11-4-2021

# Three Essays on Insurance Coverage in the U.S. Healthcare System

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# THREE ESSAYS ON INSURANCE COVERAGE IN THE U.S. HEALTHCARE SYSTEM

A dissertation submitted in partial fulfillment

of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

PUBLIC HEALTH

by

Rochelle Parrino

2021

To: Dean Tomás R. Guilarte
Robert Stempel College of Public Health and Social Work

This dissertation, written by Rochelle Parrino and entitled, Three Essays on Insurance Coverage in the U.S. Healthcare System having been approved in respect to style and intellectual content, is referred to you for judgement.

We have read this dissertation and recommend that it be approved.

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Date of Defense: November 4, 2021

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Florida International University, 2021

# DEDICATION

I dedicate this dissertation to my loving husband, Angelo and wonderful son Avi, who with their endless love, encouragement and inspiration motivated me to achieve my personal and professional goals. Also, to my devoted Hans Fritz – constantly by my side keeping me company. In addition, I would like to recognize my very special friends that encouraged me at each step in this journey, acknowledging my determination, perseverance, and tireless commitment to completing this degree. My Mom and Dad; I know they are watching with great pride from above. Much appreciation to Benzi. And to my dearest friend Gertrude – always reminding me about the piece of paper.

ACKNOWLEDGMENTS

I would like to express my heartfelt gratitude to my adviser, Dr. Timothy Page for the continuous support of my PhD study and research, and for his patience, guidance, motivation, enthusiasm, and immense knowledge on this subject. His belief in my capabilities from the time of accepting me into the program and throughout this educational journey was instrumental in my achievement of a lifelong goal. I would also like to thank my committee members: Dr. Arrieta, Dr. Jessica Adler, and Dr. Hannan for their inspiration, insightful comments and support. Their suggestions and recommendations were extremely helpful in the preparation of this dissertation.

I would like to convey my sincere appreciation to all of my faculty members and cohort classmates of the Robert Stempel College of Public Health and Social Work, Department of Health Policy and Management. During my tenure in this department, the subjects related to global public health gained increasing relevance as the pandemic raised awareness of the importance of health systems research. Lastly, a special note of admiration and appreciation to Dr. Nan Hu for his patience and exceptional insight into these subjects.

ABSTRACT OF THE DISSERTATION

THREE ESSAYS ON INSURANCE COVERAGE IN THE U.S. HEALTHCARE SYSTEM

by

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Professor Timothy Page, Major Professor

The purpose of these three studies is to advance our understanding of the impact of the uninsured on the U.S. healthcare system and specifically the professional components, accounting for 20% of healthcare expenditures in the US - roughly $772 billion in 2019. * Two of the three studies use linear mixed effects models investigating the consequences of uninsurance on physician providers at the county level. The first study examines the impact of community uninsurance rate on primary care and specialist providers to explain the effect that uninsurance has on the healthcare system, particularly on available resources for both insured and uninsured. The second study investigates the impact of Medicaid eligibility expansion on supply of physician providers, and whether the impact is more serious among specialty providers than PCPs. The third study uses a linear regression model and the ordinary least square method to evaluate the strength of the public health infrastructure following the passage of the Affordable Care Act and the effect on insurance enrollment to identify factors for future system-wide improvements. Public health

*National Health Expenditure Data US Centers for Medicare and Medicaid Services, 2020

department accreditation was used as a proxy for the strength of public health infrastructure. In these studies, our results showed a statistically significant association between PCP supply and uninsurance rate. This study suggested that the availability of providers increases as uninsurance decreases. My findings also implied that the insured population suffers in areas with high uninsurance rate since the number of professional providers is lower. My results showed a statistically significant association between the Medicaid eligibility expansion and physician supply. The results suggested that professional providers would be influenced by a higher insured rate due to Medicaid eligibility expansion since this would extend the payment methodologies of their patients thus improving their compensation. My findings also suggested that public health infrastructure strength is significantly associated with the improvement in the medical insurance enrollment rate. Outcome data also suggests that Medicaid expansion is a more significant factor than infrastructure strength to improve the insurance rate however stronger county public health infrastructures located in non-expanded states can help to close the uninsurance gap.

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### 1.1 ABSTRACT

The research questions and the hypotheses in this essay are motivated by the economic model of supply and demand, and physicians' interest to increase personal income. The premises are that providers gravitate toward a profit motive compelling them to locate in geographic areas with higher percentages of insured individuals where their practices can thrive. It is hypothesized that communities with a high uninsurance rate are negatively impacted by the relatively low availability of providers, with an even more distinguishable trend specific to specialists.

The Small Area Health Insurance Estimates (SAHIE) data was the source for county-level uninsurance rate, and the Area Health Resources File (AHRF) provided the data source for physician supplies. A longitudinal ecological design was applied for this study. Linear mixed effects models (LMEMs) were employed to examine the association between uninsurance rates and physician supplies through this panel data.

Our results showed a statistically significant association between PCP supplies and the uninsurance rate. With 1% increase in county-level uninsurance rate, the PCP supply is expected to decrease by 18.88 (95% CI: 7.45 to 30.33) per 100,000 population. Across the eight specialties, the percent change was greater in all of the specialty physicians than in PCPs (12.17%, 25.07%, 16.23%, 22.94%, 31.38%, 28.05%, 15.83%, 30.95% for Anesthesiology, Cardiovascular Medicine, Emergency Medicine, OB/GYN, Orthopedic Surgery, Psychiatry, Radiology, and General Surgery, respectively).

This study suggests that the availability of providers increases as the uninsurance rate decreases. This finding implies that the insured population suffered from a high uninsurance rate since the number of professional providers is lower in areas that have a

high uninsured population. The association between physician supply and the uninsurance rate is stronger for specialty care providers with a greater decrease in supply for 1% increase in uninsurance rate. Insured individuals share a benefit of community-wide insurance with not only more PCPs but also specialists in Orthopedic Surgery, General Surgery, Psychiatry and Cardiovascular Medicine. Implications for state-level or local policy makers is to improve the insurance rate and consider more compensation methodologies to attract essential professional providers.

## 1.2 INTRODUCTION

This study considers the relationship between the county's uninsured population with professional physician providers, while holding constant demographic factors. Questions specific to the impact uninsurance has on provider availability are analyzed using two hypotheses: 1) the ratio of providers to people by county decreases as the uninsurance rate increases. 2) the ratio of specialist providers to people by county decreases at a higher rate than PCP providers as the uninsurance rate increases.

Uninsurance within the U.S. has been a continuing source for public discussion given that the U.S. spends more on healthcare than other industrialized nations. The numbers are staggering with the U.S. spending 17.2 % of the Gross Domestic Product (GDP) and $9,892 per capita, in comparison to the Organization for Economic Cooperation and Development (OECD) median of 8.9% and $4,033 per capita (Papanicolas et al., 2018; Anderson et al., 2019). Specific to medical providers, the U.S. has nineteen percent (19%) fewer practicing physicians per 1000 population than the median OECD countries, with 2.6 compared to 3.2. (Anderson et al., 2019). The trend is not favorable with the U.S. medical schools in 2015, graduating 7.5 physicians per 100,000 population compared to the OECD median of 12.1. (Anderson et al., 2019). And, the U.S. is further distinguished

by the lowest percentage of generalist physicians per 100,000 with 11.7% compared to an OECD median of 27.9%. (Anderson et al., 2019). Not surprisingly, the results are reflecting poorly on numerous healthcare indicators such as access to primary care and wait times for specialist appointments, strongly suggesting that the U.S. is not realizing value for the dollars spent and negatively affecting insured and uninsured users alike within the healthcare system..(Rhodes et al., 2013) Furthermore, costs appear to be increasing with projected growth in U.S. healthcare expenditures of 5.6% per year between 2016 – 2025, and at this pace, by 2025, the U.S. will be spending 19.9% of GDP on healthcare. (Keehan et al., 2017)

Recognizing escalating costs, increased demand for quality healthcare, and a decrease in the value for dollars spent, a significant step towards expanding insurance coverage was the passage of the Patient Protection and Affordable Care Act (ACA) in March 2010. (Obama, 2016). Unfortunately, the gains achieved as a result of the ACA are reversing, causing the uninsured rate among working-age adults to rise from 12.7% in 2016 to 15.5% in 2018. (Collins et al., 2018) Currently, approximately 27 million non-elderly Americans are uninsured (Berchick et al., 2018). Additionally, 45% of U.S. adults are underinsured, adding stress to an already compromised healthcare system. (Collins et al., 2018) Concerns are that the uninsured rate will continue to increase and adversely affect U.S. mortality in the future years. (Woolhandler, 2017) Uninsurance affects not only institutions and providers but produces unsurmountable medical bill debt resulting in the number one cause of personal bankruptcy. (Himmelstein et al., 2015)

Of critical importance is the correlation between uninsurance and bad debt or charity care expense for hospitals and medical providers. According to the Health Resources and Services Administration (HRSA), hospital closures are likely to increase,

and it is not only rural facilities that are impacted by this trend. (Kaufman et al. 2016) Urban safety-net health systems are also affected and at risk. The Congressional Budget Office (CBO) has estimated an additional 13 million will become uninsured by 2027 as a result of eliminating the individual mandate penalty. (CBO, 2017) In 2016. Hospital providers recorded $38.3 billion in uncompensated care. (Khullar et al., 2018) Medicaid typically insures a portion of this population; however, varying eligibility requirements between states create population segments without coverage. In the past, medical providers including physicians have looked to cost shifting to commercial insureds as an option or anticipating local governmental assistance, however the future reimbursement methods will likely not permit this as a viable alternative. (Khullar et al., 2018; Winkelman & Vickery, 2019) Changes in hospital ownership and eventual closures that result from consolidations to achieve efficiencies affect the professional providers in the chain. These changes have ripple effects to physicians and other medical personnel downstream in the provider chain. Lastly and most importantly, there is ample evidence that persons lacking health insurance delay or forego care, resulting in worse health outcomes including lower health stock, more considerable morbidity and higher mortality rates. (Woolhandler, 2017; AHRQ, 2018) It is acknowledged that population-wide access to healthcare improves outcomes and facilitates a more equitable distribution of resources. (AHRQ, 2018)

Prior studies demonstrated a community health impact of a high-uninsured population upon the insured. (Pauly & Pagán, 2007) There is an assumption that the uninsured have a lower demand for quality and therefore a lower expectation for community health market quality (Pauly & Pagan, 2007). Other studies have documented that communities with a high percentage of uninsured experience negative pecuniary spillover through higher insurance premiums and more costly self-pay fees. (Pagán &

Pauly, 2006; Courtemanche et.al. 2017) Insured and uninsured adults living in communities with high proportions of uninsured adults are more likely to report unmet medical needs than those living in communities with lower percentages of uninsured (Pagán & Pauly, 2006).

