care organizations? *Jama*. 1998;279(11):853-858.

34. Rosenthal MB, Dudley RA. Pay-for-performance: will the latest payment trend improve care? *Jama*. 2007;297(7):740-744.

35. Berenson RA, Rich EC. US approaches to physician payment: the deconstruction of primary care. *J Gen Intern Med*. 2010;25(6):613-618.

36. Barnett ML, Linder JA, Clark CR, Sommers BD. Low-Value Medical Services in the Safety-Net Population. *JAMA Intern Med*. 2017;177(6):829-837.

37. Barnett ML, Linder JA. Antibiotic prescribing for adults with acute bronchitis in the United States, 1996-2010. *Jama*. 2014;311(19):2020-2022.

38. Barnett ML, Linder JA. Antibiotic prescribing to adults with sore throat in the United States, 1997-2010. *JAMA Intern Med*. 2014;174(1):138-140.

39. Mehrotra A, Zaslavsky AM, Ayanian JZ. Preventive health examinations and preventive gynecological examinations in the United States. *Arch Intern Med*. 2007;167(17):1876-1883.

40. Edwards ST, Mafi JN, Landon BE. Trends and quality of care in outpatient visits to generalist and specialist physicians delivering primary care in the United States, 1997–2010. *J Gen Intern Med*. 2014;29(6):947-955.

41. Linder JA, Ma J, Bates DW, Middleton B, Stafford RS. Electronic health record use and the quality of ambulatory care in the United States. *Arch Intern Med*. 2007;167(13):1400-1405.

42. Cassel CK, Guest JA. Choosing wisely: helping physicians and patients make smart

decisions about their care. *Jama*. 2012;307(17):1801-1802.

43. Rao VM, Levin DC. The overuse of diagnostic imaging and the Choosing Wisely initiative. *Ann Intern Med*. 2012;157(8):574-576

44. Mafi JN, McCarthy EP, Davis RB, Landon BE. Worsening trends in the management and treatment of back pain. *JAMA Intern Med*. 2013;173(17):1573-1581.

45. Schwartz AL, Landon BE, Elshaug AG, Chernew ME, McWilliams JM. Measuring low-value care in Medicare. *JAMA Intern Med*. 2014;174(7):1067-1076.

46. Papke LE, Wooldridge J. Econometric methods for fractional response variables with an application to 401 (k) plan participation rates. 1993.

47. Van Herck P, De Smedt D, Annemans L, Remmen R, Rosenthal MB, Sermeus W. Systematic review: effects, design choices, and context of pay-for-performance in health care. *BMC Health Serv Res*. 2010;10(1):247.

48. Mendelson A, Kondo K, Damberg C, et al. The effects of pay-for-performance programs on health, health care use, and processes of care: a systematic review. *Ann Intern Med*. 2017;166(5):341-353.

49. Physicians AA of F. Joint principles of the Patient-Centered Medical Home. *Del Med J*. 2008;80(1):21.

50. Gilchrist VJ, Stange KC, Flocke SA, McCord G, Bourguet C. A comparison of the National Ambulatory Medical Care Survey (NAMCS) measurement approach with direct observation of outpatient visits. *Med Care*. 2004;42(3):276-280.

51. Coughlin TA, Long SK, Sheen E, Tolbert J. How five leading safety-net hospitals are preparing for the challenges and opportunities of health care reform. *Health Aff*. 2012;31(8):1690-1697.

52. Wang CJ, Conroy KN, Zuckerman B. Payment reform for safety-net institutions—improving quality and outcomes. *N Engl J Med*. 2009;361(19):1821-1823.

53. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med*. 2011;155(2):97-107.

54. Services USD of H and H. National Healthcare Quality and Disparities Report. 2016.

55. Braveman PA, Cubbin C, Egerter S, Williams DR, Pamuk E. Socioeconomic disparities in health in the United States: what the patterns tell us. *Am J Public Health*. 2010;100(S1):S186-S196.

56. Gaskin DJ, Hadley J. Population characteristics of markets of safety-net and non-safety-net hospitals. *J Urban Heal*. 1999;76(3):351-370.

57. Cunningham P, Felland L, Stark L. Safety-net providers in some US communities have increasingly embraced coordinated care models. *Health Aff*. 2012;31(8):1698-1707.

58. Ku L, Jones E, Shin P, Byrne FR, Long SK. Safety-net providers after health care reform: lessons from Massachusetts. *Arch Intern Med*. 2011;171(15):1379-1384.

59. Chatterjee P, Joynt KE, Orav EJ, Jha AK. Patient experience in safety-net hospitals: implications for improving care and value-based purchasing. *Arch Intern Med*. 2012;172(16):1204-1210.

