FACTORS INFLUENCING PHYSICIAN PARTICIPATION IN MEDICAID

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Department of Public Policy and Administration

Abstract

of

FACTORS INFLUENCING PHYSICIAN PARTICIPATION IN MEDICAID

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More individuals have health care coverage after the passage of the monumental federal health care reform law, the Patient Protection and Affordable Care Act (ACA). However, the promise of the ACA cannot be fulfilled if there are not enough physicians participating in Medicaid to sustain the huge beneficiary population. With a low provider to beneficiary ratio in Medicaid, individuals are forced to go without needed care or wait weeks, if not months, to be seen by a medical provider. Long waits to see a health care provider can have life or death implications, raising the urgency of this policy problem.

This study analyzed the relationship between physician participation in Medicaid and a variety of environmental factors, such as reimbursement rates, practice characteristics and personal traits. My research sought to identify which factors are the most influential in a physician's decision to participate in the governmental health care program. I employed a series of ordered logistic regression and logistic regression models in my quantitative analysis. Data from the 2012 and 2013 National Ambulatory Medical Care Survey were used to evaluate the relationship between influencing factors and participation, as physicians prepared for the sharp increase in the Medicaid population due to the 2014 ACA implementation.

The quantitative analysis demonstrated that reimbursement rates may not actually be the golden ticket to improving physician participation, while the ethnicity of a physician and region of practice are far more influential in a physician's decision to participate in Medicaid. A central finding from my study indicated the ethnicity of a physician is a critical factor impacting Medicaid participation; minority physicians are more likely to participate in Medicaid than non-minority physicians. Another important finding showed physicians who practice in rural locations are more likely to participate in Medicaid than those who practice in urban areas.

My study has policy implications for lawmakers and Medicaid officials. It is vital that the federal and state governments increase physician participation to deliver on the promise of the ACA and subsequently improve the health and wellbeing of millions of Medicaid beneficiaries nationwide.

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Chapter One

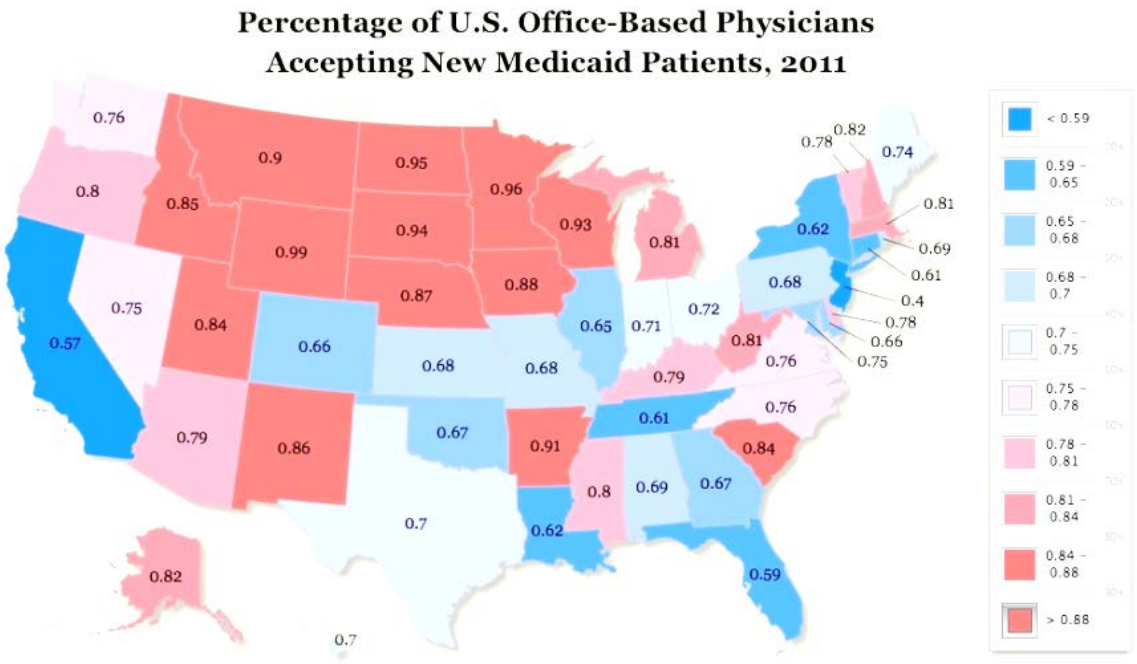
INTRODUCTION

Access to care hinges on availability of Medicaid providers

The 2010 passage of the monumental federal health care reform law, the Patient Protection and Affordable Care Act (ACA), generated a lot of buzz surrounding Medicaid beneficiaries' access to health care. More individuals have health care coverage with the ACA which requires more physicians to deliver health care. However, there are not enough physicians participating in Medicaid to sustain the huge beneficiary population.

Medicaid is the federal-state government funded health insurance program for low-income individuals. According to the Centers for Medicare and Medicaid Services (2016), there are 72.5 million individuals enrolled in Medicaid nationwide. The ACA expanded Medicaid eligibility and promised health coverage for all, but inadequate access to care threatens one's ability to actually utilize this coverage. Only half of all physicians in the United States accept new Medicaid patients (Pipes, 2016). With a low provider to beneficiary ratio in Medicaid, individuals are forced to go without needed care or wait weeks, if not months, to be seen by a medical provider. Long waits to see a health care provider can have life or death implications, raising the urgency of this policy problem.

Figure 1: Percentage of Physicians Accepting New Medicaid Patients
Source: Roy, A. (2012) *Forbes*



This study addresses the following question: *What environmental factors influence physician participation in Medicaid?* By analyzing the relationship between provider participation in Medicaid and a variety of environmental factors, such as reimbursement rates, practice characteristics and personal traits, I seek to identify what drives or deters physicians to care for beneficiaries in the governmental health care program. This relationship has important policy implications as more people need health care following the ACA. The ACA's promise of health care is predicated on the availability of physicians. There are past studies that yielded interesting findings on Medicaid participation, but my study is well-timed as it evaluates the factors for participation in a post-health care reform environment.

Sweeping reform establishes Medicaid

The Medicaid program has provided health care coverage for the nation's most vulnerable population since its enactment in 1965. Prior to this, poor individuals were only able to obtain care by visiting emergency departments, clinics for the indigent, or by seeing philanthropic physicians who volunteered their time and expertise (Tucker, 2002).

Public interest in reducing poverty spurred the creation of the Medicare and Medicaid programs, which President Lyndon B. Johnson signed into law. This was part of Johnson's "Great Society" package of programs to fight social injustice and disparities. The creation of Medicaid and Medicare is arguably one of the most sweeping policy reforms ever enacted to date in the United States. Medicare was charged with providing care for the elderly, while Medicaid served as the societal safety net for low income Americans. These federal health care programs were derived to create access for the elderly and poor to health care providers and facilities that were previously only available to private payers. This was an attempt to level the playing field to ensure each individual received the same quality of care, regardless of socioeconomic status. While the federal government maintained authority over the Medicare program, it relinquished administration of Medicaid to the states (Tucker, 2002).

It has always been about the money

Physicians and governmental entities have been battling over the finances of Medicaid since its creation. Upon enactment, physicians were reluctant to include the government in the business of health care. However, Congress sought to ease physician acceptance of Medicaid by matching fee-for-service reimbursement rates with those of

private insurance companies, which were generally deemed as adequate. In the fee-for-service payment model, physicians are paid a set rate for each service provided, which includes office visits, procedures, and tests. A few bad apples threatened the considerably equitable reimbursement rate levels in the early years following the enactment of Medicaid. A number of doctors swindled the Medicaid program with fraudulent reimbursement claims. In direct response to abuse by physicians, legislative amendments and regulations were enacted to lower reimbursement rates. Consequentially, physicians began to opt out of participating in Medicaid (Tucker, 2002).

Decisions about Medicaid spending, including the fees paid to physicians, are often driven by a complex web of political and regulatory influence. With one of every four dollars spent by state governments today going towards Medicaid costs, legislatures are paying more attention than ever to the government funded health program (Pipes, 2016). Medicaid is financed with federal and state funds. For every one dollar spent by a state on Medicaid, it receives at least a 100 percent match in federal funds. States with lower per capita income levels receive federal funding over and above the 100 percent match (Kaiser Family Foundation, 2015).

The passage of the ACA in 2010 incentivized states to expand their Medicaid programs to cover individuals earning less than 138 percent of the federal poverty level; the federal government would provide the full cost associated with these newly eligible individuals until 2016. The legislation prescribed the funding level to decrease slightly to 90 percent of the cost by 2020. It was each state's prerogative to decide whether it would take on a Medicaid expansion following the ACA implementation in 2014. However,

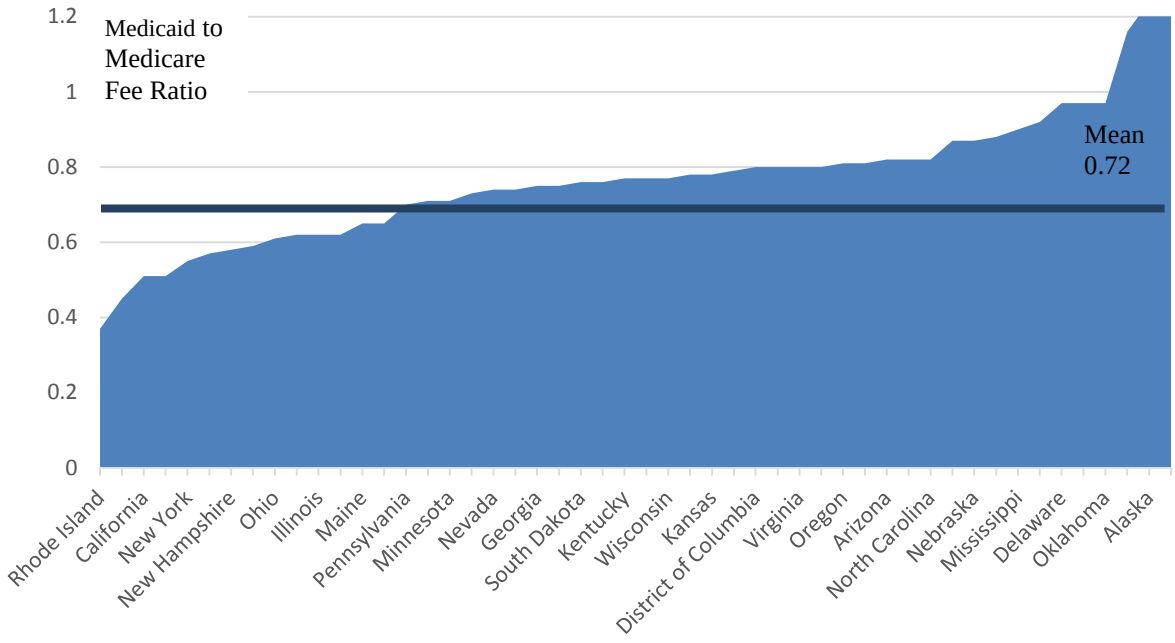
states that chose not to expand their Medicaid programs left millions of dollars of funding from the federal government on the table. The remainder of funding for each state's Medicaid program primarily comes from its general fund. Additionally, some states allocate money to Medicaid from a special health care tax (Kaiser Family Foundation, 2015).