However, questions remain about the relationship between an area's uninsured rates and provider availability – for both insured and uninsured. The unfavorable trend in health insurance coverage necessitates further research to determine the impacts of the uninsurance on the insured within the healthcare system. While these prior studies have hypothesized that reduced provider availability is responsible for the negative health spillovers to the insured in high uninsured areas, these hypotheses must be explicitly tested.

## LITERATURE REVIEW

### 1.3.1 Uninsurance within the Public Health System

Prior studies have documented the effect of uninsurance on the healthcare infrastructure. The proportion of the U.S. population without health insurance is higher than in other similar high-income countries where coverage ranges from 99-100% ((Papanicolas et al., 2018). Researchers have shown that high levels of uninsurance impact individual and community health in a variety of ways, and specifically that health outcomes are worse for people who lack insurance (Woolhandler, 2017; Tolbert, 2019)

Earlier research focused on access to care presenting evidence that the uninsured use primary care services at relatively low rates (Hadley et al., 2007; McMorrow et al., 2014). Preventative care and follow through with major surgical procedures and disease management for chronic conditions are regularly left untreated (Hadley et al. 2007; Shi, 2012) Initial and follow-up physician office visit fees are not affordable by many uninsured, and therefore medical care may be deferred. (Saloner et al., 2015; Melnick et al., 2013;

Himmelstein et al. 2009; Saloner, 2018). Delays in treatment are responsible for higher cost hospitalizations and more extensive medical procedure protocols. (Woolhandler, 2017; Castaneda & Saygili, 2016; Smith et al., 2017; Christopher, 2016) Often, the uninsured will wait until their illness is more critical before seeking care, thus requiring an acute care facility. (Walker, 2013) Therefore, the uninsured population faces significant difficulties in gaining access to services, which increases the likelihood of illnesses and diseases that could be treated timelier and in a less costly setting. It is well documented that the type of insurance coverage or lack thereof is a factor in making appointments for healthcare services (O'Toole et al., 2001; Mort, 1996; Hafner-Eaton, 1993; Hadley et al., 1991; Patrick, 1992; Weissman & Epstein, 1989). In his remarks at Miami-Dade Community College on October 20, 2016, former President Obama commented that the "Emergency Room is the most expensive place to get care." He further noted that the hospital "would have to give you the care for no cost, and they would have to then make up for those unreimbursed expenses by charging everyone else more money." Prior studies have supported these observations and concluded that the uninsured have limited options seeking care at facilities that will accept them such as Emergency Departments (ED) and safety-net hospitals, (Walker, 2013) And a prior study showed that when provided with accessible primary care, patterns are difficult to change without an assigned primary care provider and the uninsured patient continued to utilize the ED for their care. (McCarthy et al., 2002)

Numerous studies have identified poorer health among those not obtaining the necessary diagnostic tests, treatment, medications, and other regular follow-up needed to manage chronic illnesses. (Christopher et al., 2016; Ayanian et al. 2000**;** Levy & Meltzer, 2004**,** 2008**);** McWilliams, 2009) The conclusion drawn from McWilliams systematic literature research work strongly indicates a significant relationship between health

insurance coverage and health outcomes. (McWilliams, 2009). Prior studies have supported the evidence that mortality and health insurance are related, with higher odds of an uninsured patient dying at 0.97 compared to an insured patient at 0.71 (Woolhandler, 2017)

The consequences of uninsurance or under-insurance weakens not only the individual's health stock but their pocketbook as well. Approximately 62% of individuals file for bankruptcy as a result of unexpected medical bills. Many have no insurance coverage or are under-insured with high deductibles and copayments. (Himmelstein et al., 2015) According to prior studies, with the addition of high self-pay office fees, the uninsured are significantly, negatively and disproportionally affected. (Collins et al. 2015)

The passage of the ACA has not reduced the number of bankruptcies in part because coverage of some insurance plans under the exchanges is insufficient to mitigate financial exposure. For example, some plans designate higher balances as a patient responsibility (Himmelstein et al., 2015) These high out of pocket deductibles and copayments paid by the patient, are a component in all types of health insurance, including public programs like Medicare, which usually have a patient owed amount known as "cost-sharing". The roots for this concept are found in the landmark Health Insurance Experiment (HIE) Rand study (Brook et al., 2016), which demonstrated the effects of cost-sharing on service use. However, numerous studies have documented that cost-sharing amounts for some plans is extreme, placing health care at an unaffordable level (Emanuel et al., 2017; Newman et al., 2016) and classifying this population underinsured.

Approximately one-fifth of the U.S. population resides in rural areas, and the interaction between geographic location and health status has been extensively studied. (Dwyer-Lindgren et al., 2017) Some studies compared the differences between urban and

rural settings, and it can further be analyzed at the Zip-code level to identify trends, variations and disparities. (Dwyer-Lindgren et al., 2017) Unique challenges face rural hospitals in comparison to urban facilities and practices. Previous studies have shown that low bed census and a high percentage of bad debt cause many smaller communities to lose their hospitals and force patients to travel to larger tertiary care facilities miles from their home (Hart et al.,1994). Additionally, prior studies have documented that the associated physicians seek privileges at other hospitals, and many relocate to maintain their practices (Iglehart, 2018). The ratio of patients to primary care physicians in rural areas is 39.8 per 100,000 compared to 53.3 per 100,000 in more urban areas. (Hing & Hsiao, 2014) thus compromising access to care regardless of the socioeconomic status of the patient. The socioeconomic factors of rural residents with a lower-than-average per capita income, a higher percentage of unemployment and uninsurance combined with the lack of professional medical providers within their communities contribute to an inability for residents residing in rural areas to obtain needed primary or specialist medical care. (Patterson et al., 2014; Aboagye et al. 2013)

It is essential to consider that a segment of the population will remain uninsured as there will likely be a core of patients that are ineligible for coverage or choose not to participate in any type of coverage. (Wright, 2010). The ACA is responsible for insuring an estimated 20 million that were previously uninsured, but others remain uncovered. (Kominski et al. 2017; Collins et al., 2016; Wishner & Burton, 2017) Prior studies have documented the reasons for uninsurance which include ACA's exclusion of undocumented immigrants, residence in a state that chose not to expand Medicaid, unaware of marketplace insurances and subsidy availability, and lack of guidance to assist in the enrollment process.

((Collins et al., 2016; Wishner & Burton, 2017) According to a Kaiser study, 45% of uninsured adults did not obtain coverage because of affordability. (Tolbert, 2019)

### 1.3.2 Provider Response to Uninsurance

Previous studies have acknowledged that there is a strong interdependency between hospitals and professional providers, comprised of physicians and highly trained medical personnel. However, additional studies may help to clarify the relationship between uninsured rates and physician provider availability. Earlier research work generally focused on hospitals and large healthcare entities excluding the professional component. (Blumenthal & Rizzo, 1991) Both hospitals and physicians typically associate the uninsured with bad debt or charity care. (Wright, 2010) Healthcare providers categorize any unpaid balance as uncompensated care, and in 2017, $38.4 billion attributed to this cost. (AHA, 2017) It is acknowledged that these numbers could be overstated and imperfect since, by definition, it is a variety of unpaid amounts, including rarely paid list prices known as gross charges and bad debt balances, left uncollected. Distinctions should be drawn between bad debt and charity care definitions with criteria using Federal Poverty Guidelines (FPG) needed for better clarity into the magnitude of the issue, (Miller, 2007). However, studies have shown that providers generally are determined to maintain their revenue cycle income stream for those patients deemed as financially able to pay (Cohen & Zammitti, 2018). Although physicians ostensibly have an obligation to treat those in need of care regardless of their financial status, they also function within a U.S. health system governed by practical and complicated realities related to reimbursement and compensation. (Hadley & Holahan, 2003) Several recent studies have reported an uptick in unpaid coinsurance, and deductible amounts since more employer-based insurances have raised these thresholds.

(Dranove et al. 2016; Barkholz, 2016; Cohen & Zammitti, 2018) High deductible health plans (HDHP) within this study's period from 2013-2017 are defined as $1,300 for a single member and $2,600 for family. (Cohen & Zammitti, 2018) In 2020, the U.S. Internal Revenue Service (I.R.S.) redefined it as any plan with a deductible of $1,400 for an individual and $2,800 for a family. Patients covered by plans requiring that large portions of costs are self-paid are often referred to as underinsured and may encounter aggressive billing tactics on the part of providers eager to be compensated. According to prior research, under the ACA, the reduction in the number of uninsured patients through conversions via insurance exchanges or Medicaid has enabled some healthcare systems to provide a measure of assistance to the underinsured with patient discounts for those having difficulties meeting their deductibles. (Cohen & Zammitti, 2018; Nikpay **e**t al. 2016) However, other studies documented that not all providers offer compassionate accommodations and embrace aggressive tactics such as requesting payment upfront for non-emergent or urgent care, obtaining credit bureau reports and credit scores, and pursuing bedside collection techniques using portable credit card processors. (Cohen & Zammitti, 2018) Prior research concluded that professional providers have the interest to maintain income levels, and compensation fee schedules vary based upon the patient's insurer. (Blumenthal & Rizzo, 1991) There is little incentive to treat those with insurances that reimburse at lower scales. Typically, physician practices will verify insurance coverage before the appointment and require upfront payments prior the actual visit. A "wallet biopsy" enables a provider to manage the services to a given population to meet personal or professional practice financial objectives, as both a business owner as well as a caregiver.

Given that adequate financial support is an ongoing concern for hospitals and professional healthcare providers alike, any payment methodology changes made by government or private insurers can cause distress as well as create opportunities within the system. As an example, for those states that expanded Medicaid under ACA, physician fee schedules were increased. These fee schedules differ by state, and study results point to states paying a higher reimbursement for primary care visits as mandated by the ACA during the two years 2013 and 2014 are correlated with an increase in available appointments for Medicaid enrollees. Conversely, Medicaid patients in states paying lower reimbursement rates and those states post-2014 after the increase expired, encountered more difficulties in obtaining appointments. (Polsky, 2015; Candon, 2018) The relevant point to this study is that earlier research concluded that there was an estimated increase of 1.25 percentage points in availability per 10% increase in Medicaid reimbursements. (Polsky, 2015) further providing evidence that physician compensation is a strategic component in the access to services. Study findings also indicate that in comparison to uninsured patients, Medicaid patients experience better access to primary care services at a level similar to insured patients. However, according to prior studies, results indicated that those with Medicaid have worse access issues related to specialists than those without insurance. (Christopher, 2016; Nguyen & Sommers, 2016)

Prior studies have documented different methods providers use to compensate for losses, such as reducing charity care appointments, staffing cuts or reductions in staff pay. (Hadley & Feder, 1985). However prior studies indicate that the most common method for providers to minimize potential losses is to ask for full payment upfront thus reducing the possibility of unpaid medical bills and eliminate the bad debt or charity write-offs. These initial and follow-up office visit fees are not affordable by many

uninsured, and therefore medical care may be deferred or delayed until the condition becomes an emergency. (Saloner et al., 2015; Melnick et al., 2013; Himmelstein et al., 2009; Saloner et al., 2018) Additionally, previous studies have suggested that privately insured patients located in areas with high uninsurance pay more through an increase in charges to compensate for those that do not pay. (Hadley & Feder, 1985) However, various types of adjustments within the billing process are acknowledged in an attempt to make up for lost revenues.