60. Ross JS, Cha SS, Epstein AJ, et al. Quality of care for acute myocardial infarction at urban safety-net hospitals. *Health Aff*. 2007;26(1):238-248.

61. Berenson J, Shih A. Higher readmissions at safety-net hospitals and potential policy solutions. *Issue Br (Commonw Fund)*. 2012;34:1-16.

62. Shahan CP, Bell T, Paulus E, Zarzaur BL. Emergency general surgery outcomes at safety net hospitals. *J Surg Res*. 2015;196(1):113-117.

63. Genther DJ, Gourin CG. The effect of hospital safety-net burden status on short-term outcomes and cost of care after head and neck cancer surgery. *Arch Otolaryngol Neck Surg*. 2012;138(11):1015-1022.

64. Blegen MA, Goode CJ, Spetz J, Vaughn T, Park SH. Nurse staffing effects on patient outcomes: safety-net and non-safety-net hospitals. *Med Care*. 2011:406-414.

65. Gilman M, Adams EK, Hockenberry JM, Milstein AS, Wilson IB, Becker ER. Safety-net hospitals more likely than other hospitals to fare poorly under Medicare's value-based purchasing. *Health Aff*. 2015;34(3):398-405.

66. Mouch CA, Regenbogen SE, Sha'Shonda LR, Wong SL, Lemak CH, Morris AM. The quality of surgical care in safety net hospitals: a systematic review. *Surgery*. 2014;155(5):826-838.

67. Roberts ET, Zaslavsky AM, McWilliams JM. The value-based payment modifier: program outcomes and implications for disparities. *Ann Intern Med*. 2018;168(4):255-265.

68. Gilman M, Adams EK, Hockenberry JM, Wilson IB, Milstein AS, Becker ER. California safety-net hospitals likely to be penalized by ACA value, readmission, and meaningful-use programs. *Health Aff*. 2014;33(8):1314-1322.

69. Fisher ES, Shortell SM. Accountable care organizations: accountable for what, to whom, and how. *Jama*. 2010;304(15):1715-1716.

70. Centers for Medicare & Medicaid Services (CMS) HHS. Medicare Program; Merit-Based Incentive Payment System (MIPS) and Alternative Payment Model (APM) incentive under the physician fee schedule, and criteria for physician-focused payment models. Final rule with comment period. *Fed Regist*. 2016;81(214):77008.

71. Eijkenaar F, Emmert M, Scheppach M, Schöffski O. Effects of pay for performance in health care: a systematic review of systematic reviews. *Health Policy (New York)*. 2013;110(2-3):115-130.

72. Johnston ME, Langton KB, Haynes RB, Mathieu A. Effects of computer-based clinical decision support systems on clinician performance and patient outcome: a critical appraisal of research. *Ann Intern Med*. 1994;120(2):135-142.

73. Baker DW, Qaseem A, Reynolds PP, Gardner LA, Schneider EC. Design and use of performance measures to decrease low-value services and achieve cost-conscious care.

Ann Intern Med. 2013;158(1):55-59.

74. Shi L, Lebrun LA, Zhu J, et al. Clinical quality performance in US health centers. *Health Serv Res*. 2012;47(6):2225-2249.

75. Rothkopf J, Brookler K, Wadhwa S, Sajovetz M. Medicaid patients seen at federally qualified health centers use hospital services less than those seen by private providers. *Health Aff*. 2011;30(7):1335-1342.

76. Goldman LE, Chu PW, Tran H, Romano MJ, Stafford RS. Federally qualified health centers and private practice performance on ambulatory care measures. *Am J Prev Med*. 2012;43(2):142-149.

77. Falik M, Needleman J, Herbert R, Wells B, Politzer R, Benedict MB. Comparative effectiveness of health centers as regular source of care: application of sentinel ACSC events as performance measures. *J Ambul Care Manage*. 2006;29(1):24-35.

78. Richard P, Ku L, Dor A, Tan E, Shin P, Rosenbaum S. Cost savings associated with the use of community health centers. *J Ambul Care Manage*. 2012;35(1):50-59.

79. Shi L, Tsai J, Higgins PC, Lebrun LA. Racial/ethnic and socioeconomic disparities in access to care and quality of care for US health center patients compared with non–health center patients. *J Ambul Care Manage*. 2009;32(4):342-350.

80. Werner RM, Goldman LE, Dudley RA. Comparison of change in quality of care between safety-net and non–safety-net hospitals. *Jama*. 2008;299(18):2180-2187.

81. Figueroa JF, Joynt KE, Zhou X, Orav EJ, Jha AK. Safety-net hospitals face more barriers yet use fewer strategies to reduce readmissions. *Med Care*. 2017;55(3):229.