Autonomy of states allows for different payment rates

Each state has the authority to set different Medicaid provider reimbursement rates. Therefore, reimbursement rates vary from state to state. In Medicare, the government provided health care coverage for senior citizens, rates are set at the national level and are uniform for all physicians nationwide. Medicare rates are generally considered to be equitable for physicians. Thus, provider participation in Medicare is greater than it is in Medicaid (Kaiser, 2015).

Subject to economic volatility, many states have decreased payments to Medicaid providers in recent years. Oklahoma recently announced imminent cuts to Medicaid reimbursement rates due to a budgetary crisis (Muchmore, 2016). While California has the nation's largest Medicaid program, known as Medi-Cal, its provider reimbursement rates are among the lowest, ranking 47th out of 50 states (California HealthLine, 2012).

Figure 2: Area Distribution of Medicaid Reimbursement Rates, by State
Source: Urban Institute (2012)



N*ew pressures on health care delivery systems*

While the financing of Medicaid garners a great deal of media attention, the changing physician workforce is also an obstacle to health care delivery for the governmental health care program. A shortage of 60,000 to 90,000 physicians is expected in the United States by 2025; the supply of physicians cannot keep up with the demand for health care (Association of American Medical Colleges, 2016). The Physicians Foundation (2014) reports that 81 percent of physicians feel they are over-extended and a staggering 44 percent are planning to retire, cut back on hours worked, or even change careers in the next few years.

New administrative requirements, such as electronic medical records and a new coding system for health care claims, mean physicians have less time to spend with

patients while they must spend more time in front of a computer. Because of the administrative burdens, the number of physicians in private practice is at an all-time low as the vast majority move into employment by a hospital system or medical group. Employers of physicians often have billing departments to take away some of the administrative burden on the practitioner. However, employed physicians also report decreased clinical autonomy on how to best care for their patients (Physicians Foundation, 2014).

The demographics of the physician workforce have also changed. The median age of physicians has decreased from 54 to 50. More females have entered the workforce as well as more minorities (Physicians Foundation, 2014). While having younger, more diverse physicians seems like a step in the right direction to workforce planning, there is a major roadblock to their ability to take on more Medicaid patients: staggering levels of student loan debt. On average, new physicians report $166,000 in medical school debt (Kristof, 2014). Hence, the crushing debt exerts pressure on physicians' decisions to participate in Medicaid.

ACA emphasizes need for new research

This study seeks to identify practice and personal characteristics that impact a physician's decision to provide care for Medicaid beneficiaries. In addition, reimbursement rates will be evaluated to determine if they really are the golden ticket to increasing provider participation.

Because of the dire need for greater health care provider participation in Medicaid, more research is needed to determine the motivating or deterring factors.

Because the funding of Medicaid is volatile and subject to severe cuts during economic downturns or policy changes with new presidential administrations, other non-financial factors for participation should be evaluated.

The findings in my study have important policy implications as state legislatures and Medicaid directors struggle to improve physician participation in a never-before experienced era for health care. The ACA changed the game entirely. This study evaluates different factors for participation during a time where there are new pressures constraining physician participation in Medicaid.

Health care is a fundamental need that was emphasized with the passage of the ACA. This monumental health care reform has increased the demand for services which requires a larger supply of physicians. The ACA cannot deliver on its promise without increasing the number of Medicaid-participating physicians. There are serious consequences if there are not enough physicians to see Medicaid patients; a long wait time to see a health care provider may turn minor health problems into chronic or even deadly conditions. A healthier society is a more productive society. Attracting more physicians to participate in Medicaid saves money downstream and more importantly, saves lives.

Chapter Two

LITERATURE REVIEW

Three literature review themes

Three main themes emerged from my review of the relevant literature on provider participation in Medicaid: reimbursement rates, practice type, and physician characteristics. Therefore, this literature review will cover these areas, moving from macro level factors to micro level factors that influence an individual physician's decision to participate in Medicaid.

Medicaid reimbursement rates influence provider participation

Economic model is the bedrock of research

It is no surprise that Medicaid reimbursement rates influence provider participation; physicians need to be fairly compensated for their services in order to protect their bottom line. The seminal piece of research on Medicaid provider participation defined the two market demand model. This model shows a strong tendency for health care providers to participate in Medicaid if their marginal revenue from patients with private insurance dips below fees paid by the Medicaid program. When Medicaid fees are lower than private insurance fees, it is not economically feasible to participate in the governmental health care program. When Medicaid pays higher rates than private insurers, physicians must participate to keep their practice afloat; this scenario is rare as private insurers' payment rates have tended to be higher than Medicaid's over the decades. Thus, there is a strong relationship between Medicaid reimbursement rates and provider participation (Sloan, Mitchell, and Cromwell, 1978).

Survey research by Garner, Liao and Sharpe (1979) further solidified these findings and reported that the primary reason physicians do not participate in Medicaid is because of low reimbursement rates. This supplemental study did not evaluate actual reimbursement rates; its information was mined from a survey of physician opinions. However, both of these studies formed the bedrock on which all future research on Medicaid provider participation was built upon.

Money, money, money

Multiple studies have utilized Medicaid reimbursement rates as a predictor of different participation-related dependent variables. Each state's Medicaid reimbursement rates vary and have fluctuated over time as the state and federal governments respond to economic realities. Berman, Dolins, Tang, and Yudkowsky (2002) obtained survey responses from 6,695 pediatricians nationwide. When using the pediatrician's home state Medicaid fee ratio as the independent variable, the authors viewed its impact on participation. There was, indeed, a positive relationship with Medicaid fees and participation; pediatricians who live in states with higher Medicaid fees reported greater levels of participation in Medicaid than those in states with low fees.

Other studies' findings contradicted the notion that high Medicaid fees spur greater levels of Medicaid participation. Mayer, Stearns, Norton, and Rozier (2000) used longitudinal data to evaluate the impact of varying reimbursement rates on dentists' participation in Medicaid in North Carolina. Over a six-year period, North Carolina's reimbursement rates increased by 23 percent. While the participation rate did slightly increase, it did not increase on the same scale as the reimbursement rate hikes. A

California-focused study had similar findings when using longitudinal data. Bindman, Yoon, and Grumbach (2003) studied provider participation in the Golden State before and after a reimbursement rate increase. Participation did not increase from 1996 to 2001 following an eight percent rate increase in California's Medicaid program in 2000.

Decker (2009 & 2012) evaluated the impact of reimbursement rates as the independent variable on different measures of provider participation. Both of the sequential studies found some level of correlation between payment rates and participation.

The 2009 research hypothesized that higher reimbursement rates will result in more Medicaid enrollee physician visits. Lower reimbursement rates will result in fewer physician visits and more visits by Medicaid enrollees to the emergency room. The researcher was employing the underlying assumption that low reimbursement rates lead to less provider participation in Medicaid; less provider participation means patients are forced to visit emergency rooms for non-urgent conditions that typically would be treated in a primary care office. Emergency rooms are not allowed to turn away patients because of their insurance status or inability to pay. There was a positive relationship between fees and the number of visits to a physician's office for Medicaid enrollees: when fees decreased, so did the number of office visits. Consequentially, lower fees increased the volume of emergency room visits greatly; when patients do not have access to a medical provider in an office setting, they instead visit an emergency room (Decker, 2009).

This author took her research a step further and evaluated the impact each state's Medicaid-Medicare fee ratio had on whether or not physicians would accept new

Medicaid patients in a later study. By using acceptance of new Medicaid patients as the dependent variable in a logit regression model, Decker (2012) found that there is a strong, positive correlation between reimbursement rates and Medicaid participation; an increase in fees is often associated with an increase in Medicaid provider participation.

While there is consensus across most research that there is, indeed, a relationship between Medicaid reimbursement rates and provider participation, the magnitude of the relationship differs due to some limitations in the studies. Decker (2009 and 2012) utilized the National Ambulatory Medical Care Survey to determine multiple measures of Medicaid participation. While the samples in Decker's 2009 and 2012 studies are nationally representative with over 4,000 respondents, the data stems from self-reporting, which can be unreliable. Physicians may be inclined to over-report their Medicaid participation, which could potentially alter the strength of the relationship between variables. Bindman et al. (2003) also relied on self-reporting through a survey of primary care and specialist physicians. However, over-reporting did not seem to be an issue as California's provider participation did not increase after Medicaid reimbursement rates were increased.

The research conducted on North Carolina dentists' participation in Medicaid found that there were small increases in Medicaid participation when reimbursement rates increased annually. However, it is important to note that the participation increases were not statistically significant. However, the rise in fees was considered to be minimal at a 23 percent total increase spread out over six years. This study relied on submitted Medicaid claims data to determine participation status (Mayer et al., 2000).

Reimbursement rates not necessarily the golden ticket

Overall, the literature review yielded contradictory findings on the relationship between reimbursement rates and Medicaid participation. Some studies identified a strong, positive relationship between reimbursement rates and participation levels. Other studies found that the increase in reimbursement rates did not increase physician participation at the same magnitude; participation only slightly increased when rates were raised significantly. Because the literature did not have consistent findings, the need for my research is underscored.

Practice characteristics influence Medicaid participation

Narrowing the focus to practice-wide characteristics

A physician's bottom line is not the sole motivator when deciding whether he or she is going to provide care for Medicaid enrollees. Research shows that practice characteristics are also driving forces. The location of the practice, mode of practice, and the surrounding community's demographics are environmental factors that can influence a physician's Medicaid participation status. Doctors who practice in rural areas may be more likely than doctors in urban areas to have personal relationships with their patients that transcend payment ability. Furthermore, doctors in smaller communities may have a sense of duty as community leaders to provide care for all. Mode of practice also matters as those in group practices likely have designated staff to deal with billing complexities associated with Medicaid; private practice physicians with little staff help may not have as much time to deal with Medicaid's administrative burdens. Doctors in group practices can also realize greater economies of scale than a solo practitioner which can make participation in Medicaid more financially viable. Because of all of these potentially

motivating or deterring factors for participation, I will narrow my review of the literature from reimbursement rates to practice characteristics.

Is it all about location?

A medical practice's geographical location and characteristics of the surrounding community demographics can make or break a physician's decision to participate in Medicaid. Greene, Blustein, and Weitzman (2006) used bivariate regression analysis to examine the relationship between a practice's surrounding community racial and economic segregation levels and a physician's likelihood to participate in Medicaid. They found that there was not a significant relationship between county economic segregation and physicians' participation in Medicaid. However, there was a slight correlation that showed specialists, or non-primary care doctors, had higher rates of Medicaid participation rates in economically segregated counties.

Other findings in the Greene et al. (2006) study were alarming as they found a strong relationship between racial composition of a county's Medicaid population and provider participation rates. When a practice was located in a county where the Medicaid population was mainly white, physicians were much more likely to participate in Medicaid than in a county where the Medicaid population was primarily composed of minorities.

While Greene et al. (2006) openly stated that their research was subject to an ecological fallacy, they had no other way to accurately measure racial and economic segregation in a practice's community. The best option was to use county-level data for the independent variable and individual physician data for the dependent variable.

Nonetheless, they bolstered the findings by using a large sample from the widely-recognized Community Tracking Study Physician Survey which contains cross-sectional data from a survey of over 10,000 physicians in 25 states.