As financial concerns among providers rise, previous studies documented professional providers establishing appointment limits based upon the insurance category as another method to reducing compensation loss exposure. (Medford-Davis et al., .2017). In a post-ACA environment, difficulties remain for the uninsured according to a Sabik study, with the uninsured experiencing a lower acceptance rate among office-based physicians under ACA's newly expanded Medicaid while no apparent change in acceptance of new Medicaid enrolled patients. (Sabik & Gandhi, 2013). As these prior post-ACA studies suggest, professional providers have observed an increase in volume for Medicaid recipients at their offices, thus limiting available time slots for uninsured (Rhodes et al., 2014; Jacobson & Jazowski, 2011; Polsky et al., 2015) As a recent addition to physician office practices, telemedicine and electronic health records (EHR) have an opportunity to improve clinical health-related communication and can provide support in maintaining insurance coverage through electronic documentation of enrollment dates and eligibility information. (DeVoe, 2014) However, given these various physician office practice improvements to accommodate the newly insured, the availability of appointments for the uninsured has not kept pace with demand and has shown a decrease according to previous studies. (Christopher, 2016)

Community safety net urban hospitals in locations such as Tampa, FL, or Boston, Massachusetts, have been forced to restructure or merge amid insurmountable financial burdens. (Khullar et al., 2018) Governmental and non-profit community hospitals felt the effects as for-profit chains had made inroads in acquisitions expanding market share. And the for-profit portfolio additions have little interest in those patients with limited insurance coverage. Safety net hospitals make up about 5% of U.S. hospitals, and in 2017, these institutions provided 17.4% of uncompensated care, totaling $6.7 billion, and 23% of the charity care, totaling to $5.5 billion. (AHA, 2017). These expenses, in addition to other governmental cuts in reimbursement under Medicaid and Medicare, have placed severe financial pressure on these providers. With the implementation of the ACA, the expectation was to reduce the uninsured burden and subsequent uncompensated or charity care to relieve some of this pressure. Using the CMS Provider of Services file, Healthcare Provider Cost Reporting Information System reports and a difference in difference statistical model, previous studies found that the ACA's Medicaid expansion was associated with improved hospital fiscal performance and substantially reduce the possibility of closure, especially in rural markets and counties with large numbers of uninsured adults before Medicaid expansion. (Lindrooth et al., 2018; CMS, 2019) Prior studies found that Medicaid enrollment has a positive impact on the associated providers connected to hospitals in maintaining a workforce base within the community and provided access to care for individuals residing in these areas. (Lindrooth et al., 2018; CMS, 2019) However, prior studies have strongly suggested that in those states that did not expand Medicaid, hospitals and particularly those in rural communities were at risk for closure. (Kaufman et al. 2016). From 2013 to 2017, 64 rural hospitals closed, more than twice as many as during the previous 5-year period because of financial distress.

(Government Accountability Office, 2018) Using Medicare Cost Report Data and a difference in difference statistical approach, the Kaufman study observed disparity between urban facilities and rural institutions, leading to a finding that these health provider systems should be considered separately. Kaufman et al. 2016).

And, as can be expected, the professionals working adjacent to these closed hospitals are impacted and may choose to leave the area for more urban centers. Prior studies have documented that the patient-to- primary care physician ratio in rural areas are compromised with only 39.8 physicians per 100,000 people, compared to 53.3 physicians per 100,000 in urban areas. (Hing & Hsiao, 2014) This uneven distribution of physicians and particularly specialists have a significant impact on the health of the rural population that is difficult to overcome. (Hing & Hsiao, 2014; Germack et.al., 2019)

The ACA's impact upon professional provider resource supply should not be understated. With the advent of the ACA, more individuals secured Medicaid or insurance offered through the insurance exchanges. (Courtemanche et al., 2017; Cohen, 2015) These initiatives helped to reduce the number of unreimbursed services however the remaining uninsured population continues to encounter access issues as physician practices adapt to increases in Medicaid enrollees. (Sabik & Gandhi, 2013). Prior studies have reported that those newly enrolled Medicaid patients are taking advantage of improved access in obtaining medical care which corresponds to an increase in identified illnesses and a continuation of follow-up care improving the opportunity for positive health outcomes. (Kaufman **e**t al. 2015) It is widely acknowledged that before the enactment of the ACA, there were shortages and an uneven distribution of healthcare resources. (Wishner & Burton, 2017) however the increase in volume created by the newly insured, exacerbated unmet needs in many communities related to primary care, specialty care, and behavioral

health. (Wishner & Burton, 2017) Other studies have observed further strain on the professional provider segment of the system intensified by aging baby boomers, physician retirements, and more desirable lifestyle choices, limiting those interested in demanding health services careers. (Institute of Medicine, 2009) Previous studies have shown that professional providers have responded to the increase in demand through staffing increases, hiring advanced nurse practitioners, expanding to new geographic location or enlarging existing sites, and extending practice office hours. Urgent care centers and retail medicine outlets have expanded the point of service care options, which has spread the demand over a broader range of providers. (Wishner & Burton, 2017) However issues related to professional provider resource allocation exist.

1.3.3 Spillover Effects of Uninsurance on the Insured

Spillover refers to the effects of the uninsured upon the insured in the context of this study. Earlier studies demonstrated a community health impact of a high-uninsured population upon the insured. (Pauly & Pagan, 2007). Research conducted by Pagan and Pauly noted that the insured population in communities with a significant number of individuals with no insurance or are underinsured experience similar access issues. (Pauly & Pagán, 2007; Pagán & Pauly, 2006). Their studies have concluded that providers in these areas may reduce services, increase fees or choose to establish a practice in a more lucrative location which affects the strength of the community's heath care infrastructure. (Pagán & Pauly 2006). Studies have documented that communities with a high percentage of uninsured can result in higher insurance premiums for those insured and more costly self-pay fees. (Pagán & Pauly, 2006; Courtemanche et al., 2017) Previous studies have suggested that privately insured patients located in areas with high uninsurance pay more through increased charges to compensate for those that do not pay.( Hadley & Feder, 1985;

HIAA, 1982 ). Lastly, insured and uninsured alike living in communities with high proportions of uninsured adults are more apt to report unmet medical needs than those living in communities with lower percentages of uninsured (Pagán & Pauly, 2006).

Similarly, prior studies have also considered high percentages of Medicaid recipients and the impact on the community healthcare market. In comparison to insurance or Medicare, Medicaid generally pays a lower physician fee schedule reimbursement. Providers in communities with large Medicaid populations may choose to either not accept Medicaid patients or limit the number in their practice, thus placing an even greater strain on uninsured and Medicaid communities. Physician practices setting Medicaid patient quotas will negate the positive aspects of the expansion efforts, intended to cover previously uninsured individuals. What is thought to be a community benefit could also be responsible for overloading the system "crowding out" private insurance and Medicare patients. (Sabik, & Gandhi, 2013) Lower average reimbursement levels for physicians further reduce access for Medicaid patients and the uninsured. (Sabik, & Gandhi, 2013) Other studies have suggested constraints on the number of Medicaid and uninsured/self-pay (and probable charity) patients accepted by practices significantly impacts the provision of care not only for these patients but for the entire community. (Sabik, 2012) Given the financial pressures facing secondary and tertiary care facilities, decisions to proceed with hospital closures have a spillover effect on the entire community. (Hart et al.1994) In more remote rural areas where the hospital serves as a major employer, the impact can be devastating to the local economy forcing professional staff including physicians to seek employment elsewhere. (Hart et al., 1994) The effect upon those remaining in the community affects their health status through reduced accessibility to all types of providers.

Prior studies have investigated the effects of community uninsurance and the associated adverse impact to public health institutions and providers and concluded that the result is more apparent on a localized level than on a nationwide scale. Several previous studies have referred to health as a durable output of combined components suggesting that the health stock of the community neighborhood suffers identifiable consequences and is compromised by a high number of uninsured. Disproportionate percentages of uninsured and underinsured places a burden on the health system with a higher number of individuals with disabilities, chronic illnesses, and communicable diseases. Correspondingly, these community neighborhoods will lack sufficient resources to treat cases because of reduced capacity resulting from provider location decisions, decreased clinic-operating hours, staffing declines, and hospital closures. Prior work in this area determined that the prevalence of uninsurance does not only harm those that are uninsured. It calls for further research to examine the suggested effects of uninsurance more deeply at the community level. (Institute of Medicine, 2013).

Prior studies draw a strong relationship between the uninsured and insured, presenting an argument that the insured population should have a distinct interest in improving uninsured access to healthcare beyond the financial components of uncompensated costs. The insured should consider the quality of healthcare available within a community in addition to economic aspects. (Pauly & Pagán, 2007) It is suggested in Pauly & Pagán study that a possible lower demand for quality by the uninsured has a negative spillover effect on the insured community members and in conclusion, the insured population has the self-interest to reduce the size of the uninsured in their community. The assumption is that the uninsured have a lower demand for quality, and therefore there is a non-pecuniary spillover of lower market quality. In communities that rely heavily on

charity care and simultaneously demand quality healthcare, there is a negative pecuniary spillover through costs paid via higher insurance premiums to cover uninsured patients and no non-pecuniary effects on quality. Lastly, it was pointed out that a reduction in the spillover effect occurs if the community is large enough to be segmented based upon insurance status. The study also points to limited accessibility of healthcare for insured in high-uninsured communities and a more significant percentage of unmet needs. Study authors commented that more in-depth research work is needed to determine the causality for the lack of healthcare providers and providers unwilling and unwelcoming to the uninsured. Study methodologies and communication strategies are also needed to convince the insured population of the non-pecuniary spillover affects the uninsured population in terms of healthcare accessibility, i.e., primary care and specialty physicians which reflected in the indicator responses. (Pauly & Pagán, 2007)

Another study by the same authors examined the relationship between community-level uninsurance rates and the self-reported unmet needs of insured and uninsured adults in the U.S. (Pagán & Pauly, 2006) The primary result reflects a community uninsurance rate that is positively and significantly associated with reporting unmet medical needs. Most notably, insured individuals living in areas with high proportions of uninsured are more likely to report unmet medical needs than those living in communities with lower percentages of uninsured. It is argued that the provision of healthcare services is strongly linked to the number of uninsured, which in some cases, force cutbacks in services. Also, a rise in prices discourages use by insured paying a proportional coinsurance. Thirdly, specialized physicians may face reduced demand by uninsured; thus, providers may choose to locate elsewhere. Authors commented that the next step is to determine if this finding can be replicated or is a result of uninsured using safety-net facilities; or if uninsured are

underreporting unmet needs. Although a reference to physicians inferred, no in-depth analysis of the market segment has been conducted. (Pagán & Pauly, 2006)