82. Singh GK. Area deprivation and widening inequalities in US mortality, 1969–1998. *Am J Public Health*. 2003;93(7):1137-1143.

83. Kind AJH, Jencks S, Brock J, et al. Neighborhood socioeconomic disadvantage and 30-day rehospitalization: a retrospective cohort study. *Ann Intern Med*. 2014;161(11):765-774.

84. Durfey SNM, Kind AJH, Buckingham WR, DuGoff EH, Trivedi AN. Neighborhood disadvantage and chronic disease management. *Health Serv Res*. 2019;54:206-216.

85. Hu J, Kind AJH, Nerenz D. Area Deprivation Index predicts readmission risk at an urban teaching hospital. *Am J Med Qual*. 2018;33(5):493-501.

86. Taylor J. Changes in latitudes, changes in attitudes: FQHCs and community clinics in a reformed health care market. 2012.

87. Pimperl AF, Rodriguez HP, Schmittdiel JA, Shortell SM. The Implementation of Performance Management Systems in US Physician Organizations. *Med Care Res Rev*. 2018;75(5):562-585.

88. Altman S, Lewin ME. *America's Health Care Safety Net: Intact but Endangered*. National Academies Press; 2000.

89. McHugh M, Kang R, Hasnain-Wynia R. Understanding the safety net: inpatient quality of care varies based on how one defines safety-net hospitals. *Med Care Res Rev*. 2009;66(5):590-605.

90. Knox L, Brach C. The practice facilitation handbook: training modules for new facilitators and their trainers. *Rockv Agency Healthc Res Qual*. 2013.

91. Gilman M, Hockenberry JM, Adams EK, Milstein AS, Wilson IB, Becker ER. The financial effect of value-based purchasing and the hospital readmissions reduction program on safety-net hospitals in 2014: a cohort study. *Ann Intern Med*. 2015;163(6):427-436.

Supplementary Materials

Appendix to Chapter 2 "The Association Between Primary Care Physician Compensation and Patterns of Care Delivery, 2012-2015"

Adrian Garcia Mosqueira, M.A.; Meredith Rosenthal, Ph.D. and Michael L. Barnett, M.D., M.S.

__**Table of Contents**__

Appendix Methodology: Methodology Behind Low-Value and High-Value Composite Measures

We developed two composite measures from the 20 quality measures defined in Appendix Table 2. The two composite measures integrated two mutually exclusive groups of quality measures, 8 measures for low-value care and 12 measures for high-value care (Appendix Table 2). A critical component in creating these measures is that a single office visit may be eligible for multiple quality measures. For instance, if a patient with coronary artery disease (CAD) and congestive heart failure (CHF) presents for a visit and is taking aspirin and a beta-blocker but no statin or angiotensin-converting enzyme (ACE) inhibitor, that visit would be eligible for 5 high value measures and receive "credit" for 3 of those measures (1 for aspirin and 2 for beta-blocker), or a composite high-value score of 3/5 = 0.6. Therefore, for the composite measures, each visit has a number of eligible measures (denominator) and the number of times the service measured was delivered (numerator).

We also needed to account for the fact that a visit which is eligible for multiple services should have more weight than a visit with only one service. To accomplish this, for the calculation of survey-weighted estimates of the composite measures, we multiplied the survey weights provided by NAMCS by the number of eligible services for a given visit. Therefore, a visit with 5 eligible services would have 5 times its typical weight than a visit with 1 service. We used these modified survey weights for regressions that included the composite measures.