Multiple studies demonstrated that physicians in rural practices are more likely to participate in Medicaid. Adams, Bronstein, and Florence (2003) studied the effect of a practice's location on Georgia doctors' decisions to participate in Medicaid by using the market region as a control variable. The researchers found a decrease in participation in Medicaid in urban practice locations but an increase for physicians in rural practices. Decker (2012) found that physicians practicing in metropolitan areas are less likely to accept new Medicaid patients than doctors in rural settings.

Corporate medicine: both boon and bane of Medicaid participation

The landscape of the health care delivery system is rapidly changing. Health plans, hospitals, and physician groups are merging at increasing rates to keep up with new cost containment requirements set forth by the ACA. Some argue that consolidation is driving the increase of "corporate medicine." While independent practice was the historical preference of physicians, the tides are shifting. Most physicians nationwide are now either employed or in group practices (Physicians Foundation, 2010).

Cunningham and Hadley (2008) closely studied the impact of the type of medical practice on provider participation in Medicaid. The authors used whether a physician was in a corporate or group practice setting as the independent variable and new Medicaid patient acceptance as the dependent variable. The Community Tracking Study Physician Survey was also used in the cross-sectional analysis. By looking at the same dataset over

a nine-year time period, the authors bolstered the validity of the results. The multivariate logistic regression found that doctors who changed from solo practice to employed or group practice status were more likely to accept new Medicaid patients. This can be attributed to the economies of scale that can be realized in more "corporate" settings. There is less of an opportunity cost for physicians in large practices with a central billing department to participate in Medicaid. The complex billing requirements in Medicaid make participation unattractive to physicians in small, independent practices.

Employing a similar approach, Bradbury (2015) found that physicians in a small practice with only one to two doctors were less likely to participate in Medicaid. Furthermore, this study's findings also supported the economies of scale argument. When a practice has information technology (IT) support, there was a relationship with Medicaid participation; less sophisticated IT was linked with a lower likelihood of provider participation. Because the 2008 Health Tracking Physician Survey excluded providers who practice in hospital settings, this research isolated the relationship between office-based physicians and Medicaid participation. Generally, private practices have fewer resources to invest in IT than hospital systems. This supports the theory that there is a steeper opportunity cost for a private practitioner to invest in the IT needed to sync with the Medicaid billing system. The reimbursement, also considered to be the benefit, does not outweigh the opportunity cost which deters providers in these settings from providing care for the low-income population.

Earlier research challenges the findings that physicians in more "corporate" settings are more likely to participate in Medicaid. The study conducted by Mayer et al.

(2000) found that dentists in independent practices were significantly more likely to participate in Medicaid than those in "corporate" practice settings. However, this study only considered dental practices which may be structured differently than all other medical practices. Moreover, this study was looking at data from the late 1980's and early 1990's. Consolidation has been increasing over time so it could be argued that there were not the same market pressures and realized economies of scale when this data was collected.

Location matters but other relationships are unclear

There were some concrete findings across past research on the relationship between practice characteristics and Medicaid participation; location does, indeed, matter. Physicians in rural practices are more likely to participate in Medicaid. There were also wavering findings, such as the relationship between corporate practice and participation. It was not clear whether physicians in a group or corporate practice are more likely to participate in Medicaid than those in independent practices. This shows me that I need to evaluate the relationship between practice characteristics and participation in my research, especially given the health care consolidation trend post-ACA passage.

Personal characteristics also impact a physician's decision

Emotions over finances

Individual characteristics also play a role in shaping a physician's Medicaid participation decision. Because females are stereotyped to be natural caregivers, some may believe they may be more willing to provide care for the poor in Medicaid than male physicians. Ethnicity of the physician could also play a role. Hispanics make up 58

percent of the Medicaid population in California so it is reasonable to assume that Hispanic physicians are motivated to participate in Medicaid to take care of those with similar cultural upbringings (Kaiser Family Foundation, 2015). Medical specialty also serves as an influencer for Medicaid participation. Primary care doctors and pediatricians are known to have lower starting salaries than certain specialists, such as anesthesiologists or cardiologists. Thus, these doctors may be less motivated by money and more motivated by compassion. Due to the possible effect of a physician's individual characteristics has on Medicaid participation, I thought it was important to review related studies. These studies are discussed in this section.

Are males more benevolent?

While there is not a wide array of research to determine if there is a strong relationship between gender and Medicaid participation of physicians, Bradbury (2015) utilized gender as one of the many independent variables in an ordinal logistic regression analysis. The study indicated a statistically significant relationship between gender and Medicaid participation. Male physicians had higher participation levels than female providers. It is unclear if the author controlled for the distribution of males and female physicians in the dataset. There are more male than female physicians in the workforce so weights should have been included in the regression model to account for the disparate population sizes between genders. If there are no weights included with many more male survey respondents than female respondents, the validity of the relationship between gender and participation is threatened.

Minorities are more likely to participate

Policy implications emerge from the findings on physician race and Medicaid participation. The study conducted by Greene et al. (2006) controlled for physician characteristics when evaluating the relationship between county segregation levels and Medicaid participation. The control variables showed that minority physicians, specifically African Americans and Asians, are more likely to participate in Medicaid than white physicians. While there could be many underlying reasons for the difference in Medicaid participation among physicians of different races, the findings suggest that we would have greater Medicaid participation if the physician population was more racially diverse.

A heart for children

Providers who specialize in pediatric care have higher Medicaid participation rates than physicians in other medical specialty fields. The study on North Carolina dentists' Medicaid participation by Mayer et al. (2006) yielded another valuable nugget of information: pediatric dentists have greater rates of Medicaid participation than general dentists. By using whether a dentist sees ten or more Medicaid children per calendar quarter as one of multiple dependent variables in this research, the authors were able to see the direct impact provider participation has on children's access to care in the Medicaid program.

Instead of studying the physicians' perspective, the California HealthCare Foundation (2015) took a different approach and compared access to care in California's Medicaid program and nationwide Medicaid programs from the enrollee's perspective.

Utilizing Medicaid enrollment status as the independent variable and a variety of measures of access to care as the dependent variables, this study found that access to care is better for children in Medicaid than it is for adults. This information surfaced after controlling for the respondents' age in a large and representative sample from the highly credible National Health Interview Survey. While this provides a glimmer of hope for children's health advocates, this information may not be 100 percent valid when controlling for health care needs. Children have to go to the doctor more often than adults. Whether it is because of the school medical examination and vaccination requirements or the frequent illnesses school-aged children experience, kids visit their primary care doctors frequently. Thus, they are more likely to report better access to care than adults who need specialty type of care.

Personal traits do, indeed, matter

While there was not a wide range of studies to review on the impact personal characteristics have on Medicaid participation among physicians, there were some nuggets of valuable information gleaned from the literature. Males tend to be more likely to participate in Medicaid, but there are also more male physicians in the workforce than females. There is a strong relationship between ethnicity and participation; minorities are more likely to participate than whites. The studies showed that children matter. Pediatric doctors had higher rates of participation. The findings in this section are interesting, but need to be corroborated by additional research as there were not many studies that evaluated the relationship between personal traits and participation to compare and

contrast. I would like my research to fill this void and bolster the literature review's findings on personal traits.

Contradictory findings in literature make way for my research

This literature review covered numerous peer-reviewed articles and revealed some fairly contradictory findings, such as how doctors in "corporate" practices may or may not be likely to participate in Medicaid. It is also unclear if there is a strong or weak relationship between Medicaid reimbursement rates and provider participation. The overarching question is whether reimbursement rates, even when increased, are considered to be adequate enough to influence participation. Because of mixed findings from previous research and the recent expansion of Medicaid and the subsequent impact, more up-to-date research is needed on the environmental factors that influence provider Medicaid participation. It is especially important to conduct new research to compare and contrast the findings with studies conducted prior to health care reform.

The literature review yielded both well supported and contradictory findings that will serve as a foundation for my research. I aim to hone in on the impact of reimbursement rates on provider participation. Because there was not a definitive answer from the past research on whether higher reimbursement rates spur greater Medicaid participation levels, it is key to evaluate in my research. This is especially important to research post-ACA passage as lawmakers and Medicaid directors try to figure out how to best ensure adequate physician participation levels. Due to the recent push for consolidation in health care and the subsequent movement of physicians from solo practice to more "corporate" practices, I plan to evaluate the relationship between

different measures of practice characteristics and Medicaid participation as I suspect this area could have many non-financial policy implications. Furthermore, more research is needed on personal traits of physicians and their impact on Medicaid participation as there was not much previous research done on this theme.

Chapter Three

METHODOLOGY

Examining physician participation in 2012 and 2013

My research examines physician participation in Medicaid in 2012 and 2013 to assess what factors influence decisions to participate in the governmental health care program. I focus on these years as physicians were preparing for the sharp increase in the Medicaid population in 2014, when the ACA's Medicaid expansion was to be implemented. Employing quantitative analysis, I used a number of regression models to measure the relationship between numerous influential factors and physician participation in Medicaid. This chapter explains the dataset, variables and theoretical framework for my quantitative analysis.

Data sources

Central dataset supplemented with additional data points

I used a dataset from the Centers for Disease Control and Prevention (CDC) for my quantitative analysis. The CDC sends the "National Ambulatory Medical Care Survey" (NAMCS) to health care providers in office-based settings annually. The goal of this survey is to obtain nationally representative data on the delivery of health care from the provider's vantage point. The CDC creates the NAMCS and compiles the resulting data but contracts out the data collection to US Census Bureau representatives. This is a widely-reputable survey that is used by numerous researchers as it is one of the only governmental-sponsored surveys that obtain data on many different facets of ambulatory care. The survey includes questions on insurance acceptance, practice characteristics,

medical procedures, patient population, and many other factors that have research interest. This comprehensive survey provides a big bang for the buck. It has been used for many decades with few changes made to the survey which makes longitudinal data analysis possible.

I used the resulting survey data from 2012 and 2013, which was after the ACA was signed into law. In 2012 and 2013, physicians knew the Medicaid expansion was soon-to-be implemented following the passage of the ACA. While obtaining data post-ACA implementation would be ideal for my research, it was not yet available. The 2012 survey sample included 15,000 physicians and the 2013 survey sample included 11,000 physicians. Both doctors of medicine (MDs) and doctors of osteopathic medicine (DOs) were surveyed. However, no hospital-based physicians are included in the sample as the focus of the survey is on outpatient practices.

While the NAMCS is a very robust dataset, I needed to supplement it with additional data sources to best evaluate my research question. Therefore, I utilized the Medicaid-to-Medicare fee ratio data compiled by the Urban Institute. This ratio is created by comparing the average of a state's Medicaid reimbursement rates with Medicare reimbursement rates. Because Medicare payment rates are considered to be fairly equitable and equivalent for physicians nationwide, they serve as a benchmark to use when looking at each state's Medicaid payment rates. I integrated the 2012 Medicaid-to-Medicare fee ratio into the 2012 NAMCS data. Because the 2013 Medicaid-to-Medicare fee ratio was not available, I used the 2014 ratio instead. Data from the US Census Bureau was also utilized to factor in each state's poverty rate in both 2012 and 2013.