Studies by different authors sought to more definitively establish that a high level of uninsurance in a community may negatively affect access to and quality of health care for insured persons. A study by Sabik using 1996 to 2006 Medical Expenditure Panel Survey Household Component data linked to data from the Current Population Survey, Area Resource File, and the Interstudy Competitive Edge analyzed 86,928 insured adult respondents living in approximately 200 large metropolitan areas. (Sabik, 2012) The outcome reflected that among privately insured adults, a higher community uninsurance rate resulted in a lower probability of having a usual source of care, such as an office-based visit, having any medical expenditures, and reporting being satisfied with the quality of care provided by the typical source of care. (Sabik, 2012) A higher community uninsurance rate also led to a higher probability of reporting difficulty in obtaining needed care. Among Medicare enrollees, a higher community uninsurance rate resulted in lower reported satisfaction with care and a higher probability of experiencing difficulty or delay in getting needed care. (Sabik, 2012) The conclusion drawn is that substantial spillover effects of the community uninsurance rate existed on access and satisfaction with health care among insured working-age adults and seniors. (Sabik, 2012) This study did not specifically address provider availability related to uninsurance. (Sabik, 2012)

Other studies have challenged the above and specifically Pauly & Pagan through commenting that their study results may not reflect the causal effect of uninsurance rates, as the studies rely on cross-sectional data and have not fully accounted for the role of both observable and unobservable market factors in determining access to care. (Gresenz & Escarce, 2011). One study, in particular, analyzed how variations in uninsurance rates

within markets over time affects access to care, specifically whether an individual forgoes necessary medical care, employing models that control for both market and time and using instrumental variables to attempt to address potential endogeneity. (Gresenz & Escarce, 2011) According to the authors, this approach improves on previous studies by controlling for time-invariant market characteristics that may confound cross-sectional analyses. Thus, it may be more relevant for assessing the potential effects of policies that reduce the rate of uninsurance. (Gresenz & Escarce, 2011) In contrast to previous studies, the results suggest that changes in uninsurance rates primarily affect those aspects of the local healthcare system that influence care for the uninsured. (Gresenz & Escarce, 2011) The study suggests that the negative effect on access for the uninsured is more a result of the reduction in resources per uninsured individual, and therefore increasing the safety net resources would positively affect the uninsured but have little effect on the insured. (Gresenz & Escarce, 2011) However, in this study, the author disputes explicitly the previous findings that insured individuals are negatively impacted by those uninsured within the community. Additional research is warranted to respond to this study. (Gresenz & Escarce, 2011)

Further investigations yielded mixed results depending upon community size. In one study, the impact of spillover effects focused on Medicare beneficiaries, specific diagnoses and population density. (McMorrow, 2013) A review of the relationship between the uninsurance rate at the Metropolitan Statistical Area (MSA) level and inpatient quality of care delivered to Medicare beneficiaries measured by mortality from eight procedures and conditions was conducted; however, the study was specific to selected diagnostic categories and Medicare beneficiaries. No control was available for Medicare supplemental coverage. The author acknowledged that the uninsurance rate was measured

using survey data that was not intended to represent the local level. McMorrow commented that this introduced a potentially substantial measurement error into the analysis. A suggestion made was that the data from the American Community Survey (ACS) would enable better representative estimates of uninsurance with more specificity of geographic detail. Using this data to perform a similar analysis would be "a natural extension" of this or other work on market-level insurance effects. The results from this study indicated that overall, no significant or widespread adverse spillover effects of the uninsured population on mortality for Medicare beneficiaries. The evidence from models without market fixed effects suggests that the impact could vary by community size. Smaller market-level communities show a positive, though statistically insignificant association between the local uninsurance rate and Medicare mortality. This is consistent with the thought that a large uninsured population can result in reductions in shared quality for all patients. Negative spillover effects may be more likely to occur among smaller communities because if providers in small neighborhoods face lower market demand, they may have limited ability to spread the fixed costs of investments. Providers in smaller community market neighborhoods also may be less able to differentiate themselves to serve only a specific segment of the payer distribution. Therefore, patients with different payers are more likely to share providers in smaller community markets, and this increases the likely hood of spillover effects. The author commented that no conclusions should be drawn or generalized to other payers or diagnostic groups. Medicare coverage could bias the results and add to improved mortality outcomes. Additionally, since large MSA's were used in this study, future studies using smaller MSA's may have different outcomes with fewer healthcare resources available. The author acknowledged that dual-eligible Medicaid/Medicare recipients, along with Medicaid, could be added and, therefore, an

instrumental variable approach might be desirable to pursue in a broader study. It was also suggested that additional analysis should consider the market-level effects as a result of the ACA Medicaid expansion. (McMorrow, 2013)

Another limited scope study was specific to investigating the relationship between the percent of uninsured in the county and expenditures associated with emergency department (E.D.) visits. (Kirby & Cohen, 2018) This study used MEPS data linked to county-level data from the ACS, the Healthcare Cost and Utilization Project, and AHRF. The period was between 2009 and 2013 to estimate the association between the percent uninsured in counties and the amount paid for a typical E.D. visit**.** Among those with private insurance**,** an increase of one (1) percentage point in the county uninsurance rate was associated with a $20 increase in the mean E.D. payment. No similar association was identified in E.D. visits covered by other insurances**.** There appears to be tentative evidence that costs associated with high rates of uninsurance spill over to those with insurance**,** however, the authors recommended additional research to replicate these findings with longitudinal data and methods before drawing causal conclusions. Recent changes in area uninsurance rates following the ACA's Medicaid and insurance market expansions and subsequent changes in E.D**.** expenditures present an ideal opportunity for further investigative work. (Kirby & Cohen, 2018)

Uninsured spillover on social aspects has been previously studied to a limited extent, but a focus on provider availability was not an intended outcome. Qualitative investigations have looked at the impact of the uninsured beyond healthcare. Although interesting and useful insights into community issues are offered, these studies did not assess the magnitude or statistical significance of uninsurance. (Timmermans et al. 2014; Hardeman et al. 2012) Small sample sizes were used in specific small geographic areas. The

uninsurance effects on the functioning of religious institutions and schools was investigated in one study using two Los Angeles communities. (Timmermans et al. 2014) A higher rate of absenteeism was identified in learning institutions and schools due to health insurance problems of pupils; however, an insignificant effect was seen among religious churches/organizations. Churches are often seen as providing support for health care programs as a means to engage those in their religious community. Another related study targeted two high uninsured communities in two different states. (Hardeman, et. al. 2012) The findings provided separate recommendations and conclusions for each community; however, the overall result is that the relative size of the uninsured population will likely have an impact on the insured and local healthcare system. It was commented in the study results that these qualitative surveys were initial inquiries, and further quantitative work was warranted. (Timmermans et al. 2014; Hardeman et al. 2012)

## 1.4 CONCEPTUAL FRAMEWORK

The purpose of this study is to evaluate the relationship between the county's uninsured population with professional physician providers per 100,000 population, while holding constant demographic factors. This study specifically questions the impact uninsurance rate has on provider availability. This research question is motivated by the economic model of supply and demand, and physicians' interest to increase personal income. There are two hypotheses, and the first is the ratio of providers to county population decreases as the uninsurance rate increases. The second hypothesis is the ratio of specialist providers to county population decreases at a higher rate than PCP providers as the uninsurance rate increases. Physicians' geographical location selections are motivated by multiple factors. Carpenter and colleagues (1999) found that the cost of living, crime rates, tax rate were important factors that impacted physicians' location

decision. While Chou and Lo (2009) reported that financial interests such as high-cost malpractice insurance premiums and maximum caps were also drivers of physicians, particularly for surgeons. Financial considerations were also important to physicians. For example, Wright, (2010) claimed that although physicians are motivated by a variety of factors, the bottom line is that financial concerns are an important consideration in a profession where time represents money. By linking the Small Area Health Insurance Estimates (SAHIE) and the US Census data with the Area Health Resources File (AHRF) data, I am able to examine the impact of the county-level uninsurance rate on their physician (including PCPs and specialty physicians) supplies.

## 1.5 DATA AND METHODS

A longitudinal ecological design was used for this study. A panel data set was created using primarily open access secondary sources to evaluate the effect of the proportion of insured on the provider supply applying multivariable models controlling for the covariates of primary and specialist physician supplies and socio-economic status. Linear mixed effects models (LMEMs) were used since a total of nine (9) year measures of physician supply per county was undertaken. The year 2010 was used as the reference year (baseline), and the whole study period included years from 2010 through 2018.

### 1.5.1 Data Resources and Variables

SAHIE, U.S. Census data, and AHRF data were downloaded from year 2010 to 2018 and combined as a single data file for this analysis. SAHIE and AHRF data sets were linked by counties' Federal Information Processing Standards (FIPS) code as the key to match these datasets. The number of counties in the linked data was 3,142. These are the counties that has records in both SAHIE and AHRF data. The U.S. territories were

included in the US Census data set but not in SAHIE, so they were removed from the analytical dataset.

To provide more detail and background to the data resources used in this study, previous studies have used different databases to conduct this research. However, this is the first study to evaluate this relationship using county-level data. This retrospective study was accomplished using datasets that have records for each county in each year. Data at the county-year level was aggregated and merged into existing datasets beginning with the most recent release of the Small Area Health Insurance Estimates (SAHIE) to provide single-year estimates of health insurance coverage for counties in the U.S. The SAHIE database is generated from aggregated American Communities Survey (ACS) data. However, SAHIE is the only source of data for single-year estimates of health insurance coverage status for all counties in the U.S. by selected economic and demographic characteristics. The ACS data does provide detailed survey estimates of health insurance coverage for counties with small populations as multi-year estimates. These multi-year estimates are period in time estimates not reflecting on an annual basis, and therefore, the estimates do not reveal annual changes such as a yearly impact that the ACA would have on the uninsured. Since the SAHIE program models 1-year ACS estimates using administrative records to provide health insurance coverage estimates for every county in the United States on an annual basis, this is a better resource to capture trends being sought that would otherwise not be discernable. To obtain the share of uninsured and for a basic measure of the uninsured rate, SAHIE data was used as the best source for this variable. The methodology selected was similar to other previous studies using SAHIE county-level demographic and insurance data. (Dalzell et al., 2015; Garthwaite et.al., 2019; Vaughan et al 2014).

The Health Resources and Services Administration (HRSA) database, known as the Area Health Resources File (AHRF), was used to investigate the research variables specific to the availability and accessibility of physician providers at the county-level. This data source is generated from the American Medical Association (AMA) Physician Masterfile, which is produced by the AMA. It was used to obtain the proportion of primary care physicians, and the proportion of specialists. The AHRF has been used in prior studies specifying professional providers per 100,000 population at the county-level with type by year (Khatana et al., 2019; Vaughan et al., 2014).