Table A1 – Low-Value and High-Value Care Measure Definitions

	Quality Measure	Denominator Population	Numerator	Exclusions
Low-Value Care Measure	Antibiotics for “never” URI’s	New problem visits with primary diagnosis or reason for visit including: bronchitis, nonstreptococcal pharyngitis or upper respiratory infections	Prescription of any oral antibiotic	"Competing diagnosis" for antibiotics including urinary tract infection, other bacterial infections, vaginitis, human immunodeficiency virus. Also excluded patients with chronic obstructive pulmonary disease or any cancer diagnosis, as well as patients sent to the emergency department or admitted.
	Screening EKG in GME	Any visit with a diagnosis or reason for visit of annual physical exam	Order for EKG	Any diagnosis or reason for visit of chronic sinusitis, immune disorders, nasal polyps, eye/orbit related injuries, or head trauma.
	Screening CBC in GME	Any visit with a diagnosis or reason for visit of annual physical exam	Order for CBC	Any diagnosis or reason for visit of cancer, hematologic disease, fever, fatigue or bacterial infection
	Screening UA in GME	Any visit with a diagnosis or reason for visit of annual physical exam	Order for a UA	Any diagnosis or reason for visit of urologic disease or symptom [dysuria, urgency, retention, hematuria], kidney disease in chronic kidney disease, or pregnancy.
	Opioids for back/neck pain	Any visit with a diagnosis or reason for visit involving back or neck pain	Prescription of any opioid-containing medication	Any diagnosis or reason for visit including “red flags”: fever, weight loss, cachexia, neurologic symptoms, cancer, spinal fracture, myelopathy, post-laminectomy
	CT/MRI for back/neck pain	Any visit with a diagnosis or reason for visit involving back or neck pain	Order of advanced imaging (CT/MRI)	Any diagnosis or reason for visit including “red flags”: fever, weight loss, cachexia, neurologic symptoms, cancer, spinal fracture, myelopathy, post-laminectomy
	Opioids for headache	Any visit with a diagnosis or reason for visit of headache or migraine	Prescription of any opioid-containing medication	Any diagnosis or reason for visit of human immunodeficiency virus, pregnancy, neurologic symptoms [weakness, sensory changes, altered mental status], cancer, head trauma or epilepsy
	CT/MRI for headache	Any visit with a diagnosis or reason for visit of headache or migraine	Order of advanced imaging (CT/MRI)	Any diagnosis or reason for visit of human immunodeficiency virus, pregnancy, neurologic symptoms [weakness, sensory changes, altered mental status], cancer, head trauma or epilepsy
High Value Care Measures	Tobacco cessation counseling	Any visit for a current cigarette smoker or diagnosis/reason for visit for smoking	Tobacco cessation counseling provided	None
	Weight reduction counseling	Any visit for a patient with a body mass index greater than or equal to 30, or a diagnosis/reason for visit of obesity	Counseling provided for weight reduction, exercise, or diet/nutrition	None
	Anticoagulant use in Afib	Any visit with a diagnosis of atrial fibrillation or atrial flutter	Prescription of heparin-family drug, coumadin, novel anticoagulant,	Any diagnosis or reason for visit of gastrointestinal bleeding, gastritis, alcoholism or drug abuse, gait disorder, dementia, central nervous system bleeding, seizures, central

			aspirin or Aggrenox	nervous system malignancy, or thrombocytopenia
	Aspirin use in CAD	Any visit with a diagnosis or reason for visit or chronic illness code for coronary artery disease	Prescription of an antiplatelet agent including aspirin	Any diagnosis or reason for visit of gastrointestinal bleeding, gastritis, central nervous system bleeding
	Beta blocker use in CAD	Any visit with a diagnosis or reason for visit or chronic illness code for coronary artery disease	Prescription of a beta blocker	Any diagnosis of heart block, asthma or chronic obstructive pulmonary disease
	Statin use in CAD	Any visit with a diagnosis or reason for visit or chronic illness code for coronary artery disease	Prescription of a statin	Any diagnosis of liver disease or alcoholism
	Beta blocker use in CHF	Any diagnosis or chronic illness code of congestive heart failure	Prescription of a beta blocker	Any diagnosis of heart block, asthma or chronic obstructive pulmonary disease
	ACE/ARB use in CHF	Any diagnosis or chronic illness code of congestive heart failure	Prescription of an ACE or ARB	Any diagnosis of hyperkalemia or angioedema
	Antiplatelet use in CVD	Any diagnosis or chronic illness code of congestive heart failure	Prescription of an antiplatelet agent including aspirin	Any diagnosis or reason for visit of gastrointestinal bleeding, gastritis, central nervous system bleeding
	Statin use in DM	Any diagnosis or chronic illness code of diabetes mellitus	Prescription of a statin	Any diagnosis of liver disease or alcoholism
	Depression counseling	Any diagnosis of depression or chronic illness code of depression	Prescription of antidepressant (SSRI, SNRI, TCA etc.) or mental health counseling	None
	Treatment for osteoporosis	Any diagnosis of osteoporosis or chronic illness code for osteoporosis	Prescription for osteoporosis medication (bisphosphonate, PTH, etc.)	None