Theoretical Model

Formula includes multiple independent variable categories

Through a review of the literature, it was clear that there are three categories of factors that affect physician participation in Medicaid: reimbursement rates, practice characteristics and personal traits. Thus, these three categories are employed in the regression model that I used to analyze the relationship between the influencing factors (independent variables) and a provider's Medicaid participation status (dependent variable). In this section, I will explain the reasoning for the model described by the formula below.

Provider Participation in Medicaid = f (Reimbursement Rates, Practice Characteristics, Personal Traits)

Reimbursement Rates = f (Medicaid-to-Medicare Fee Ratio)

Practice Characteristics = f (Metropolitan Area Dummy, Solo Practice Dummy, Physician Owned Practice Dummy, Poverty Rate of Practice State, Advanced Information Technology Systems Proxy Dummy)

Personal Traits = f (Doctor of Medicine Dummy, Primary Care Physician Dummy, Minority Dummy, Employee Dummy, Salary Dummy)[1]

Medicaid revenue ranges used as dependent variable

Using individual physicians as the unit of analysis, my regression model studies provider participation in Medicaid. The dependent variable is the percent of a physician's total patient care revenue derived from Medicaid. This is measured in four ordinal ranges:

[1] I wanted to include gender as an independent variable but it was not available in the NAMCS data.

0-25 percent, 26-50 percent, 51-75 percent, and 76-100 percent. The NAMCS survey collects the Medicaid participation data in ordinal ranges so it was not possible to obtain physicians' participation in a continuous integer, such as 78 percent. The physicians have four options to choose from on the survey; they choose the range that best fits their participation level. Using a dependent variable that is coded according to the ranges was the most appropriate way to study provider participation for a variety of reasons. First, simply evaluating whether or not a provider accepts Medicaid patients does not yield enough information. Providers who participate in Medicaid may accept very few Medicaid patients, such as one patient per week. Obtaining a range of revenue earned from Medicaid more accurately measures participation levels. Secondly, a review of the literature demonstrated that other researchers used a similar variable to measure participation (Decker, 2009 & 2012).

Independent variable category: reimbursement rates

The first category of independent variables is reimbursement rates. This is measured through a continuous variable that compares state Medicaid payment rates to Medicare reimbursement rates, which are considered to be the gold standard by physicians. If a state has a relatively high payment rate, it would have a ratio close to 1. California has low Medicaid reimbursement rates; its payment ratios were 0.51 in 2012 and 0.52 in 2014.

Past research had mixed findings on whether reimbursement rates positively influence provider participation in Medicaid. As health care has become more consolidated and "corporate" in recent years, practice finances are driving Medicaid

participation decisions instead of compassion. Therefore, I anticipate a positive relationship between rates and participation. Physicians who practice in states with high reimbursement rates should have higher participation in Medicaid compared to physicians who practice in states with low reimbursement rates.

Independent variable category: practice characteristics

The second category of independent variables is practice characteristics. As discussed in the literature review, past research indicates that doctors in group practices or employed settings are more likely to participate in Medicaid than doctors in solo practices due to economies of scale. As Medicaid billing requirements can be complicated, it is easier for doctors in more "corporate" settings that have a central, expert billing department to complete the necessary paperwork rather than an individual practitioner. Thus, I included multiple dummy variables that account for "corporate" practices: solo or non-solo practice, physician-owned practice, and sophisticated information technology systems. Whether or not the practice uses secure electronic messaging to communicate with patients was used as a proxy for determining whether the practice has sophisticated information technology systems as this signals a major investment into computer software.

Another variable included in this category is the poverty rate of the state the medical practice is located in. This is measured as a continuous integer. Doctors who practice in states with higher poverty levels may feel a greater impetus to provide Medicaid care as they may have fewer patients with private insurance.

Moreover, I also included a dummy variable for whether the provider practices in a metropolitan statistical region, otherwise known as urban area, or a rural region. The past research clearly showed that providers in rural areas were more likely to accept Medicaid.

Independent variable category: personal traits

The third category of independent variables is personal traits. All of the variables in this category are dummy variables that assess different characteristics of individual physicians. One variable looks at whether the physician is a doctor of medicine (MD) or a doctor of osteopathic medicine (DO). While there was not past research on participation of MDs compared to DOs, I thought it would be an interesting factor to include as a variable. I also included primary care doctors as an independent variable. As demonstrated in the literature review, pediatricians were more likely to participate in Medicaid than other specialty doctors. Therefore, it is reasonable to believe that primary care providers may have more of a drive or compassion to serve the underserved as they are paid less than medical specialists and are better distributed throughout communities of all socioeconomic levels.

Two variables that measure the effect of the "corporatization" of health care on individual physicians tested for whether the physician was an employee of an individual or entity. This would be in direct contrast with a physician owner of a practice. The other variable looked at whether the physician receives his or her compensation on a salary-basis. Past literature indicated that doctors in larger practices are more likely to participate in Medicaid as they have staff to handle billing complexities and, therefore,

can take advantage of economies of scale. Doctors in larger practices are more likely to be employed and paid by salary than physicians in smaller practices.

Tables for describing variables

Tables 1 and 2 below display descriptive statistics to explain the dependent variable for the 2012 and 2013 data.

Table 1: Dependent Variable Description, 2012 Data

Physicians' total revenue from Medicaid, by range

Observations	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
49,573	1.23	0.57	1	4

Value	*Description*	Frequency	*Percent*	*Source*
0-25 percent	0-25 percent of physician's patient care revenue derived from Medicaid=1	41,222	83.1%	NAMCS
26-50 percent	26-50 percent of physician's patient care revenue derived from Medicaid=2	5,830	11.8%	NAMCS
51-75 percent	51-75 percent of physician's patient care revenue derived from Medicaid=3	1,934	3.9%	NAMCS
76-100 percent	76-100 percent of physician's patient care revenue derived from Medicaid=4	587	1.2%	NAMCS
	Total	*49,573*	*100%*	

Table 2: Dependent Variable Description, 2013 Data

Physicians' total revenue from Medicaid, by range

Observations	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
35,846	1.25	0.58	1	4

Value	*Description*	Frequency	*Percent*	*Source*
0-25 percent	0-25 percent of physician's patient care revenue derived from Medicaid=1	29,379	82.0%	NAMCS
26-50 percent	26-50 percent of physician's patient care revenue derived from Medicaid=2	4,538	12.6%	NAMCS
51-75 percent	51-75 percent of physician's patient care revenue derived from Medicaid=3	1,502	4.2%	NAMCS
76-100 percent	76-100 percent of physician's patient care revenue derived from Medicaid=4	427	1.2%	NAMCS
	Total	*35,846*	*100%*	

Table 3 describes the independent variables and reviews their coding, hypothesized relationship direction and data source.

Table 3: Independent Variable Descriptions and Predicted Relationships

Reimbursement Rates			
Variable	*Description*	*Source*	*Predicted Direction of Relationship with Dependent Variable*
Medicaid-Medicare Fee Ratio (2012, 2014)	State Medicaid reimbursement rates' equivalence to Medicare rates. Continuous variable. 1=state Medicaid rate is equal to Medicare rate.	Urban Institute	Positive
Practice Characteristics			
Variable	*Description*	*Source*	*Predicted Direction of Relationship with Dependent Variable*
Solo Practice (Dummy)	Solo practice instead of a consolidated practice. Binary variable. 1=solo practice.	NAMCS	Negative
Metropolitan Area (Dummy)	Practice is located in a Metropolitan Statistical Area (urban). Binary variable. 1=MSA location.	NAMCS	Negative
Sophisticated IT Proxy (Dummy)	Practice utilizes electronic messaging with patients. Binary variable. 1=e-messaging used.	NAMCS	Positive
Poverty Rate of Practice's State	Poverty rate of state where practice is located, measured by percentage. Continuous variable.	US Census Bureau	Positive
Physician Owned Practice (Dummy)	Practice owned by a physician instead of a hospital or corporation. Binary Variable. 1=physician owned.	NAMCS	Negative

Table 3 Continued: Independent Variable Descriptions and Predicted Relationships

Personal Traits			
Variable	*Description*	*Source*	*Predicted Direction of Relationship with Dependent Variable*
MD (Dummy)	Doctor is a doctor of medicine instead of a doctor of osteopathic medicine. Binary variable. 1=MD.	NAMCS	Positive
Minority (Dummy)	Doctor is non-white, has Hispanic, African American, or other ethnicity. Binary variable. 1=Minority	NAMCS	Positive
Primary Care Doctor (Dummy)	Doctor specializes in primary care. Binary variable. 1=Primary Care.	NAMCS	Positive
Employee (Dummy)	Doctor is an employee. Binary variable. 1=Employee	NAMCS	Positive
Salary-based Compensation (Dummy)	Physician's compensation is salary-based and not based on revenue of practice. Binary variable. 1 = Salary.	NAMCS	Positive

Tables 4 and 5 below provide descriptive statistics for each independent variable in the 2012 and 2013 datasets.

Table 4: Descriptive Statistics, 2012 Data

Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Reimbursement Rates				
Medicaid-Medicare Fee Ratio (2012)	0.72	0.12	0.45	0.97
Practice Characteristics				
Solo Practice (Dummy)	0.34	0.47	0	1
Metropolitan Area (Dummy)	0.84	0.36	0	1
Sophisticated IT Proxy (Dummy)	0.37	0.48	0	1
Poverty Rate of Practice's State	15.93	3.25	10.3	24.2
Physician Owned Practice (Dummy)	0.84	0.37	0	1

Table 4 Continued: Descriptive Statistics, 2012 Data				
Personal Traits				
Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
MD (Dummy)	0.93	0.25	0	1
Minority (Dummy)	0.22	0.41	0	1
Primary Care Doctor (Dummy)	0.34	0.47	0	1
Employee (Dummy)	0.28	0.45	0	1
Salary-based Compensation (Dummy)	0.26	0.44	0	1

Table 5: Descriptive Statistics, 2013 Data				
Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Reimbursement Rates				
Medicaid-Medicare Fee Ratio (2014)	0.67	0.10	0.45	0.92
Practice Characteristics				
Solo Practice (Dummy)	0.34	0.47	0	1
Metropolitan Area (Dummy)	0.89	0.31	0	1
Sophisticated IT Proxy (Dummy)	0.51	0.50	0	1
Poverty Rate of Practice's State	15.19	2.42	10.1	19
Physician Owned Practice (Dummy)	0.78	0.41	0	1
Personal Traits				
MD (Dummy)	0.94	0.23	0	1
Minority (Dummy)	0.26	0.42	0	1
Primary Care Doctor (Dummy)	0.30	0.46	0	1
Employee (Dummy)	0.71	0.45	0	1
Salary-based Compensation (Dummy)	0.29	0.46	0	1

Regression model framework

Because the dependent variable is an ordinal variable that identifies levels of participation in Medicaid, ordered logistic regression is the best functional form to complete the analysis. [2] Results will be provided in log odds and odds ratios which are easy to understand as they explain the likelihood of the independent variable affecting the dependent variable. Furthermore, I will conduct various tests to ensure that this is the best model for the data and will check for multicollinearity and heteroskedasticity. The following chapter will cover the results of the regression analysis.