However, SAHIE has limitations since it is only comprised of age under 65 data and race in SAHIE is identified at the state level but not the county-level, with no defining factor specifying insured/uninsured, and AHRF was limited to years 2010, 2015 and 2018. Therefore, it became necessary to use U.S. Census Bureau Annual County Resident Population Estimates (U.S. Census) data containing more detail to capture these variables for the studies. The U.S. Census data maintains the full range of age distribution and race at the county-level.

This study will link SAHIE (US Census) with AHRF to examine the impact of uninsurance rate on the county-level physician (PCP and specialties) supplies.

1.5.2 Dependent Variables – Outcome

The supply of the total MD's and DO's, primary care (PCP) and specialty providers are the primary outcomes for this essay. Definitions and volume information for primary care and specialty providers was identified the survey data derived from the Association of American Medical Colleges (AAMC) sourced from the AMA Masterfile. Primary care was defined as those practicing under Internal Medicine, Family Medicine/General Practice, and Pediatrics ([1] KFF.org). Primary care data in both SAHIE and AHRF sources excludes

Geriatric medicine because SAHIE is representative of the population under age 65 and in AHRF, it is combined with other specialties in the "Other" category. Obstetrics and Gynecology (OB/GYN) is categorized separately in AHRF and thus will be reported independently from primary care data. Specialty providers investigated were selected based upon the eight (8) highest specialist percentages of the total specialist practicing physicians. Professional providers are distinguished by allopathic physicians (M.D.'s) and osteopathic D.O.; however, these are combined and not separated for of these studies. The eight (8) specialties I considered include Anesthesiology, Cardiovascular Medicine, Emergency Medicine, General Surgery, OB/GYN, Orthopedic Surgery, Psychiatry, and Radiology and Diagnostic Radiology. Table 1.1 summarizes the physician supplies and allocation, by specialty, in 2018.

The AHRF data included non-Federal and Federal /VA providers however only non-Federal data was selected to use for this study. This data file contains the professional provider information related to both primary care and specialist physicians. During the detailed review of the data in SAHIE and AHRF, the availability of information became more evident and subsequent modifications were made. Total M.D., D.O., and primary care data was available and downloaded for nine (9) years (2010 - 2018) and specialty provider data was available and downloaded for three (3) years (2010, 2015, 2018).

The numbers of non-federal primary care M.D.s, D.O.s were derived from AHRF for each of the counties in the dataset and merged to the SAHIE data by the county FIPS. county FIPS were manually created in AHRF using the FIPS coding rule. A check was performed, and 72 FIPS codes were identified as U.S. territories (Puerto Rico and Guam) which were removed from the dataset. A total of 88 FIPS codes in AHRF were not in SAHIE, so these counties were removed from the study.

The regression model required as the dependent variable the number of Total Professional MD and DO Providers per 100,000 people. To compute this figure, I divided the total number of M.D.s and D.O.s by the county population, and then multiplied the number by 100,000.

1.5.3 Exposure

The percent of uninsured population in each county for each year is the exposure of this essay. The percent of uninsured in each year is calculated by dividing the number of uninsured people in each county (derived from SAHIE) by the number of county population in that year. The percent of insured population ranges from 0 to 100%.

1.5.4 Control Variables - Covariates

Poverty rate, age, race, and gender have been previously stated in prior literature as the factors of physician supplies. Hence, these variables were adjusted for in the model. Hence, the covariates in this essay include the county-level poverty rate, county-level percent of population under the age of 65, percent of population under age 19, percent of county-level NH Blacks, percent of county-level Hispanics, and percent of county-level males in each year.

The variable of county-level poverty rate was calculated by dividing the total number of county population under 138% of FPG by the total county population and times 100% in each year; the county-level percent of population under the age of 65 was calculated by dividing the number of people over age 65 by the total county population and multiplying by 100% in each year; the percent of population under age 19 in each county was calculated by taking the number in this demographic group and dividing by the total number in each county and multiplying by 100% in each year; the percent of Non-Hispanic (NH) Black in each county was calculated by dividing the number of NH Blacks in each

county by the total number of people in each county in each year; the percent of Hispanic in each county was calculated by dividing the number of Hispanic in each county by the total number of people in that county in each year. Finally, the percent of male in each county was calculated by dividing the number of males in each county by the total number of people in that county in each year.

1.5.5 Statistical Analysis

The covariates used as control variables included the poverty rate, black non-Hispanic, Hispanic, age over 65 and under age 19, sex and a dummy variable for each year.

The County-Year level data set was used for analysis using data from 2010 to 2018 with nine (9) years of primary care provider (M.D.s and D.O.s) data and three (3) years of specialty physicians (M.D.s and D.O.s) data. LMEMs were used to investigate the association between exposures and outcomes for the longitudinal data as follows:

A LMEM was used to relate PCP (M.D.s and D.O.s) supplies with uninsurance rate from 2010 through 2018 for all county population:

$$E(Providers\ per\ 100{,}000\ \ people)_{it} = \beta_0 + \beta_1 County\ level\ uninsurance\ rate_{it} + \beta_2\ County\ level\ poverty\ rate_{it} + \beta_3 County\ level\ percent\ of\ NH\ Black_{it} + \beta_4 County\ level\ percent\ of\ Hispanic_{it} + \beta_5 County\ level\ percent\ of\ age\ over\ 65_{it} + \beta_6 County\ level\ percent\ of\ under\ 19_{it} + \beta_7 County\ level\ percent\ of\ Male_{it} + \sum_{t=1}^{8} \delta_t \mathbf{1}(Year = t) \quad (1)$$

where *i* denotes the index of county (*i* = 1, 2, …, 3142) and *t* indicates the number of years from baseline (year 2010), $\beta_1$ is the regression parameter for the exposure (uninsurance rate) that indicates the difference in the expected value of physician per 100,000 population with 1% increase in the uninsurance rate, $\beta_2$ to $\beta_7$ are regression parameters for confounding variables, $\delta_t$ is difference between each year and the baseline indicating the year-to-year fluctuation, and **1**(Year = t) is the indicator function for each of the year *t* (*t*=1,…8). In this model, the data were considered to be clustered within

each county *i* (*i* = 1, 2, …, 3142) and measurements across the 9 years within each cluster were correlated. Using the LMEM, the standard error estimated were adjusted for the clustering by assuming the exchangeable correlation structure (i.e., the correlation between each pair of measurements within a given county were assumed to be the same).

The following linear mixed effects model was used to relate specialty physician (M.D.s and D.O.s) supplies with uninsurance rate in 2010, 2015, and 2018:

$$\begin{aligned} &Providers\ per\ 100{,}000\ \ people_{it} = \beta_0 + \beta_1 County\ level\ uninsurance\ rate_{it} + \\ &\beta_2\ County\ level\ poverty\ rate_{it} + \\ &\beta_3 County\ level\ percent\ of\ NH\ Black_{it} + \beta_4 County\ level\ percent\ of\ Hispanic_{it} + \\ &\beta_5 County\ level\ percent\ of\ age\ over\ 65_{it} + \beta_6 County\ level\ percent\ of\ under\ 19_{it} + \\ &\beta_7 County\ level\ percent\ of\ Male_{it} + \sum_{t=1}^{2} \delta_t \mathbf{1}(Year = t) \end{aligned} \quad (2)$$

where *i* denotes the index of county (i = 1, 2, …, 3142) and *t* indicates the year (t=0 for 2010; t=1 for 2015; and t=2 for 2018), $\beta_1$ is the regression parameter for the exposure (uninsurance rate) that indicates the difference in the expected value of physician per 100,000 population with 1% increase in the uninsurance rate, $\beta_2$ to $\beta_7$ are regression parameters for confounding variables, $\delta_t$ is difference between each year and the baseline indicating the year-to-year fluctuation, and **1**(Year = t) is the indicator function for each of the year *t* (*t*=1, 2). In this model, the data were also considered to be clustered within each county *i* (*i* = 1, 2, …, 3142) and measurements across the 3 selected years within each cluster were correlated. Using the LMEM, the standard error estimated were adjusted for the clustering by assuming the exchangeable correlation structure (i.e., the correlation between each pair of measurements within a given county were assumed to be the same). No fixed effect of states or counties were considered in this model.

All analyses were performed using Stata (Stata Corp., College Station, TX, USA) version 16. Data linkage and management was performed using Stata version 16 and SAS (SAS Inst. Inc., Cary, NC, USA). All tests are two-sided; p-values < 0.05 indicate

statistically significant results. Robust standard errors (SEs) were used for the analysis of the panel data.

Standard statistical approaches for evaluating the effect of uninsurance on providers and the influence of health policy changes were selected based on methods used in similar studies. (Zhou, et al., 2020)

Testing for heteroskedasticity was done and employing robust standard errors. Variance inflator factor tests were used to measure how much an independent variable is influenced by the other independent variables and to check for multicollinearity to what extent the independent variables are highly linearly related, and if the absolute value of the correlation coefficient is close 1.

## 1.6 RESULTS

### 1.6.1 Descriptive Statistics

Table 1.2 reports the descriptive statistics (mean ± SD) of the county-level population characteristics and uninsurance rate from 2010 to 2018. Uninsurace rate reduced from 18.53% in 2010 to 11.49% in 2018, with two apparent reductions in 2014 and 2015. Percent of population over 65 increased from 15.94% in 2010 to 19.26% in 2018. The percentage of Hispanic population increased from 8.33% in 2010 to 9.63% in 2018. The percentage of poverty rate (under 138% in FPG) reduced gradually from 26.73% in 2010 to 23.53%.

### 1.6.2 Association between PCP Supply and Uninsurance Rate

A LMEM was fit to evaluate the association between uninsurance rate and PCP supply from 2010 to 2018. Table 1.3 reports the results. The results suggest that with 1% increase in county-level uninsurance rate (or 1% decrease in insurance rate), the PCP supply is expected to decrease by 18.88 per 100,000 population (95% CI: 7.45 to 30.33 per

100,000 population). In the same model, poverty rate, percent of population over 65, percent of population under 19, and percent of male are also statistically significant factors for PCP supplies.