Table A2 – Patient and Physician Characteristics by Ownership

	Own Solo		Own Non-Solo	
(n raw)	27,154		22,081	
(n weighted)	574,548,344		597,514,201	
Age (mean)	**39**	[36.4 – 41.7]	**42.9**	[40.8 – 45.0]
Female	**61.40%**	[0.59 – 0.64]	**60.50%**	[0.58 – 0.63]
Race/Ethnicity				
Non-Hispanic White	**70.70%**	[0.68 – 0.74]	**58.10%**	[0.55 – 0.62]
Non-Hispanic Black	**11.10%**	[0.09 – 0.13]	**13.00%**	[0.11 – 0.15]
Hispanic	**13.10%**	[0.11 – 0.15]	**21.70%**	[0.18 – 0.25]
Non-Hispanic Other	**5.00%**	[0.04 – 0.06]	**7.20%**	[0.05 – 0.09]
Number of Chronic Diseases				
0	**50.10%**	[0.46 – 0.54]	**44.60%**	[0.41 – 0.48]
1	**19.00%**	[0.18 – 0.20]	**21.30%**	[0.20 – 0.23]
2	**12.30%**	[0.11 – 0.13]	**15.00%**	[0.13 – 0.17]
3	**9.20%**	[0.08 – 0.11]	**10.10%**	[0.09 – 0.11]
4+	**9.40%**	[0.07 – 0.12]	**9.00%**	[0.08 – 0.10]
Region				
Northeast	**24.10%**	[0.20 – 0.28]	**20.50%**	[0.16 – 0.25]
Midwest	**18.00%**	[0.15 – 0.21]	**11.80%**	[0.09 – 0.15]
South	**32.60%**	[0.29 – 0.37]	**43.70%**	[0.39 – 0.49]
West	**25.30%**	[0.20 – 0.31]	**24.00%**	[0.19 – 0.29]
Rural Visit Location	**8.30%**	[0.07 – 0.10]	**11.20%**	[0.08 – 0.14]
Insurance Type				
Private	**63.30%**	[0.60 – 0.67]	**47.20%**	[0.44 – 0.51]
Medicare	**20.30%**	[0.16 – 0.24]	**22.80%**	[0.21 – 0.25]
Medicaid/CHIP	**13.50%**	[0.12 – 0.16]	**23.10%**	[0.19 – 0.27]
Other	**2.90%**	[0.02 – 0.03]	**6.90%**	[0.06 – 0.08]
Practice Characteristics				
Who Owns the Practice?				
Physician Grp.	**97.60%**	[0.96 – 0.99]	**98.70%**	[0.97 – 1.00]
Acad/Commty	**0.00%**	[0.00 – 0.00]	**0.00%**	[0.00 – 0.01]
Insurer/HMO	**2.30%**	[0.01 – 0.04]	**0.00%**	[0.00 – 0.02]
Capitation Revenue				
0-25% Revenue	**60.20%**	[0.55 – 0.66]	**66.80%**	[0.61 – 0.73]
26-50% Revenue	**5.20%**	[0.03 – 0.07]	**9.70%**	[0.05 – 0.15]
51-75% Revenue	**5.50%**	[0.00 – 0.11]	**2.80%**	[0.02 – 0.04]
Over 75% Revenue	**1.40%**	[0.00 – 0.02]	**2.60%**	[0.01 – 0.04]
Missing	**28.00%**	[0.23 – 0.32]	**18.00%**	[0.14 – 0.22]

Note**:** Table presents estimates of sample demographic characteristics stratified by ownership type 95% CI in brackets.

Table A3 – Factors Affecting Compensation (FACs) for Physician Owners

	Own Solo	Own Non-Solo
Observations (raw)	1,035	1,133
Observations (weighted)	205,769	181,459
Practice Finances	**72.88%** [0.69-0.77]	**71.30%** [0.68-0.75]
Personal Productivity	**33.70%** [0.30-0.38]	**57.80%** [0.54-0.62]
Patient Satisfaction	**4.40%** [0.03-0.06]	**9.80%** [0.07-0.13]
Quality Measures	**6.90%** [0.05-0.09]	**14.80%** [0.12-0.18]
Practice Profiling	**5.85%** [0.04-0.08]	**8.52%** [0.06-0.11]

Note: Chi squared p-value for differences in FACs across ownership status is 0.00 at the 95% C.I. Physicians could check more than one FAC in the survey, thus these totals are not mutually exclusive.

Table A4 – Out-of-Visit/Office Care by PCP Ownership

	Percentage [95% C.I.]	Unadjusted O.R. [95% C.I.]	Adjusted O.R. [95% C.I.]
Home Visits			
Own Solo	**4.6%** [0.30 – 0.60]	**1.29** [0.51 – 3.26]	0.88 [0.21 – 3.67]
Own Non-Solo	**11.5%** [0.09 – 0.14]	**3.49** [1.41 – 8.59] ***	2.04 [0.50 – 8.35]
Nursing H Visits			
Own Solo	**15.7%** [0.12 – 0.19]	**0.90** [0.49 – 1.66]	1.23 [0.48 – 3.17]
Own Non-Solo	**19.5%** [0.16 – 0.23]	**1.18** [0.67 – 2.08]	1.19 [0.48 – 2.97]
Hospital Visits			
Own Solo	**53.7%** [0.49 – 0.58]	**2.63** [1.66 – 4.17] ***	**2.28** [1.09 – 4.73] **
Own Non-Solo	**46.0%** [0.42 – 0.50]	**1.93** [1.22 – 3.07] ***	1.76 [0.84 – 3.69]
Phone Consults			
Own Solo	**53.3%** [0.49 – 0.58]	**1.86** [1.16 – 2.98] **	**3.07** [1.46 – 6.43] ***
Own Non-Solo	**62.7%** [0.59 – 0.67]	**2.74** [1.70 – 4.40] ***	**4.64** [2.18 – 9.84] ***
Email Consults			
Own Solo	**16.5%** [0.13 – 0.19]	**1.15** [0.69 – 2.15]	1.42 [0.60 – 3.33]
Own Non-Solo	**12.6%** [0.09 – 0.16]	**0.83** [0.43 – 1.59]	1.43 [0.59 – 3.51]
Observations (raw/weighed)	**7,819/623,039**		