Limitations

My research has several limitations that must be acknowledged. First, an ecological fallacy occurs with one of my variables. The poverty rate variable measures state-level data while the rest of the variables' unit of analysis is an individual physician or individual physician's practice. Because I had the state where the physician practiced in the NAMCS dataset, I was able to match the state poverty rate that I received from the US Census Bureau. As I did not have the physician's city of practice, this ecological fallacy was unavoidable. This could temper the effect of any correlations between poverty rate and Medicaid participation as a state may have a much different poverty rate than the city where the physician practices. Thus, it will be hard to definitively measure the relationship between these variables and identify policy implications.

Another limitation is that I used the 2014 Medicaid-to-Medicare fee ratio with 2013 NAMCS data. Because the 2013 Medicaid-to-Medicare fee ratio was not available,

[2] The most commonly recognized regression model, ordinary least squares (OLS), was not appropriate for my data. OLS works best with continuous dependent variables.

I used the 2014 ratio instead. While it was not ideal to integrate the fee ratio from 2014 with data from the 2013 NAMCS, Medicaid fees only increased by 0.8 percent from 2012 to 2014. Because payment rates remained fairly stable in 2013, I was not concerned with this biasing my statistical analysis.

The final limitation is that NAMCS relies on self-reporting by physicians. Thus, this bears the risk of physicians under or over-reporting Medicaid participation. Moreover, some physicians may have business managers who have a more intimate knowledge of the practice's revenue streams. Hence, physicians completing the NAMCS may not be able to accurately report on the amount of revenue obtained from Medicaid. The problems stemming from self-reporting could potentially affect the results.

Chapter Four

RESULTS

Two different types of regression models used

This chapter presents the results of my quantitative analysis. First, I will discuss the reasoning for utilizing ordered logistic regression. Next, I will explain the results from that approach to assess the impact of multiple factors on provider participation in Medicaid. Because the ordered logistic regression model suffered from heteroskedasticity, I also approached the research question using logistic regression. I will explain how I generated additional dependent variables for the transformed regression approach and present my results.

Ordered logistic regression output

Multi-faceted model evaluates multiple years and multiple independent variables

As discussed in Chapter 3, ordered logistic regression is the model I utilized to analyze my research question: what environmental factors influence physician participation in Medicaid? I ran regression models for 2012 and 2013 in the exact same manner and will compare the results to study whether there are key differences in the years leading up to the full implementation of the ACA and the resulting boom in Medicaid enrollment.

It is important to keep in mind that the dependent variable is an ordinal range that ranks Medicaid participation levels as follows: (1.) 0-25 percent patient revenue from Medicaid; (2.) 26-50 percent patient revenue from Medicaid; (3.) 51-75 percent patient revenue from Medicaid; and (4.) 76-100 percent patient revenue from Medicaid. Thus,

my regression model is analyzing the impact each independent variable has on Medicaid participation. In the quantitative analysis of reimbursement rates, practice characteristics, and personal traits, the study reveals the direction of the variables' relationship with Medicaid participation and whether they are statistically significant. Tables 1 and 2 in the previous chapter provide descriptive statistics and a coding summary for the dependent variable.

Output indicates many statistically significant variables

The results of the ordered logistic regression are displayed in Tables 6 and 7. All independent variables had a statistically significant relationship with Medicaid participation at the 95 percent confidence level, with the exception of the state poverty rate variable (2013). The log odds and odd ratios are included in Tables 6 and 7. For a one unit increase in the independent variable there is an increase or decrease to the dependent variable equivalent to the log odd number. The log odd for the minority variable in Table 6 is 0.95. This means that for every one unit increase in the minority variable, which is coded 0 for non-minority and 1 for minority, there is a 0.95 increase in Medicaid participation. The odds ratio for the same variable is 2.58, which means minority physicians are 2.58 times more likely to have higher levels of Medicaid participation than non-minority physicians.

Table 6: Ordered Logistic Regression, Relationship between Explanatory Variables and Medicaid Participation 2012

Variable	Log Odds	Odds Ratio
Medicaid-Medicare Fee Ratio	-0.28* (0.11)	0.75* (0.08)
Solo Practice (Dummy)	0.25* (0.03)	1.28* (0.04)
Metropolitan Area (Dummy)	-0.57* (0.03)	0.56* (0.02)
Sophisticated IT Proxy (Dummy)	-0.08* (0.03)	0.92* (0.02)
Poverty Rate of Practice's State	0.05* (0.00)	0.05* (0.00)
Physician Owned Practice (Dummy)	-0.40* (0.04)	0.67* (0.03)
MD (Dummy)	0.22* (0.05)	1.24* (0.06)
Minority (Dummy)	0.95* (0.03)	2.58* (0.07)
Primary Care Doctor (Dummy)	-0.75* (0.03)	0.47* (0.01)
Employee (Dummy)	0.47* (0.04)	1.61* (0.06)
Salary-based Compensation (Dummy)	0.44* (0.03)	1.55* (0.04)
Number of Observations	44,961	
Nagelkerke	0.11	
Probability > Chi Squared	0.0	
LR Chi-Squared	6020.64	
*Indicates statistical significance with 95 percent confidence		

Table 7: Ordered Logistic Regression, Relationship between Explanatory Variables and Medicaid Participation 2013		
Variable	**Log Odds**	**Odds Ratio**
Medicaid-Medicare Fee Ratio (2014)	1.15* (0.17)	3.15* (0.53)
Solo Practice (Dummy)	0.20* (0.04)	1.22* (0.05)
Metropolitan Area (Dummy)	-0.41* (0.06)	0.66* (0.04)
Sophisticated IT Proxy (Dummy)	-0.16* (0.03)	0.85* (0.03)
Poverty Rate of Practice's State	0.01 (0.00)	1.01 (0.01)
Physician Owned Practice (Dummy)	-0.51* (0.04)	0.60* (0.03)
MD (Dummy)	0.37* (0.08)	1.45* (0.12)
Minority (Dummy)	0.98* (0.03)	2.67* (0.10)
Primary Care Doctor (Dummy)	-0.69* (0.04)	0.50* (0.02)
Employee (Dummy)	0.17* (0.05)	1.18* (0.06)
Salary-based Compensation (Dummy)	0.21* (0.04)	1.23* (0.04)
Number of Observations	25,106	
Nagelkerke	0.08	
Probability > Chi Squared	0.0	
LR Chi-Squared	1512.40	
*Indicates statistical significance with 95 percent confidence		

Models explain very little variance

In evaluating whether the ordered logistic regression model is the best fit for my data, there is a quasi-goodness of fit value to examine. The Nagelkerke value is 0.11 in 2012 and 0.08 in 2013. This is displayed in Tables 6 and 7. With a range of 0-1, a

Nagelkerke value of 1 marks the model as a perfect predictor of the outcome. This means the models do not explain much of the variance in the dependent variable.[3]

Some hypothesized relationships are not supported

While the majority of my predictions regarding the direction of the relationships were correct, I had some surprising findings. Table 8 illustrates the findings.

Table 8: Predicted vs. Actual Direction of Relationships

Variable	*Predicted Direction of Relationship with Dependent Variable*	*Actual Direction of Relationship with Dependent Variable (2012 Data)*	*Actual Direction of Relationship with Dependent Variable (2013 Data)*
Medicaid-Medicare Fee Ratio	Positive	Negative	Positive *2014 Data*
Solo Practice (Dummy)	Negative	Positive	Positive
Metropolitan Area (Dummy)	Negative	Negative	Negative
Sophisticated IT Proxy (Dummy)	Positive	Negative	Negative
Poverty Rate of Practice's State	Positive	Positive	Positive
Physician Owned Practice (Dummy)	Negative	Negative	Negative
MD (Dummy)	Positive	Positive	Positive
Minority (Dummy)	Positive	Positive	Positive
Primary Care Doctor (Dummy)	Positive	Negative	Negative
Employee (Dummy)	Positive	Positive	Positive
Salary-based Compensation (Dummy)	Positive	Positive	Positive

[3] There is debate among scholars whether Nagelkerke is an accurate measure of goodness of fit. Nonetheless, one might try to change the model if running a replication of my study in the future to see if the Nagelkerke value changes.

The literature and my findings were mixed on whether reimbursement rates positively influence Medicaid participation. In 2012, there was a negative relationship between reimbursement rates and provider participation. This means as reimbursement rates increase physician participation levels decrease. This can also mean that as reimbursement rates decrease physician participation levels increase. In 2013, there was a positive relationship between reimbursement rates and provider participation; physician participation in Medicaid increases as reimbursement rates increase.

Another surprising finding was the relationship between doctors in solo practices and Medicaid participation; the relationship was positive for both 2012 and 2013. This is in direct contrast with the literature, which indicated doctors in solo practices have less time to devote to dealing with the administrative complexities of Medicaid and, therefore, are less likely to participate than doctors in group practices or more "corporate" settings. My analysis shows that doctors in solo practices have higher levels of Medicaid participation than doctors in group practices.

The sophisticated IT proxy variable relationship with Medicaid participation was also surprising as it had a negative relationship; I predicted a positive relationship. Sophisticated IT systems are usually installed in "corporate" practices, as they have the money and staff to build advanced IT infrastructures. A solo practitioner may not have the knowledge or funds to develop a sophisticated IT system. As discussed earlier, "corporate" practices experience better economies of scale that often make it easier to participate in Medicaid than less "corporate" practices. The regression analysis resulted

in a negative relationship, which means doctors who practice in offices with less sophisticated IT systems have a greater propensity to participate in Medicaid.

The relationship between primary care and Medicaid participation also contradicted my hypothesis. I predicted a positive relationship between primary care specialty and Medicaid participation; primary care doctors are more likely to participate in Medicaid than those in other medical specialties, like cardiology or dermatology. The regression analysis demonstrated a negative relationship, meaning primary care doctors are less likely to participate than specialists. This was surprising as the literature indicated primary care physicians may be less motivated by money and more motivated by their compassion.

Testing for assumptions: multicollinearity is not a concern

After running a series of tests, it is apparent that the independent variables are not affecting each other and the findings. Multicollinearity is present in a model when the explanatory variables are highly correlated and could influence each other, spurring bias in the results. Tables 9 and 10 (Appendix A and B), the pairwise correlation coefficient tables, illustrate that multicollinearity is not an issue with the explanatory variables. If a coefficient is 0.8 or larger, the variables are highly correlated and threaten bias in the model. The largest coefficient of the independent variables in the 2012 correlation table is -0.68, indicative of the relationship between the employee and physician-owned practice variables. While this could mean there are two variables somewhat influencing each other, it is not surprising since they both relate to whether a physician is an owner or employee of a practice. This correlation coefficient is by far the largest value on the 2012

table; the vast majority of coefficients are no larger than 0.25. The largest coefficient of the independent variables in the 2013 correlation table is -0.24. Thus, it is safe to say that multicollinearity is not threatening the 2012 and 2013 models.

Another safeguard to check for multicollinearity is the variance inflation factor (VIF) test. This test was executed by inputting the explanatory variables into an OLS regression model. Although the majority of this analysis is based in ordered logistic regression, the VIF test does not run properly in models other than OLS. Thus, I ran an OLS regression model with the only objective of testing for VIF. If VIF values are under 4, it is unlikely multicollinearity exists. Table 11 enumerates the VIF scores for all independent variables. The largest VIF score is 1.97 for the physician-owned practice and primary care variables; the test bolsters the findings by demonstrating multicollinearity is unlikely.