### 1.6.3 Association between Specialty Physicians Supply & Uninsurance Rate

A LMEM was fit to evaluate the association between uninsurance rate and supply of each of the eight specialties (Anesthesiology, Cardiovascular Medicine, Emergency Medicine, OB/GYN, Orthopedic Surgery, Psychiatric, Radiology, and General Surgery) from 2010 to 2018 adjusting for poverty rate, percent of Black, percent of Hispanic, percent of people under 65, percent of people under 19, percent of male, and the calendar year). Table 1.4 reports the results. For Anesthesiology, with 1% increase in county-level uninsurance rate (or 1% decrease in insurance rate), the physician supply is expected to decrease by 5.46 per 100,000 population (95% CI: 1.22 to 9.69 per 100,000 population, p-value=0.012); for Cardiovascular medicine, with 1% increase in county-level uninsurance rate, the physician supply is expected to decrease by 5.63 per 100,000 population (95% CI: 3.77 to 7.89 per 100,000 population, p-value<0.001); for Emergency Medicine, with 1% increase in county-level uninsurance rate, the physician supply is expected to decrease by 6.22 per 100,000 population (95% CI: 0.38 to 12.08 per 100,000 population, p-value=0.037); for OB/GYN, with 1% increase in county-level uninsurance rate, the physician supply is expected to decrease by 8.83 per 100,000 population (95% CI: 5.16 to 12.49 per 100,000 population, p-value<0.001); for Orthopedic Surgery, with 1% increase in county-level uninsurance rate, the physician supply is expected to decrease by 8.11 per 100,000 population (95% CI: 4.70 to 11.51 per 100,000 population, p-value<0.001); for Psychiatric, with 1% increase in county-level uninsurance rate, the physician supply is expected to decrease by 10.62 per 100,000 population (95% CI: 6.89 to 14.35 per 100,000

population, p-value<0.001); for Radiology, with 1% increase in county-level uninsurance rate, the physician supply is expected to decrease by 5.67 per 100,000 population (95% CI: 1.61 to 9.72 per 100,000 population, p-value=0.006); finally, for General Surgery, with 1% increase in county-level uninsurance rate, the physician supply is expected to decrease by 11.68 per 100,000 population (95% CI: 6.62 to 16.74 per 100,000 population, p-value<0.001).

1.6.4 Comparison of change in physician supply between primary care and specialty physicians

Table 1.5(a) reports the total numbers of PCP from 2010 to 2018, and specialty physicians in 2010, 2015, and 2018. Table 1.5(b) summarizes the regression coefficients for the change in supplies of PCPs and eight specialty physicians as well as the percent change of them. Across all of the eight specialties (Anesthesiology, Cardiovascular Medicine, Emergency Medicine, OB/GYN, Orthopedic Surgery, Psychiatry, Radiology, and General Surgery), the percent change of were greater in all of the specialty physicians than in PCPs (12.17%, 25.07%, 16.23%, 22.94%, 31.38%, 28.05%, 15.83%, 30.95% for Anesthesiology, Cardiovascular Medicine, Emergency Medicine, OB/GYN, Orthopedic Surgery, Psychiatry, Radiology, and General Surgery, respectively, versus 7.90% for PCPs). The results show that the percent of decrease in specialty physicians were greater than the rate for PCPs.

1.6.5 Association between Total Physicians Supply and Uninsurance Rate

A LMEM was fit to evaluate the association between uninsurance rate and total physician supply (total non-federal M.D.s and D.O.s) from 2010 to 2018 among those over the age of 65, adjusting for poverty rate, percent of Black, percent of Hispanic, percent under the age of 19, and percent of male. Table 1.6 reports the results. The results suggest

that with 1% increase in county-level uninsurance rate (or 1% decrease in insurance rate), the total physician supply is expected to decrease by 28.94 per 100,000 population (95% CI: 14.14 to 43.41 per 100,000 population; p-value<0.001). In the same model, poverty rate, percent of Black, percent of population under 19, and percent of male are also statistically significant factors (all p-values < 0.001) for physician supplies.

## 1.7 DISCUSSION

In this study, a significant association is found between physician supply and uninsurance rate among 3,142 counties in the 50 U.S. states. For primary care physicians, there is a reduction in 18.88 PCPs per 100,000 population with 1% increase in uninsurance rate. For specialty physician, there numbers range from 5.46 to 11.68 per 100,000 population. A significant association was found between county-level total physician supplies (approximated by the total M.D.s and D.O.s in the county) and the county-level uninsurance rate. In terms of the percent change of physicians, all specialty physicians had much greater declines (between 12.17% and 31.38% declines) than that for PCPs (7.9% decline) from 2010 to 2018. With 1% increase in county-level uninsurance rate, the total physician supply is expected to decrease by 28.94 per 100,000 population.

It has been reported that many factors may impact the geographic location of physicians (Carpenter & Neun,1999; Chou & Lo, 2009). For example, Carpenter and colleagues found that the cost of living, low crime rates, and excessive taxes were important factors that impacted physicians' location decision. While Chou and Lo reported that financial interests such as high-cost malpractice insurance premiums and maximum caps were also drivers of physicians, particularly for surgeons.

The study results indicate that as another factor, the availability of providers increases as uninsurance decreases within the community. This finding has implications

for the insured population amongst the uninsured as the number of professional providers decrease in areas that have a high uninsured population. The impact is more evident when comparing the specialty providers to the primary care PCP's, with a greater decrease in availability and in some cases doubling the percentage decrease for certain specialties.

This finding is consistent with other similar studies that investigated physician location decisions. Personal family related considerations (Carpenter & Neun, 1999), in conjunction with lifestyle and spousal influences are determinants when selecting a practice location. (Kazanjian & Pagliccia, 1996). However, financial considerations may also be part of the decision such as high-cost malpractice insurance premiums associated with a particular area and maximum caps, which were found in a prior study to be factors particularly for surgeons in determining a geographic location. (Chou & Lo Sasso, 2009). Additionally, the personal level of student debt was identified as a concern and that subsidies for practicing in more rural or shortage areas may not offer sufficient financial incentives to motivate newly graduated providers to select a compromised community. (Chou & Lo Sasso, 2009). An important factor in selecting a practice location is the strength of the medical community. As cited in previous studies, co-locating with other professionals and hospital systems is part of the decision process. (Kazanjian & Pagliccia, 1996). This is of particular interest to those in more rural settings that may not have the level of professional support found in more urban areas. (Kazanjian & Pagliccia, 1996).

With the added expense of credentialing at local hospitals and acquiring new patient rosters, an established professional provider generally does not pursue relocation because of the costs involved to build a practice. (Chou & Lo Sasso, 2009) Prior studies have suggested that offering compensation incentives will not necessarily increase the likelihood of providers willing to move. (Carpenter & Neun,1999)

The study by Wright (2010) specifically analyzed the loss of income and the opportunity cost of providing uncompensated care. Another study suggests similar findings and that there is a strong measure of physician self-interest in maintaining an income level to support their practice. These consistent findings are factors facing future healthcare policy development. (Jacobson & Jazowski, 2011; Cunningham & Hadley, 2008). The premises are that providers gravitate toward a profit motive which compels them to locate in geographic areas with higher percentages of insured individuals. (Santerre, & Neun, 2000) This factor influences those providing healthcare services to be situated where practices can thrive. (Santerre & Neun, 2000)

It has been suggested in prior research that those that salaried physicians will more often offer services to the uninsured. (Wright, 2010). A recent study conducted by the American Medical Association (AMA) specific to physician compensation found that slightly more than half of the physicians in the U.S. are paid a portion of their compensated amount based on salary however this portion can vary based upon the type of practice, ownership and medical specialty. Personal productivity can be an important component in compensation, especially for physician practice owners. Single and multi-specialty practices are more likely compensated based on personal productivity than physicians in other practice types. As an example, physicians employed by hospital emergency departments and faculty physicians in medical schools were mostly paid on a salary. However, the greater portion of physician compensation methodologies included a mix of factors such as salary, personal productivity, overall practice financial performance, and bonuses. As documented in a recent study, only nineteen percent (19%) of surveyed physicians were compensated solely based on salary and similarly about the same percentage reported their compensation based only on productivity. Psychiatry as a

specialty had the largest percentage of physicians paid solely via a salary at forty-one percent (41%) compared to surgical subspecialties reporting twelve percent (12%). (Rama, 2018)

For those physicians relying more heavily on personal productivity and practice financial performance, a recent study published by CMS in 2015 found that physician revenues were made up of primarily private insurance (34%), Medicare (22%), Medicaid (17%) with other insurance programs and third-party payers such as workers compensation, legal settlements, at fifteen percent (15%) and Self Pay representing twelve percent (12%). The self-pay portion includes those physicians that practice under a growing category called "concierge "medicine accepting only private pay and no governmental or private insurance to obtain a higher level of reimbursement. As duly noted, these are revenue sources for services provided as compensated care (CMS, 2015) and does not reference unreimbursed care.

Our results showed that orthopedic surgery and general surgery are the two areas of specialty that were most sensitive to the uninsurance rate (-31.38% and -30.95% change, respectively). There are also the two subspecialties (surgical subspecialties and general surgery) in which physicians are least dependent on salaries (12.0% and 15.8%, respectively). (Rama, 2018). Since the county-level uninsurance rate could have much higher impact on physicians compensated by productivity and financial performance than on physicians compensated only by salary, this could partially explain the physicians' sensitivity to geographical location based on the uninsurance rate. Meanwhile, Pediatrics, Internal Medicine, and Family Practice were among the areas with relatively larger proportion of salary-based physicians (22.0%, 20.4%, and 18.0%). The physicians in these three areas were considered as primary care physicians in our study. Our results indicated

that percent change of PCPs with 1% increase in uninsurance rate over the same period is only -7.90 %.

Nationwide, across urban and rural communities, all geographic areas and amongst the various physician specialties, physicians providing charity care has decreased from 76.3% in 1996 to 68.2% in 2005. (Wright, 2010). Safety net providers such as hospital emergency departments and Federally Qualified Health Centers (FQHC) tend to support the community through offering care to those that are unable to obtain appointments or afford the self-pay visit fee charge. (Sabik & Gandhi, 2013). The burden placed on safety-net institutions may not have the capacity to serve all those in need of timely care and although not encouraged to do so, the uninsured may attempt to seek care at private physician practices as a means to absorb the overload.

Wright (2010) claimed that although physicians are motivated by a variety of factors, the bottom line is that financial concerns are an important consideration in a profession where time represents money. These authors found that he association between physician's hourly wage and the provision of charity care is more likely for salaried physicians and less likely for nonsalaried physicians. In other words, it is less probable that nonsalaried physicians (or physicians compensated based on their productivity and financial performance) would perform charity care services. General Surgery and Orthopedic Surgery were among the subspecialties with large proportion of non-salary physicians (Rama 2018), this further supported our finding that Orthopedic Surgery and General Surgery were most sensitive to the uninsurance rate among physicians I considered in this study.

And the negative impacts of high levels of uninsurance on the insured population has been well documented (Pauly & Pagan, 2007; Pagán, & Pauly, 2006). According to

researchers focused on this subject, the insured population in communities with a significant number of individuals with no insurance or are underinsured experience similar access issues. Prior studies have shown that providers in these areas may reduce services, increase fees or choose to establish a practice in a more lucrative location (Pagán & Pauly, 2006). Problems associated with accessing healthcare translate into unmet needs and a higher likelihood of poorer health outcomes, regardless of insurance status.