Note: **p<0.05 ***p<0.01
*Adjusted model uses productivity-based employee physicians as reference category. Adjusters are patient demographics, such as racial/ethnic, urban/rural, age, gender and number of chronic conditions, as well as practice-level characteristics including percentage of revenue from Medicare, Medicaid and private insurance, revenue subject to capitation, and electronic health records availability.

Table A5 – Overuse and Quality Measures by Ownership

	Owner Solo			Owner Non-Solo		
Quality/Overuse Measure	N	%	95% CI	N	%	95% CI
Overuse Composite	4798	**35.83**	[0.33-0.39]	4391	**36.50**	[0.33-0.40]
Antibiotics for "never" URIs	390	**56.89**	[0.46-0.68]	414	**59.64**	[0.52-0.68]
Screening EKG in GME	2085	**6.91**	[0.04-0.10]	1487	**6.77**	[0.04-0.09]
Screening CBC in GME	2745	**24.93**	[0.21-0.29]	2082	**24.05**	[0.20-0.28]
Screening UA in GME	2810	**21.75**	[0.18-0.26]	2111	**16.67**	[0.13-0.20]
Opioids for back/neck pain	1093	**32.21**	[0.27-0.37]	1467	**40.50**	[0.34-0.47]
CT/MRI for back/neck pain	1093	**5.02**	[0.03-0.07]	1467	**4.45**	[0.03-0.06]
Opioids for headache	340	**12.93**	[0.08-0.18]	309	**14.25**	[0.08-0.21]
CT/MRI for headache	340	**1.84**	[0.01-0.03]	309	**0.37**	[0.00-0.01]
High Value Composite	9588	**34.81**	[0.32-0.37]	8920	**34.05**	[0.32-0.36]
Tobacco cessation counseling	2438	**9.84**	[0.08-0.12]	2284	**11.67**	[0.09-0.14]
Weight reduction counseling	4946	**20.23**	[0.17-0.23]	4649	**18.87**	[0.16-0.22]
Anticoagulant use in Afib	223	**64.92**	[0.55-0.75]	185	**64.87**	[0.54-0.76]
Aspirin use in CAD	588	**33.78**	[0.25-0.42]	518	**37.60**	[0.29-0.46]
Beta blocker use in CAD	479	**44.66**	[0.35-0.55]	424	**54.63**	[0.46-0.63]
Statin use in CAD	588	**38.69**	[0.30-0.48]	524	**46.61**	[0.38-0.55]
Beta blocker use in CHF	262	**44.14**	[0.35-0.54]	245	**42.37**	[0.29-0.56]
ACE/ARB use in CHF	372	**17.54**	[0.11-0.24]	329	**18.45**	[0.13-0.24]
Antiplatelet use in CVD	396	**32.02**	[0.23-0.41]	307	**31.00**	[0.24-0.38]
Statin use in DM	2235	**36.91**	[0.32-0.41]	2226	**37.13**	[0.33-0.41]
Depression counseling	2121	**49.38**	[0.45-0.54]	1784	**47.61**	[0.43-0.52]
Treatment for osteoporosis	711	**19.08**	[0.15-0.23]	601	**24.05**	[0.17-0.31]

Note: Abbreviations: confidence interval (CI), upper respiratory tract infection (URI), computed tomography (CT), electrocardiogram (ECG), complete blood count (CBC), urinalysis (UA), general medical examination (GME), magnetic resonance imaging (MRI), atrial fibrillation (AF), coronary artery disease (CAD), congestive heart failure (CHF), angiotensin-converting enzyme inhibitor (ACE), angiotensin receptor blocker (ARB), cerebrovascular disease (CVD), diabetes mellitus (DM).
*All estimates are survey-weighted proportions accounting for NAMCS sample design.
** Low- and high-value care composites calculated at the visit level as the proportion of low- or high-value services delivered at a visit. To account for visits qualifying for more services than others, survey weights were multiplied by the number of eligible low- or high-value measures.