Table 11: VIF Values for 2012 and 2013

Variable	VIF Value 2012	VIF Value 2013
Medicaid-Medicare Fee Ratio	1.10	1.08 *2014 Data*
Solo Practice (Dummy)	1.16	1.39
Metropolitan Area (Dummy)	1.13	1.03
Sophisticated IT Proxy (Dummy)	1.04	1.09
Poverty Rate of Practice's State	1.09	1.10
Physician Owned Practice (Dummy)	1.97	1.37
MD (Dummy)	1.03	1.02
Minority (Dummy)	1.03	1.03
Primary Care Doctor (Dummy)	1.03	1.03
Employee (Dummy)	1.97	1.41
Salary-based Compensation (Dummy)	1.07	1.08

Testing for assumptions: variance problems threaten model

I also tested for heteroskedasticity to verify the integrity of my regression model. Heteroskedastic findings are problematic because this means the relationship between the independent and dependent variables are not equal across all values of the dependent variable. After running the appropriate test, it was clear that there was a heteroskedasticity problem in the data. I therefore ran a Brant test. The Brant test checks to ensure that there are no differences in the slopes of the independent variables across the values of the dependent variable. If the coefficient for an independent variable is .15 (relatively flat) when comparing respondents with a "1" to those with a "2" on the dependent variable, then the coefficient should be the same when comparing a "2" with a "3" or a "3" with a "4." If not, then the parallel construction assumption of ordinal logistic regression is violated. Unfortunately, the Brant test yielded results that indicated the coefficients across values of the dependent variable were unequal. I attempted to address the variance problems in a variety of ways while maintaining a single model, but ultimately could not do so.

Making the switch to binary logistic regression

New approach requires new dependent variables

Because there were severe variance problems in the ordered logistic regression model, I decided to take a new approach and dichotomize the dependent variable from one ordinal range to multiple binary variables and transition from ordered logistic regression to logistic regression. This eliminates the possibility of having a variance problem as the dependent variable is coded in a 0-1 manner instead of a 1-4 manner.

Approaching the topic using logistic regression allowed me to measure the effects of the independent variables on the multiple Medicaid participation levels separately. I recoded the dependent variable and ran the logistic regression model three separate times. This is in direct contrast to the ordered logistic regression model which measured the effects of the independent variables on all possible values of the dependent variable at the same time.

Multiple steps were taken to transform the dependent variable in order to utilize logistic regression. I created three distinct, binary dependent variables that represent different levels of Medicaid participation: 26-50 percent, 51-75 percent and 76-100 percent. In doing this, I coded the previous lower Medicaid participation range as "0" and the higher range as "1." In the first dependent variable, the 0-25 percent range was coded as "0" and the 26-50 percent range was coded as "1." In the second dependent variable, the 26-50 percent participation range was coded as "0" while the 51-75 percent participation range was coded as "1." In the third dependent variable, the 51-75 percent range was coded as "0" and the 76-100 percent range was coded as "1." No changes were made to the independent variables.

I decided to run multiple logistic regression models to compare one participation range against another participation range. I ran the models this way instead of comparing one range against the other three ranges combined because there could be multiple inflection points. For example, if I analyzed the physicians in the 0-25 percent participation range against all of the physicians grouped in the 26-100 percent participation ranges, there may be inflection points at the 51-75 percent range and the 76-

100 percent range. Comparing one range against another precludes the possibility of having multiple inflection points and makes it easier to identify relationships between variables. It should be noted that I did not evaluate observations that fall outside of the designated participation levels when comparing two ranges against each other.

I ran a logistic regression model for each of the three dependent variables twice to evaluate the 2012 and 2013 data. In total, six logistic regression analyses were conducted to produce the results. Running three distinct models allowed me to isolate the effects of the independent variables on the different participation levels by comparing one participation range against another in ascending order. Table 12 (Appendix C) shows all of the dichotomized dependent variable model outputs for 2012 and 2013 data.

Large number of statistically significant relationships

The logistic regression model yielded slightly different results than the previous ordered logistic regression model. The vast majority of the independent variables in years 2012 and 2013 had statistically significant relationships with the three dichotomized dependent variables, which are identified as physicians who earn 26-50 percent, 51-75 percent and 76-100 percent of their patient care revenue from Medicaid. Obtaining a large number of statistically significant relationships was not unexpected as the number of observations was very large for each of the regression models, ranging from 46,000 to 1,300.

26-50 percent dependent variable model

A few independent variables did not have a statistically significant relationship with the 26-50 percent range dependent variable: medical doctor/doctor of osteopathic

medicine (2012, 2013), solo practice (2013) and salary-based compensation (2013). The Nagelkerke values for 2012 and 2013 were both far below 1, so it should be noted that this may not be the best fitting model for the data. The results of these logistic regression models are displayed in Table 10 in Appendix C.

51-75 percent dependent variable model

There were four independent variables that did not have a statistically significant relationship with the 51-75 percent range dependent variable. This includes: metropolitan area (2013), poverty rate (2012), physician-owned practice (2012), primary care (2013) and employee status (2012). The rest of the variables were statistically significant at the 95 percent confidence level. The Nagelkerke values for 2012 and 2013 were both far below 1, but were greater than the values for the 26-50 percent participation model. Thus, this may not be the best model for the data. The results of this logistic regression model are displayed in Table 10 in Appendix C.

76-100 percent dependent variable model

Many of the independent variables were not statistically significant in this model; this is not surprising since the sample size was much smaller than it was for the other values of the dependent variable. There are far fewer physicians who participate in Medicaid at this very high level, which means there are fewer observations in the dataset. The results of this logistic regression analysis are illustrated in Table 10 in Appendix C. Two variables, MD (2012) and metropolitan area (2013) were automatically omitted from the model when conducting the logistic regression because they were perfect predictors of the dependent variable outcome of "0." My output suggested that physicians coded as

MDs and those whose practices are in metropolitan areas predicted Medicaid revenue levels less than 76 percent every single time. Because a perfect prediction precludes any chance for a standard error or coefficient, these variables were dropped from the model.

The Nagelkerke values for 2012 and 2013 were both far below 1 but higher than they were in the other two models. This model seems to be the most predictive although it has the least number of observations. This should be explored further if my research is replicated.

Hypothesized vs. actual relationships

Table 13 (Appendix D) provides a visual comparison of my hypothesized relationship directions between the independent and dependent variables and the actual direction revealed by the logistic regression analyses. The table demonstrates that my results were very mixed when compared to my hypothesized direction of relationships.

Overall, the output for the highest participation range models, 76-100 percent is surprising. The direction of the relationships in that participation level frequently varied from the direction of the relationships in the lower participation levels. Whether it is the smaller sample size for this participation level or an interaction I was not able to identify, something is making the results for the highest participation level differ from the others.

Hypothesized vs. actual relationship: reimbursement rates

I hypothesized the association between the Medicaid-Medicare fee ratio variable would be positive, but the output displayed a mix of negative and positive relationships. This correlates with the previous research that indicated higher reimbursement rates may

not be the golden ticket to increasing Medicaid participation (Mayer et al., 2000, Bindman et al., 2003).

There appears to be a curvilinear relationship between reimbursement rates and Medicaid participation. The relationship was positive in 2012 and 2013 at the lowest participation level in the analysis, which is 26-50 percent of revenue from Medicaid. This suggests that higher reimbursement rates spur participation and lower rates deter participation for those participating in Medicaid at a low level. The results are mixed at the 51-75 percent range and are negative in both 2012 and 2013 at the highest participation level of 76-10 percent. While the curvilinear relationship is interesting, I cannot explain this definitively. Therefore, this should be investigated further in future research.

Hypothesized vs. actual relationships: practice characteristics

The majority of outputs in the practice characteristics category of independent variables were mixed. There were a few variables that had generally consistent positive or negative relationships with the multiple dependent variables.

There was a mostly negative relationship across all participation levels and metropolitan area. This matches with my prediction. Physicians practicing in rural areas are seemingly more likely to participate in Medicaid than those in urban areas.

Two variables in this category that measure similar practice characteristics, solo practice and physician-owned practice, had completely opposite findings. I predicted a negative relationship between solo practice and participation; doctors in solo practices should have lower levels of participation in Medicaid. The output displayed the opposite

with a generally positive relationship. This means doctors in solo practices may be more likely to participate than those in group practices. This differs largely from past research that showed that doctors in solo practice found it more difficult to participate in Medicaid (Cunningham & Hadley, 2008). The relationship between physician-owned practice and participation was generally negative. Hence, those in physician-owned practices may be less likely to participate in Medicaid than those in "corporate" practices. This matches the literature that identified corporate structures as more viable practice models for Medicaid participation than small practices (Cunningham & Hadley, 2008).

Hypothesized vs. actual relationships: personal traits

Similar to the practice characteristics output, the results of the personal traits category of independent variables are mixed. However, there were two variables with interesting outputs for discussion.

Not surprisingly, the relationship between minority physicians and all three Medicaid participation dependent variables was mostly positive in 2012 and 2013. This matched my hypothesis and previous literature that suggested physicians with a minority ethnicity may be more likely to participate in Medicaid. On the contrary, a white, non-minority physician would be more likely to have lower levels of Medicaid participation (Greene et al., 2006).

The results for the primary care variable differed from my prediction. I hypothesized there would be a positive relationship between primary care doctors and participation, in accordance with the literature that indicates physicians in more compassion-based medical specialties, like primary care, have higher levels of

participation (Mayer et al., 2000). The actual results indicated a negative relationship at the 26-50 percent and 51-75 percent participation levels. When Medicaid participation increased to the highest level of 76-100 percent, the relationship transitioned from negative to positive. There may be another variable or factor influencing the direction of the relationship in the model for the highest level of participation, since many confounding outputs were produced.

Testing for assumptions

With the logistic regression model, I did not need to test heteroskedasticity. This is not a potential problem with logistic regression as my dependent variables are binary. Because I previously checked for multicollinearity with the coefficient correlation table (Appendix A), I did not need to repeat that. I conducted a VIF test for each of the dichotomized dependent variables to test for multicollinearity. If VIF values are under 4, it is unlikely multicollinearity exists. All of the VIF values were under 4. However, it is important to note that VIF values increased as the Medicaid participation range for the dichotomized dependent variable increased. This should be evaluated further in future research. Table 14 (Appendix E) displays the VIF values for the dichotomized dependent variable.

Limitations in quantitative analysis

While utilizing large datasets from the NAMCS for my quantitative analysis helps bolster the validity of my findings, some limitations in my models should be noted. Two variables, medical doctors and metropolitan area, were omitted in one of the logistic

regression models I ran. They were omitted because they were determined to be perfect predictors of the outcome for this sample. Omitting these variables helped prevent a skewed output but there could be underlying problems that led to them being perfect predictors.

The number of physicians in practices who earn 76 percent and above of patient care revenue from Medicaid is much smaller than those in practices earning 26 percent and above revenue from Medicaid. The findings in the logistic regression model utilizing the 76 percent and above dependent variable were quite surprising and should be explored further if this study is replicated. There is a chance the data in this category was skewed as there are fewer doctors that accept this extremely high level of Medicaid patients than those in the lower categories of participation.