Past research has shown that the demand for medical services is dependent upon insurance coverage and healthcare providers are under stress to adapt and flex to meet changing needs within a community in response to greater or lesser insured rates. Previously it has been suggested that within recent higher insured communities, primary care physicians and outpatient medical facilities adjust their business models to accommodate the change in payer mix which may, in turn, affect ED utilization (Richards et al., 2016)

Uninsurance and underinsurance generally translate into uncompensated care for hospitals or professional/physician providers. Although the uninsured are fewer in number than in the years before ACA, the trend is changing, and various agencies and current studies are reporting increasing numbers.(Kaiser, 2018) There are trend differences in those states that expanded Medicaid compared to those states that did not expand eligibility to 138% of FPG (Kaiser, 2018) Using Medicare Hospital Cost Reports and other hospital financial data, studies have shown that the ACA had a positive effect reducing the uncompensated care figures for most providers in expanded states.

However, previous studies have concluded that declines in charity care were observed across most major specialties, practice types, practice income levels, and

geographic regions (Cunningham et al., 1999; Cunningham & May, 2008; Isaacs & Jellinek, 2007; Mackinney, 2013)

In recent years, professional providers have engaged in vertical integration with hospitals and healthcare systems and become paid employees who could impact their practice patterns. These employers, some of whom may be for-profit entities seeking positive bottom line financial outcomes, may heavily influence or even dictate practice placement and other decisions previously determined by the individual practicing physician. The increased use of telemedicine and other automated enhancements such as electronic medical records (EMR) could potentially be unknown confounders in the analysis since the actual physical location of the provider may become less critical in measuring access to healthcare.

The implications are relevant to current policy debates arguing for more obtainable health care coverage to reduce community uninsurance, thus improving accessibility to health care for the insured population.

### 1.7.1 Limitations

As with any study, it is essential to note the limitations. Multivariable linear mixed effects regression models are being used to determine the relative influence of one or more independent variables on the dependent variable with repeated measurements. The models may be sensitive to outliers and abnormalities. Other limitations include the possibility that some unmeasured variables or characteristics could explain differences in the outcome. In recent years, professional providers have engaged in vertical integration with hospitals and healthcare systems and become paid employees who could impact their practice patterns.

Another limitation lies on the nature of the study. This is an ecological study that used county-level data. Hence, the conclusions I obtained from this research cannot be extended and interpreted on patients' individual level.

Disadvantages or weaknesses can occur in the data being used, although the best available data sets were selected for these studies. Incomplete or inaccurate data is a potential threat in any of the sources; however, care is being taken to minimize this threat to validity. The U.S. Census Bureau produces the SAHIE data that match the source data at the national level while attaining more detail at the state and local levels. SAHIE was selected for these studies because it is the only source of single-year health insurance coverage data for all counties, i.e., estimates based on one calendar year of data. SAHIE is a model-based estimates program that combines survey estimates with auxiliary information, including administrative records and census data, to create more accurate single-year estimates of the population uninsured by race/Hispanic origin (state level only), age, sex, and income for every state and county in the U.S.

The U.S. Census Bureau data sources such as SAHIE use estimates that are based on responses from a sample of the population and may differ from actual values because of sampling and non-sampling error. Estimates of sampling error are provided; however, estimates of non-sampling error cannot be determined. (U.S. Census Bureau) SAHIE contains errors stemming from model error, sampling error, and non-sampling error, although confidence intervals (CI) are provided to indicate the reliability of the estimates. (U.S. Census Bureau) Subject to the validity of the underlying model assumptions, these reflect uncertainty due to the effects of model error and sampling error but do not account for the effects of non-sampling error. (Dalzell, 2015)

The data sources continue to evolve with the implementation of the ACA, and the U.S. Census Bureau has made some changes to the data sources, including SAHIE, to reflect the implementation. (Thompson, 2014; Brault, 2014). Beginning with the 2014 survey, the health insurance questions were redesigned to include questions on health insurance exchanges, however in previous studies, these variations were not distinguished. (Thompson, 2014; Brault, 2014). Therefore, discrepancies may exist in the SAHIE data across our study years, which may lead to certain biasness of the results.

The professional data was obtained from the Area Health Resource File (AHRF), which is a publicly available dataset that aggregates data from disparate data sources. It contains county-level and state-level data on healthcare workers and other demographic and health-related variables. Some variables are based on data from the American Dental Association (ADA), the American Hospital Association (AHA), and the American Medical Association (AMA). The AHRF has some recognized limitations. The years for which data are available differ across the variables, which may limit provider related longitudinal research. Data on physician variables are available on an annual basis, but data on some other health professions and many socio-demographic variables are available on only a decennial basis because they are obtained from the U.S. Census. Additionally, professional data is obtained from the AMA Masterfile containing the physician workforce files. Prior research studies have analyzed data on physicians collected by state licensing boards that have found significant discrepancies between the numbers of physicians reported by licensing boards and the AMA. The AMA data may be less accurate than licensing board data because physicians have a stronger incentive to update their licensure records than to fill out AMA surveys. Also, the numbers of physicians in each county are determined based on physicians' preferred mailing addresses, which are not necessarily their practice

addresses. (Society of General Internal Medicine, n.d.) This may impact the county-level physicians supply in each county among those physicians who practice cross counties.

## 1.8 CONCLUSION

This study found that county-level physician supply was significantly impacted by the uninsurance rate of the location, and specialty care physicians are more sensitive to the uninsurance rate than primary care physicians. Among the eight subspecialties I investigated, General Surgery and Orthopedic Surgery were the most sensitive ones. These conclusions were consistent with multiple published studies concluding that professional providers are attracted to counties where the demand for their services is sufficient to support their practice along with economic and personal amenity considerations. (Carpenter & Neun, 1999) This may also imply that the insured population is impacted by uninsurance in their community through a reduction in the number of available providers in their community. Insured individuals share a benefit of community-wide insurance with not only more PCP's but also availability of specialists in Orthopedic Surgery, General Surgery, Psychiatry and Cardiovascular Medicine.

The suggestion to state-level or local policy makers is to improve the community insured rate benefiting the community as a whole and consider the inclusion of more generous compensation methodologies to attract essential professional providers.

REFERENCES

Aboagye, J. K., Kaiser, H. E., & Hayanga, A. J. (2014). Rural-Urban Differences in Access to Specialist Providers of Colorectal Cancer Care in the United States: A Physician WorkforceIssue.*JAMAsurgery*,*149*(6),537–543. https://doi.org/10.1001/jamasurg.2013.5062

AHA American Hospital Association Uncompensated Care Fact Sheet (2017) https://www.aha.org/system/files/2018-01/2017-uncompensated-care-factsheet.pdf

AHRQ Agency for Healthcare Research and Quality; Overview of Quality and Access in the U.S. Health Care System. Content last reviewed (2018 June), Rockville, MD. https://www.ahrq.gov/research/findings/nhqrdr/nhqdr16/overview.html

AHA American Hospital Association (2017, December) https://www.aha.org/system/files/2018-01/2017-uncompensated-care-factsheet.pdf

American Medical Association, Code of Medical Ethics (2001) https://www.ama-assn.org/delivering-care/ethics/code-medical-ethics-overview

Anderson, G. F., Hussey, P., & Petrosyan, V. (2019). It's Still The Prices, Stupid: Why The US Spends So Much On Health Care, And A Tribute To Uwe Reinhardt. *Health affairs (Project Hope)*, *38*(1), 87–95. https://doi.org/10.1377/hlthaff.2018.05144

Arrow K. J. (2004). Uncertainty and the welfare economics of medical care. 1963. *Bulletin of the World Health Organization*, *82*(2), 141–149.

Ayanian J.Z, Weissman JS, Schneider EC, Ginsburg JA, Zaslavsky AM. (2000) Unmet health needs of uninsured adults in the United States. *JAMA* ;284:2061–9.

Barkholz D. Moving patient payment upfront. (2016, May 23). *Modern Healthcare*, *46*(21), 0022.

Berchick, E.R., Barnett J.C., Upton R.D. (2019) Current Population Reports, P60-267(RV), Health Insurance Coverage in the United States: 2018, U.S. Government Printing Office,WashDC,https://www.census.gov/content/dam/Census/library/publications/2019/demo/p60-267.pdf.

Blumenthal, D., & Rizzo, J. A. (1991). Who cares for uninsured persons? A study of physicians and their patients who lack health insurance. *Medical care*, *29*(6), 502–520.

Bradley, E. H., Sipsma, H., & Taylor, L. A. (2017). American health care paradox-high spending on health care and poor health. *QJM : monthly journal of the Association of Physicians*, *110*(2), 61–65. https://doi.org/10.1093/qjmed/hcw187

Brault, M., Medalia C, O'Hara B, Rodean J, Steinweg A, (2014 Feb.3) Changing the CPS Health Insurance Questions and the implications on the uninsured rate: redesign and production estimates. Proceedings of the 2013 Federal Committee on Statistical Methodology (FCSM) Research Conference presented on November 6, 2013; PaperupdatedFeb.3,2014https://nces.ed.gov/FCSM/pdf/H3_OHara_2013FCSM_AC.pdf

Brook, R. H., Keeler E.B., Lohr, K.N. Newhouse J.P., Ware J.E., Rogers W.H., Davies A.R., Sherbourne, C.D. Goldberg G.A., Camp P., Kamberg C., Leibowitz A., Keesey J Reboussin D., (2006) The Health Insurance Experiment: A Classic RAND

Study Speaks to the Current Health Care Reform Debate. Santa Monica, CA: *RAND Corporation*

Candon, M., Zuckerman, S., Wissoker, D., Saloner, B., Kenney, G. M., Rhodes, K., & Polsky, D. (2018). Declining Medicaid Fees and Primary Care Appointment Availability for New Medicaid Patients. *JAMA internal medicine, 178*(1), 145–146. doi:10.1001/jamainternmed.2017.6302

Carpenter,B. & Neun S, (1999), An analysis of the location decision of young primary care physicians, *Atlantic Economic Journal*, 27, issue 2, p. 135-149.

Castaneda M.A. Saygili M., (2016). The health conditions and the health care consumption of the uninsured, *Health Economics Review*

CBO Congressional Budget Office; Repealing the Individual Health Insurance Mandate; An Updated Estimate (2017) https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/53300-individualmandate.pdf An Update to the Budget and Economic Outlook: 2017 to 2027 (June 2017), www.cbo.gov/publication/52801. For additional information about the baseline presented in that report, see Federal Subsidies for Health Insurance Coverage for People Under Age 65: 2017 to 2027 (September 2017), www.cbo.gov/publication/53091.

Chou, C. F., & Lo Sasso, A. T. (2009). Practice location choice by new physicians: the importance of malpractice premiums, damage caps, and health professional shortage area designation. *Health services research*, *44*(4), 1271–1289. https://doi.org/10.1111/j.1475-6773.2009.00976.x

Christopher, A. S., McCormick, D., Woolhandler, S., Himmelstein, D. U., Bor, D. H., & Wilper, A. P. (2016). Access to Care and Chronic Disease Outcomes Among Medicaid-Insured Persons Versus the Uninsured. *American journal of public health*, *106*(1), 63-9.