Table A6 – Out-of-Visit/Office Care by PCP Compensation Type, Alternate Compensation Definition

This definition of compensation defines the exposure as those physicians that select only personal productivity or practice finances FACs.

	Percentage [95% C.I.]	Unadjusted O.R. [95% C.I.]	Adjusted O.R. [95% C.I.]
Home Visits			
Reference PCPs	**3.9%** [0.03 - 0.06]	-	-
Productivity FACs	**7.6%** [0.06 - 0.09]	**2.07†** [1.26 – 3.45]	**1.98*** [1.13 – 3.48]
Nursing H Visits			
Reference PCPs	**13.1%** [0.10 - 0.17]	-	-
Productivity FACs	**15.4%** [0.13 - 0.18]	**1.21** [0.87 – 1.69]	**0.83** [0.49 – 1.42]
Hospital Visits			
Reference PCPs	**36.1%** [0.32 - 0.40]	-	-
Productivity FACs	**46.6%** [0.44 - 0.49]	**1.54†** [1.26 – 1.89]	**1.04** [0.75 – 1.45]
Phone Consults			
Reference PCPs	**56.2%** [0.52 - 0.60]	-	-
Productivity FACs	**54.4%** [0.52 - 0.57]	**0.93** [0.76 – 1.14]	**0.79** [0.58 – 1.08]
Email Consults			
Reference PCPs	**24.0%** [0.21 - 0.28]	-	-
Productivity FACs	**14.8%** [0.13 - 0.17]	**0.55†** [0.42 – 0.71]	**0.69*** [0.49 – 0.97]
Observations (raw/weighed)	**7,620/633,815**		

Note: *p<0.05 †p<0.01
*Adjusted model uses productivity-based employee physicians as reference category. E.H.R uses partial as reference. Adjusters are patient demographics, such as racial/ethnic, urban/rural, age, gender and number of chronic conditions, as well as practice-level characteristics including percentage of revenue from Medicare, Medicaid and private insurance, electronic health records availability, ownership status, and solo/group practice.

Table A7 – Overuse and Quality Measures – Full Adjusted and Unadjusted Models, Alternate Compensation Definition

This definition of compensation defines the exposure as those physicians that select only personal productivity or practice finances FACs.

	Overuse Composite		**High Value Composite**	
(n raw)	75,516		3,026	
(n weighted)	1,026,046,733		16,192,336	
	Undj. O.R. [95% CI]	Adj. O.R. [95 % CI]	Undj. O.R. [95% CI]	Adj. O.R. [95 % CI]
Productivity FACs (ref – PCPs with any non-productivity FAC)	1.05	1.04	0.84†	0.93
	[0.89-1.24]	[0.84-1.29]	[0.75-0.95]	[0.80-1.07]

Note: *p<0.05 †p<0.01 Results are odds ratios and 95% confidence intervals in brackets. Compensation reference group is PCPs that have selected clinical factors as FACs.

Appendix to Chapter 3: "Clinician Performance Data Collection and Use in Safety Net Organizations"

Adrian Garcia Mosqueira, Steve Shortell, Nilay Shah, David Peiris, Jacob Barrera, Valerie Lewis, and Meredith Rosenthal