Lastly, I have very mixed results across all of my regression models. The 76-100 percent Medicaid participation level model produced quite different results than the 26-50 percent and 51-76 percent models. Therefore, not many conclusions can be drawn from my data and some of the results should be investigated further in the future if the study is replicated.

Quantitative analysis shows mixed results with some policy implications

While I initially thought ordered logistic regression was the best model for my data, it later became apparent that logistic regression was the prime choice. The quantitative analysis revealed a mixed bag of results. Because the direction of

relationships differed frequently across the ascending levels of Medicaid participation and between 2012 and 2013, this indicates there is room for future research to further delve into this issue. However, there were some distinct results with policy implications that were harvested from this quantitative analysis. The resulting findings and policy implications will be discussed in Chapter 5.

Chapter Five

KEY FINDINGS AND RECOMMENDATIONS

Policy implications gleaned from regression analysis

The results of the regression were mixed but did suggest a few answers to my research question: What environmental factors influence provider participation in Medicaid? I thought that the results may have interesting findings that showed physicians responding to the looming Medicaid expansion implementation. However, the logistic regression analyses did not generate results that indicated a major "ACA effect" on physicians' Medicaid participation levels. While it was disappointing that the very robust dataset and logistic regression models did not yield consistent results for many of the variables analyzed, it produced a few findings that should be considered by policymakers.

Primary findings by category of environmental factors

Reimbursement rates

While I expected there to be a strong, positive relationship between reimbursement rates and Medicaid participation, the analysis yielded inconsistent results. In the lowest level of participation (26-50 percent), the relationship was positive in both 2012 and 2013. The relationship was negative in 2012 and positive in 2013 for the 51-75 percent Medicaid participation level model. The relationship was negative in 2012 and 2013 in the 76-100 percent participation with log odds that were quite high compared to those in the other models.

By looking at the direction of the relationships and log odds related to the Medicaid-Medicare fee ratio variable, an interesting and untested story emerges. There

was a curvilinear relationship with a positive relationship at the low participation level, a mixed relationship at the medium participation level and a negative relationship at the high participation level.

It is possible that physicians in the lowest Medicaid participation level are influenced by higher reimbursement rates. There were more than triple the number of physician respondents in the NAMCS who participated in Medicaid at the 26-50 percent range than those who participate at the higher levels. Perhaps physicians who participate in Medicaid at this level are more responsive to reimbursement rates to protect their practice's bottom line. When rates are below the levels needed to sustain a practice's economic viability, they opt out of participation. Conversely, when reimbursement rates are higher, they participate.

The next model for 51-76 percent Medicaid participation yielded inconsistent results across 2012 and 2013 while the 76-100 percent participation model yielded a negative relationship with reimbursement rates in both years. There may be another factor that influences those physicians who practice at reasonably high Medicaid participation levels that I did not include in my research.

Obtaining more than 50 percent of patient care revenue from Medicaid means that practice sees a very high volume of Medicaid patients. This is not financially sustainable for most practices. Physicians in these categories of participation are unique; something else may be playing a role in their Medicaid participation decision. One possible explanation for this surprising negative relationship could be that respondents in this category are most likely working in federally qualified health clinics or community

clinics. These types of practices are commonly subsidized by the government and charged with providing health care for the underserved; making money is not the primary goal. However, this is simply a theory to help make sense of the widely differing results.

Practice characteristics

The region of practice is a possible influencer for Medicaid participation. In the majority of the statistically significant relationships between metropolitan area and Medicaid participation, the direction of the relationship was negative. Thus, physicians in practices located in metropolitan or urban areas may be less likely to participate in Medicaid than physicians in practices located in rural areas.

I believe this can be explained logically with a few untested theories. First, there are likely lower overhead costs to run a practice in a rural area than an urban area so taking on Medicaid patients is not going to break the budget. Secondly, physicians may feel compelled to provide care to Medicaid beneficiaries in rural areas as they may be the only health care providers within a 30-mile range. Lastly, rural physicians are pillars in their communities and are more likely to be well-connected to the residents. They may be more inclined to take care of their community members since they know them personally.

While most health care policy experts argue consolidation is key to keeping pace with the ACA, I had contradictory findings in my quantitative analysis. The solo practice and physician-owned practice variables serve as proxies for measuring the effect "corporatization" has on physicians' Medicaid participation. If consolidated, "corporate" practices truly have greater economies of scale that enable them to deal with the

administrative burden of contracting with Medicaid, I expected the results to show non-solo practices and non-physician owned practices with greater participation.

The findings indicated a different scenario that needs to be investigated more closely in future research. While the outputs for both variables were not completely consistent, there was a general trend showing physicians in solo practices and non-physician owned practices more likely to participate in Medicaid. Solo practices are usually owned by physicians as non-physician owned "corporate" practices tend to have multiple doctors in one location. An example of a non-physician owned practice would be a Kaiser primary care outpatient practice. Therefore, these conflicting findings challenged my pre-existing notions on the importance of consolidation for health care delivery in the Medicaid program. It would be interesting if more isolated research could be done on the impact "corporatization" has on Medicaid participation levels to improve upon my conflicting findings.

Personal traits

Perhaps the most notable finding from my research was the impact of physician ethnicity. There was a fairly consistent positive relationship with the multiple Medicaid participation levels and similar log odds. The log odd for the 51-75 percent range in 2012 was 0.85. This means that for every one unit increase in the minority variable, which is coded 0 for non-minority and 1 for minority, there is a 0.85 point increase in Medicaid participation at the 51-75 level. The relationship between minority and Medicaid participation is negative in the 76-100 percent model but as stated before, that participation range produced unexplainable outputs. Nonetheless, the general trend of the

results from my analysis indicated that minority physicians may be more likely to participate in Medicaid than non-minority physicians.

Research has policy implications

As there is a new presidential administration considering a complete repeal and replacement of the ACA, the Medicaid program could undergo a series of major overhauls. Medicaid beneficiaries' ability to receive health care hinges on the willingness of physicians to participate in the program. Thus, any reform of Medicaid should attempt to increase physician participation. This section will review the policy implications revealed by my research.

More minority physicians needed

As there is a fairly consistent relationship between minority physicians and Medicaid participation in the 0-25 percent and 26-50 percent levels, it is worthwhile for state and federal governments to consider strategies to recruit more minorities into the medical profession. The student population in medical schools nationwide is certainly not considered to be diverse. African Americans constitute less than eight percent of the student populations in the vast majority of medical schools (Smith-Barrow, 2016).

Therefore, federal or state governments should consider issuing more grants or scholarships to minorities applying to medical school. This could serve as an incentive for more minorities to become physicians. Highly diverse undergraduate campuses should be a target for medical school recruitment. There could be a government-sponsored health care career day on public university campuses or some type of work-study programs in physicians' offices integrated in highly diverse universities. This type

of program would allow students to shadow physicians to learn more about the profession.

Recruiting minorities into the health care profession should start as early as possible. Investments should be made in school districts with a high density of minority students to help fund education about careers in medicine. If the federal or state governments were willing to allocate large amounts of funding to recruit more minorities into the medical profession, charter or magnet schools specialized in health care could be established in largely ethnic neighborhoods. Health care-specialized schools could help recruit young minority students to be physicians who previously might not have had the interest or opportunity to do so.

Governmental health care agencies could do very basic initiatives, such as putting up posters about the benefits of careers in medicine at universities. More challenging and costly initiatives, such as the creation of medical schools in ethnically diverse neighborhoods, could also recruit minority physicians. The sky is the limit when it comes to the variety of methods and programs federal and state governments could implement to drive more minorities into the physician workforce.

Rural areas ripe for reform

The analysis yielded generally consistent relationships between region of practice and Medicaid participation levels. This cannot be ignored, given the universally accepted fact that access to health care is abysmal in rural communities. There was a fairly consistent relationship that demonstrated rural physicians are somewhat more inclined to participate in Medicaid than urban physicians. Therefore, policy makers should consider

recruiting more physicians to practice in rural areas. The federal government already partners with many states to provide student loan forgiveness for newly graduated physicians who practice in rural areas designated as having a health professional shortage; this program could be expanded (National Health Service Corps, 2016). The government could offer heftier student loan forgiveness packages or increase the number of spots available in the program.

Because the current model provides loan forgiveness when practicing a minimum of two years in a health professional shortage area, some physicians will leave after their time commitment has been fulfilled. Thus, efforts should be made to not only recruit physicians to rural areas but also keep them there long-term. The government could help provide grants for physicians to aid with the costs of establishing their own medical practices in rural communities. Another option is for a governmental agency, similar to the US Department of Veterans Affairs, to provide very low interest loans to enable newly licensed physicians to purchase medical practices in rural areas.

Volatile payment system should not be overlooked

As the Medicaid population continues to grow, the inadequate payments for physicians cannot be ignored any longer. The logistic regression showed inconsistent results. While the direction of the relationship varied, that does not mean that the fees paid to providers should be kept at the status quo. Reimbursement rates have decreased continuously across the nation over the last decade. Therefore, providers who practice in states with somewhat “high” reimbursement levels have still seen their fees decrease over

the years. The volatility of the payment system for providers may serve as a disincentive for Medicaid participation that should be investigated in future research.

In order to determine the real impact of reimbursement rates, fees would have to be increased and held constant for numerous years to best analyze the relationship with Medicaid participation. A state legislature could substantially increase physician reimbursement rates over a five-year period and undertake a pilot program to study the response of physician participation levels in its Medicaid program. However, this is unlikely to happen in the upcoming years given the uncertainty around the new presidential administration's potential Medicaid changes; some states' Medicaid funding from the federal government has been threatened to be cut substantially through the use of block grants instead of the traditional dollar match system.

Regardless, a state like California with a huge Medicaid population and arguably inadequate access to care for its beneficiaries, should consider taking on such a pilot program. Having data from a huge Medicaid program on the impact a substantial payment increase has on participation levels would be very hard for the federal government to refute.

Future research

More research should be conducted on this very important topic as there were not many clear results from my quantitative analysis. It would be quite interesting to utilize the 2014 NAMCS data, when it is made available, to see if the results from the post-ACA implementation differ from my pre-ACA implementation findings. Further, most of the

results in the 76-100 percent participation level models were confounding and are not able to be explained. This should be evaluated in greater detail if my study is replicated.

My regression models looked at quite a few variables across 2012 and 2013, but there are likely many more factors that influence Medicaid participation levels that were not included. There is a chance that my study did not include some of the variables that had underlying influence on my results. I suspect the administrative burden of Medicaid, which includes the paperwork and wait times for reimbursement payments, is a deterrent to participation. I also believe physician age and gender could be factors that influence Medicaid participation. If these types of new variables were included in a future NAMCS dataset, that could lead to a gold mine of new information.

It would also be helpful for future studies to incorporate personal interviews with physicians. While I did not have the resources to utilize this method of research, it certainly may reveal other influential factors for Medicaid participation that non-physicians may not have ever realized. Open-ended questions posed in person may provide different responses than what is obtained through a survey.

Improving access to care through Medicaid participation can save lives

This thesis produced mostly inconsistent findings while identifying a few policy implications that are ripe for consideration. Physicians in rural areas and minority physicians may be more likely to participate in the multiple Medicaid participation levels. Therefore, governments should consider bolstering programs to attract doctors to practice in rural areas and focus on recruiting more minorities to medical schools to potentially improve access to health care in the massive governmental health care program.