<u>Table of Contents</u>

Table A8 – Linear Regression Results – Specification 1

	FEEDBACK		QI		PHYSICIAN COMPENSATION	
	Cost	Quality	Cost	Quality	Cost	Quality
SNP STATUS	1.05***	0.12	-0.05	-0.05	-0.01	-0.04
	(0.07)	(0.10)	(0.08)	(0.09)	(0.04)	(0.08)
FQHC STATUS	0.88***	-0.06	0.16	0.42***	0.04	-0.04
	(0.11)	(0.14)	(0.11)	(0.13)	(0.06)	(0.11)
ADI	0.98***	-0.03	-0.02	-0.05	-0.02	-0.06
	(0.03)	(0.04)	(0.03)	(0.04)	(0.02)	(0.03)
MEAN PHYSICIANS	1.00***	0.00	-0.00	-0.00*	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SOLO PRACTICE	0.82***	-0.23	0.05	0.22	-0.08	-0.17
	(0.18)	(0.24)	(0.19)	(0.22)	(0.11)	(0.19)
IN SYSTEM	0.99***	0.10	-0.04	0.04	-0.01	0.29***
	(0.08)	(0.11)	(0.08)	(0.10)	(0.05)	(0.09)
COMMERCIAL REVENUE	1.00***	0.01**	-0.00	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MEDICARE ACO	1.09***	0.06	0.17***	0.15*	0.11***	0.27***
	(0.06)	(0.08)	(0.06)	(0.08)	(0.04)	(0.07)
MEDICAID ACO	1.05***	0.08	0.10	0.12	0.04	0.13*
	(0.07)	(0.09)	(0.07)	(0.08)	(0.04)	(0.07)
PAY FOR PERFORMANCE	1.12***	0.18**	0.23***	0.37***	0.03	0.46***
	(0.07)	(0.09)	(0.07)	(0.08)	(0.04)	(0.07)
OWN – PHY. GRP.	0.95***	0.01	0.16	0.10	0.10	0.30**
	(0.11)	(0.15)	(0.11)	(0.14)	(0.07)	(0.12)
OWN - HOSPITAL	0.88***	-0.06	-0.16	-0.13	-0.05	0.40***
	(0.11)	(0.14)	(0.11)	(0.13)	(0.06)	(0.11)
OWN - SYSTEM	1.09***	0.35***	0.03	-0.02	-0.03	0.70***
	(0.09)	(0.12)	(0.09)	(0.11)	(0.05)	(0.10)
OWN - OTHER	0.85***	0.30	-0.49***	-0.06	-0.18**	0.04
	(0.14)	(0.19)	(0.15)	(0.18)	(0.08)	(0.15)
SOUTH CENSUS	1.02***	-0.19	-0.05	-0.06	-0.02	-0.21**
	(0.09)	(0.12)	(0.09)	(0.11)	(0.05)	(0.09)
MIDWEST CENSUS	0.92***	-0.20*	-0.12	-0.08	-0.01	-0.10
	(0.08)	(0.11)	(0.09)	(0.10)	(0.05)	(0.09)
NORTHEAST CENSUS	0.93***	-0.24**	-0.24**	-0.36***	-0.08	-0.33***
_CONS	2.58***	1.43***	1.45***	2.35***	0.23***	0.16
	(0.13)	(0.17)	(0.13)	(0.16)	(0.08)	(0.13)
OBS.	1723	1723	1723	1723	1723	1723
R-SQUARED	0.02	0.03	0.04	0.04	0.02	0.15

COEFFICIENTS ARE LINEAR REGRESSION ESTIMATES. STANDARD ERRORS ARE IN PARENTHESIS.
***** P<0.01, ** P<0.05, * P<0.1**

Table A9 – Linear Regression Results – Specification 2

	FEEDBACK	QI	PHYSICIAN COMPENSATION
SNP STATUS	1.19***	-0.10	-0.05
	(0.16)	(0.15)	(0.11)
FQHC STATUS	0.83***	0.58***	-0.00
	(0.23)	(0.22)	(0.15)
ADI	0.95***	-0.07	-0.07
	(0.07)	(0.07)	(0.05)
MEAN PHYSICIANS	1.00***	-0.00*	-0.00
	(0.00)	(0.00)	(0.00)
SOLO PRACTICE	0.66*	0.27	-0.25
	(0.39)	(0.38)	(0.26)
IN SYSTEM	1.10***	0.01	0.28**
	(0.18)	(0.17)	(0.12)
COMMERCIAL REVENUE SHARE	1.01***	-0.01*	0.00
	(0.00)	(0.00)	(0.00)
MEDICARE ACO	1.15***	0.32**	0.38***
	(0.14)	(0.13)	(0.09)
MEDICAID ACO	1.13***	0.22	0.17*
	(0.15)	(0.14)	(0.10)
PAY FOR PERFORMANCE	1.34***	0.60***	0.50***
	(0.14)	(0.13)	(0.09)
OWN – PHY. GRP.	0.95***	0.27	0.39**
	(0.24)	(0.23)	(0.16)
OWN - HOSPITAL	0.82***	-0.29	0.35**
	(0.23)	(0.22)	(0.15)
OWN - SYSTEM	1.53***	0.01	0.68***
	(0.20)	(0.19)	(0.13)
OWN - OTHER	1.15***	-0.56*	-0.14
	(0.31)	(0.30)	(0.21)
SOUTH CENSUS	0.84***	-0.11	-0.23*
	(0.19)	(0.18)	(0.13)
MIDWEST CENSUS	0.76***	-0.20	-0.11
	(0.18)	(0.17)	(0.12)
NORTHEAST CENSUS	0.73***	-0.60***	-0.40***
	(0.20)	(0.19)	(0.13)
_CONS	10.77***	3.81***	0.40**
OBS.	1723	1723	1723
R-SQUARED	0.03	0.04	0.10

STANDARD ERRORS ARE IN PARENTHESIS. BASES ARE: CENSUS REGION WEST, INDEPENDENT PRACTICE
***** P<0.01, ** P<0.05, ** P<0.1**