From its original establishment by Lyndon B. Johnson to the vast expansion triggered by the passage of the ACA, Medicaid has always served as the government's promise to provide health care for the neediest Americans. This promise can only be fulfilled through the commitment of physicians nationwide to deliver health care to Medicaid beneficiaries. Improving access to health care in the United States via increased Medicaid provider participation will not only save lives and costs downstream related to serious medical conditions and expensive medications, it will also improve the quality of life for millions.

Appendix A

Table 9: Pairwise Correlation Coefficients (2012)

	Medicaid-Medicare Fee Ratio	Solo Practice (Dummy)	Metropolitan Area (Dummy)	Sophisticated IT Proxy (Dummy)	Poverty Rate of Practice's State
Medicaid-Medicare Fee Ratio (2012)	1.0				
Solo Practice (Dummy)	-0.07*	1.0			
Metropolitan Area (Dummy)	-0.23*	-0.01*	1.0		
Sophisticated IT Proxy (Dummy)	0.03*	-0.16*	0.03*	1.0	
Poverty Rate of Practice's State	0.18*	0.05*	-0.20*	-0.06*	1.0
Physician Owned Practice (Dummy)	-0.09*	0.23*	0.10*	-0.10*	0.04*
MD (Dummy)	0.02*	-0.08*	0.07*	0.02*	0.04*
Minority (Dummy)	-0.07*	0.05*	0.06*	-0.03*	0.08*
Primary Care Doctor (Dummy)	-0.05*	0.02*	0.13*	-0.01*	-0.01*
Employee (Dummy)	0.04*	-0.32*	-0.07*	0.12*	-0.05*
Salary-based Compensation (Dummy)	-0.04*	0.10*	-0.03*	-0.04*	0.04*

Table 9 Continued: Pairwise Correlation Coefficients (2012)						
	Physician Owned Practice (Dummy)	**MD (Dummy)**	**Minority (Dummy)**	**Primary Care Doctor (Dummy)**	**Employee (Dummy)**	**Salary-based Compensation (Dummy)**
Medicaid-Medicare Fee Ratio (2012)						
Solo Practice (Dummy)						
Metropolitan Area (Dummy)						
Sophisticated IT Proxy (Dummy)						
Poverty Rate of Practice's State						
Physician Owned Practice (Dummy)	1.0					
MD (Dummy)	.02*	1.0				
Minority (Dummy)	0.00	0.03*	1.0			
Primary Care Doctor (Dummy)	0.05*	0.06*	-0.04*	1.0		
Employee (Dummy)	-0.68*	0.01*	0.00	-0.05*	1.0	
Salary-based Compensation (Dummy)	-0.11*	-0.07*	0.05*	-0.03*	0.15*	1.0

Appendix B

Table 10: Pairwise Correlation Coefficients (2013)

	Medicaid-Medicare Fee Ratio (2014)	Solo Practice (Dummy)	Metropolitan Area (Dummy)	Sophisticated IT Proxy (Dummy)	Poverty Rate of Practice's State
Medicaid-Medicare Fee Ratio (2014)	1.0				
Solo Practice (Dummy)	-0.09*	1.0			
Metropolitan Area (Dummy)	-0.01*	-0.04*	1.0		
Sophisticated IT Proxy (Dummy)	0.10*	-0.22*	0.03*	1.0	
Poverty Rate of Practice's State	-0.24*	0.07*	-0.04*	-0.05*	1.0
Physician Owned Practice (Dummy)	-0.05*	0.23*	0.05*	-0.18*	0.04*
MD (Dummy)	0.07*	-0.03*	0.03*	0.02*	0.04*
Minority (Dummy)	-0.02*	0.08*	0.06*	-0.03*	0.08*
Primary Care Doctor (Dummy)	-0.00	0.07*	0.09*	-0.01*	-0.01*
Employee (Dummy)	0.04*	0.35*	-0.08*	-0.05*	-0.05*
Salary-based Compensation (Dummy)	-0.04*	0.10*	0.03*	-0.05*	0.04*

Table 10 Continued: Pairwise Correlation Coefficients (2013)						
	Physician Owned Practice (Dummy)	**MD (Dummy)**	**Minority (Dummy)**	**Primary Care Doctor (Dummy)**	**Employee (Dummy)**	**Salary-based Compensation (Dummy)**
Medicaid-Medicare Fee Ratio (2014)						
Solo Practice (Dummy)						
Metropolitan Area (Dummy)						
Sophisticated IT Proxy (Dummy)						
Poverty Rate of Practice's State						
Physician Owned Practice (Dummy)	1.0					
MD (Dummy)	.05*	1.0				
Minority (Dummy)	0.01*	0.03*	1.0			
Primary Care Doctor (Dummy)	0.02*	0.04*	-0.05*	1.0		
Employee (Dummy)	-0.30*	-0.02*	0.05*	0.01*	1.0	
Salary-based Compensation (Dummy)	-0.14*	-0.03*	0.07*	0.05*	0.20*	1.0

Appendix C

Table 12: Logistic Regression Results, Relationship between Explanatory Variables and Dichotomized Medicaid Participation Levels

	26-50 percent revenue from Medicaid dichotomized dependent variable		*51-76 percent revenue from Medicaid dichotomized dependent variable*		*76 -100 percent revenue from Medicaid dichotomized dependent variable*	
Variable	**Log Odds 2012**	**Log Odds 2013**	**Log Odds 2012**	**Log Odds 2013**	**Log Odds 2012**	**Log Odds 2013**
Medicaid-Medicare Fee Ratio	0.35* (0.13)	1.14* (0.21) *2014 Data*	-0.62* (0.27)	0.77* (0.35) *2014 Data*	-9.31* (0.64)	-6.66* (0.90) *2014 Data*
Solo Practice (Dummy)	0.16* (0.03)	0.03 (0.05)	0.27* (0.07)	0.17* (0.08)	-0.78* (0.13)	1.07* (0.21)
Metropolitan Area (Dummy)	-0.79* (0.04)	-0.49* (0.07)	0.52* (0.08)	-0.02 (0.12)	-0.08 (0.19)	omitted
Sophisticated IT Proxy (Dummy)	-0.17* (0.03)	-0.06 (0.04)	0.55* (0.06)	-0.41* (0.08)	-0.02 (0.12)	1.26* (0.20)
Poverty Rate of Practice's State	0.04* (0.00)	0.03* (0.01)	-0.00 (0.01)	-0.05* (0.02)	0.08* (0.02)	0.06 (0.04)
Physician Owned Practice (Dummy)	-0.17* (0.05)	-0.64* (0.05)	-0.10 (0.09)	0.54* (0.10)	-2.77* (0.26)	-0.08 (0.27)
MD (Dummy)	-0.08 (0.06)	0.04 (0.09)	1.16* (0.13)	1.12* (0.24)	omitted	-1.15* (0.47)
Minority (Dummy)	0.60* (0.03)	0.69* (0.04)	0.85* (0.06)	0.38* (0.07)	-0.36* (0.12)	1.35* (0.18)
Primary Care Doctor (Dummy)	-0.68* (0.04)	-0.56* (0.05)	-0.45* (0.08)	-0.05 (0.10)	0.18 (0.15)	0.70* (0.29)
Employee (Dummy)	0.60* (0.04)	0.18* (0.06)	0.06 (0.09)	-0.26* (0.08)	-1.57* (0.26)	2.60* (0.40)
Salary-based compensation (Dummy)	0.08* (0.03)	-0.04 (0.04)	1.04* (0.06)	0.73* (0.47)	-0.24 (0.69)	0.78* (0.96)
Number of Observations	42,622	23,627	7,181	4,027	2,261	1,374
Nagelkerke	0.09	0.06	0.14	0.08	0.26	0.33
Probability > Chi Squared	0.0	0.0	0.0	0.0	0.0	
LR Chi-Squared	2188.27	743.84	753.05	244.76	435.63	343.95

**Indicates statistical significance with 95 percent confidence*

Appendix D

Table 13: Predicted vs. Actual Direction of Relationships							
Variable	*Predicted Direction of Relationship with Dependent Variable*	*Actual Direction of Relationship 26-50% Revenue from Medicaid (2012)*	*Actual Direction of Relationship 26-50% Revenue from Medicaid (2013)*	*Actual Direction of Relationship 51-75% Revenue from Medicaid (2012)*	*Actual Direction of Relationship 51-75% Revenue from Medicaid (2013)*	*Actual Direction of Relationship 76-100% Revenue from Medicaid (2012)*	*Actual Direction of Relationship 76-100% Revenue from Medicaid (2013)*
Medicaid-Medicare Fee Ratio	Positive	Positive	Positive *2014 Data*	Negative	Positive *2014 Data*	Negative	Negative *2014 Data*
Solo Practice (Dummy)	Negative	Positive	Positive	Positive	Positive	Negative	Positive
Metropolitan Area (Dummy)	Negative	Negative	Negative	Positive	Negative	Negative	Omitted
Sophisticated IT Proxy (Dummy)	Positive	Negative	Negative	Positive	Negative	Negative	Positive
Poverty Rate of Practice's State	Positive	Positive	Positive	Negative	Negative	Positive	Positive
Physician Owned Practice (Dummy)	Negative	Negative	Negative	Negative	Positive	Negative	Negative
MD (Dummy)	Positive	Negative	Positive	Positive	Positive	Omitted	Negative
Minority (Dummy)	Positive	Positive	Positive	Positive	Positive	Negative	Positive
Primary Care Doctor (Dummy)	Positive	Negative	Negative	Negative	Negative	Positive	Positive
Employee (Dummy)	Positive	Positive	Positive	Positive	Negative	Negative	Positive
Salary-based compensation (Dummy)	Positive	Positive	Negative	Positive	Positive	Negative	Positive

Appendix E

Table 14: VIF Values for Dichotomized Dependent Variable, 2012 and 2013

	26-50 percent revenue from Medicaid dichotomized dependent variable		*51-76 percent revenue from Medicaid dichotomized dependent variable*		*76 -100 percent revenue from Medicaid dichotomized dependent variable*	
Variable	**VIF 2012**	**VIF 2013**	**VIF 2012**	**VIF 2013**	**VIF 2012**	**VIF 2013**
Medicaid-Medicare Fee Ratio	1.10	1.08 *2014 Data*	1.22	1.18 *2014 Data*	1.29	1.52 *2014 Data*
Solo Practice (Dummy)	1.16	1.38	1.26	1.29	1.57	1.82
Metropolitan Area (Dummy)	1.14	1.03	1.22	1.03	1.31	1.17
Sophisticated IT Proxy (Dummy)	1.04	1.09	1.05	1.18	1.19	1.49
Poverty Rate of Practice's State	1.08	1.09	1.30	1.22	1.25	1.44
Physician Owned Practice (Dummy)	1.83	1.37	2.03	1.61	2.46	2.10
MD (Dummy)	1.03	1.02	1.05	1.10	1.28	1.07
Minority (Dummy)	1.02	1.02	1.08	1.07	1.15	1.13
Primary Care Doctor (Dummy)	1.03	1.03	1.07	1.11	1.24	1.57
Employee (Dummy)	1.93	1.41	2.33	1.47	3.05	2.08
Salary-based compensation (Dummy)	1.06	1.08	1.07	1.14	1.27	1.36

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