CMS Centers for Medicare and Medicaid Services (2015, December) https://www.cms.gov/newsroom/press-releases/cms-releases-2014-national-health-expenditures

CMS Centers for Medicare and Medicaid Services (2019, September) https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/Improving-Access-to-Maternal-Health-Care-in-Rural-Communities-An-Issue-Brief.

Cohen R, & Martinez M. (2015, Aug) *Health Insurance Coverage: Early Release of Estimates from the National Health Interview Survey, January-March 2015:* US Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Health Statistics.

Cohen, R. A., & Zammitti, E. P. (2018). High-deductible Health Plan Enrollment Among Adults Aged 18-64 With Employment-based Insurance Coverage. *NCHS data brief*, (317), 1–8.

Collins S. R.Gunja M.Z. , Doty M.M. , Bhupal H.K., (2018) *First Look at Health Insurance Coverage in 2018 Finds ACA Gains Beginning to Reverse*: Findings from the Commonwealth Fund Affordable Care Act Tracking Survey, Feb.–Mar., *To the Point* (blog), Commonwealth Fund, May.

Collins S. R., Gunja M.Z., Doty M.M, Beutel S., (2016) *Who are remaining uninsured and why haven't they signed coverage* (brief), Findings from the Affordable Care Act Tracking Survey, February-April 2016; Commonwealth Fund, August

Collins SR, Rasmussen PW, Doty MM, Beutel S. (2015) *The Rise in Health Care Coverage and Affordability Since Health Reform Took Effect:* The Commonwealth Fund; January

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

Cunningham, P. J., Grossman, J. M., St Peter, R. F., & Lesser, C. S. (1999). Managed care and physicians' provision of charity care. *JAMA*, *281*(12), 1087–1092. https://doi.org/10.1001/jama.281.12.1087

Cunningham, P. J., & Hadley, J. (2008). Effects of changes in incomes and practice circumstances on physicians' decisions to treat charity and Medicaid patients. *The Milbank quarterly*, *86*(1), 91–123. https://doi.org/10.1111/j.1468-0009.2007.00514.x

Cunningham, P. J., & May, J. H. (2006). A growing hole in the safety net: physician charity care declines again. *Tracking report*, (13), 1–4.

Dalzell, L. P., Tangka, F. K., Powers, D. S., O'Hara, B. J., Holmes, W., Joseph, K., & Royalty, J. (2015). Data sources for identifying low-income, uninsured populations: application to public health-National Breast and Cervical Cancer Early Detection Program.*Cancercauses&control:CCC*,*26*(5),699–709. https://doi.org/10.1007/s10552-015-0571-y

DeVoe, J. E., Angier, H., Burdick, T., & Gold, R. (2014). Health information technology: an untapped resource to help keep patients insured. Annals of Family Medicine, *12*(6), 568-72.

Dranove, D., Garthwaite, C., & Ody, C. (2016). Uncompensated Care Decreased At Hospitals In Medicaid Expansion States But Not At Hospitals In Nonexpansion States. *Health affairs (Project Hope)*, *35*(8), 1471–1479. https://doi.org/10.1377/hlthaff.2015.1344

Dwyer-Lindgren, L., Bertozzi-Villa, A., Stubbs, R. W., Morozoff, C., Mackenbach, J. P., van Lenthe, F. J., Mokdad, A. H., & Murray, C. (2017). Inequalities in Life Expectancy Among US Counties, 1980 to 2014: Temporal Trends and Key Drivers. *JAMAinternalmedicine*,*177*(7),1003–1011. https://doi.org/10.1001/jamainternmed.2017.0918

Emanuel E.J, Glickman A, Johnson D. (2017) Measuring the Burden of Health Care Costs on US Families: The Affordability Index. *JAMA.*;318(19):1863–1864.

Frakt A. B. (2011). How much do hospitals cost shift? A review of the evidence. *The Milbankquarterly*,*89*(1),90–130.https://doi.org/10.1111/j.14680009.2011.00621.x

GAO Government Accountability Office (2018 August); Rural Hospital Closures; Numbers and Characteristics of Affected Hospitals and Contributing Factors; https://www.gao.gov/assets/gao-18-634.pdf

Germack, H. D., Kandrack, R., & Martsolf, G. R. (2019). When rural hospitals close, the physician workforce goes. *Health Affairs*, *38*(12), 2086-2094.

Gresenz, C. R., & Escarce, J. J. (2011). Spillover effects of community uninsurance on working-age adults and seniors: an instrumental variables analysis. *Medical Care*, *49*(9), e14–e21.

Hadley J., (2007) Insurance Coverage, Medical Care Use, and Short-term Health Changes Following an Unintentional Injury or the Onset of a Chronic Condition. *JAMA* 297, no. 10 March:1073-84.26

Hadley J.& Feder F. (1985) Hospital Cost Shifting and Care for the Uninsured; *Health Aff* 4:3, 67-80

Hadley, J., & Holahan, J. (2003). How much medical care do the uninsured use, and who pays for it?. *Health affairs (Project Hope)*, *Suppl Web Exclusives*, W3–81. https://doi.org/10.1377/hlthaff.w3.66

Hadley, J., Steinberg, E. P., & Feder, J. (1991). Comparison of uninsured and privately insured hospital patients. Condition on admission, resource use, and outcome. *JAMA*, *265*(3), 374–379.

Hafner-Eaton C. (1993). Physician utilization disparities between the uninsured and insured. Comparisons of the chronically ill, acutely ill, and well nonelderly populations. *JAMA*, *269*(6), 787–792.

Hardeman, R. R., Garcia, C., & Pagan, J. A. (2012). Where Would You Rather Live If You Were Insured? Assessing Community Uninsurance Spillover Effects on the Insured. *Journal of Immigrant and Minority Health*, (4), 706.

Hart GL, Pirani MJ, Rosenblatt RA. (1994) Most rural towns lost physicians after their hospitals closed. *Rural Development Perspectives*;10(1):17-21

HIAA Health Insurance Association of America, (1982) Hospital Cost Shifting: The Hidden Tax (Washington, D.C)

[1]Himmelstein D.U. et al.., (2005): Illness and Injury as Contributors to Bankruptcy, *Health Affairs* 24 w 63–w73 (published online 2 February 2005;

[2]Himmelstein DU, Thorne D, Warren E, Woolhandler S. (2009) Medical bankruptcy in the United States, 2007: results of a national study. *Am J Med*; 122:741–6.

Hing, E., & Hsiao, C. J. (2014). State variability in supply of office-based primary care providers: United States, 2012. *NCHS data brief*, (151), 1–8.

HRSA Health Resources and Services Administration (2017, October 19) Hospital Closings Likely to Increase; https://www.hrsa.gov/enews/past-issues/2017/october-19/hospitals-closing-increase.html

Iglehart J. K. (2018). The Challenging Quest to Improve Rural Health Care. *The New Englandjournalofmedicine*,*378*(5),473–479. https://doi.org/10.1056/NEJMhpr1707176

Institute of Medicine IOM (US) Committee on the Consequences of Uninsurance. (2003). *A Shared Destiny: Community Effects of Uninsurance*. National Academies Press (US).

Institute of Medicine IOM (US) National Cancer Policy Forum. (2009). *Ensuring Quality Cancer Care through the Oncology Workforce: Sustaining Care in the 21st Century*. National Academies Press (US).

Isaacs, S. L., & Jellinek, P. (2007). Is there a (volunteer) doctor in the house? Free clinics and volunteer physician referral networks in the United States. *Health affairs (Project Hope)*, *26*(3), 871–876. https://doi.org/10.1377/hlthaff.26.3.871

Jacobson, P. D., & Jazowski, S. A. (2011). Physicians, the Affordable Care Act, and primary care: disruptive change or business as usual? *Journal of general internal medicine*, *26*(8), 934–937. https://doi.org/10.1007/s11606-011-1695-8

Kaufman, B. G., Reiter, K. L., Pink, G. H., & Holmes, G. M. (2016). Medicaid Expansion Affects Rural And Urban Hospitals Differently. *Health affairs (Project Hope)*, *35*(9), 1665–1672. https://doi.org/10.1377/hlthaff.2016.0357

Kaufman, B. G., Thomas, S. R., Randolph, R. K., Perry, J. R., Thompson, K. W., Holmes, G. M., & Pink, G. H. (2016). The Rising Rate of Rural Hospital Closures. *The Journal of rural health: official journal of the American Rural Health Association and the National Rural Health Care Association*, *32*(1), 35–43. https://doi.org/10.1111/jrh.12128

Kaufman, H. W., Chen, Z., Fonseca, V. A., & McPhaul, M. J. (2015). Surge in newly identified diabetes among medicaid patients in 2014 within medicaid expansion

States under the affordable care act. *Diabetes care*, *38*(5), 833–837. https://doi.org/10.2337/dc14-233

Kazanjian, A., & Pagliccia, N. (1996). Key factors in physicians' choice of practicelocation: findings from a survey of practitioners and their spouses.*Health &Place*, 2(1), 27–34

Keehan, S. P., Stone, D. A., Poisal, J. A., Cuckler, G. A., Sisko, A. M., Smith, S. D., . . . Lizonitz, J. M. (2017). *Health Affairs*, 36, 553-563. National health expenditure projections, 2016–25: Price increases, aging push sector to 20 percent of economy. doi:10.1377/hlthaff.2016.1627

Khatana, S., Bhatla, A., Nathan, A. S., Giri, J., Shen, C., Kazi, D. S., Yeh, R. W., & Groeneveld, P. W. (2019). Association of Medicaid Expansion With Cardiovascular Mortality. *JAMA cardiology*, *4*(7), 671–679. https://doi.org/10.1001/jamacardio.2019.1651

Khullar D, Song Z, Chokshi DA. Safety-net health systems at risk: who bears the burden of uncompensated care? Health Affairs Blog. https://www.healthaffairs.org/do/10.1377/hblog20180503.138516/full/ Posted May 10, 2018. Accessed May 12, 2020.

Kirby, J. B., & Cohen, J. W. (2018). Do People with Health Insurance Coverage Who Live in Areas with High Uninsurance Rates Pay More for Emergency Department Visits? *Health Services Research*, (2), 768. https://doi-org.ezproxy.fiu.edu/10.1111/1475-6773.12659

Kominski, G. F., Nonzee, N. J., & Sorensen, A. (2017). The Affordable Care Act's Impacts on Access to Insurance and Health Care for Low-Income Populations. *Annual review of public health*, *38*, 489–505. doi:10.1146/annurev-publhealth-031816-044555

[1]Levy H, Meltzer D. (2004) What Do We Really Know about Whether Health Insurance Affects Health? In: McLaughlin CG, editor. Health Policy and the Uninsured. Washington, D.C.: Urban Institute Press; pp. 179–204.

[2]Levy H**,** Meltzer D**.** The impact of health insurance on health. (2008), *Annu. Rev. Public Health* 29:399–409

Lindrooth, R. C., Perraillon, M. C., Hardy, R. Y., & Tung, G. J. (2018). Understanding The Relationship Between Medicaid Expansions And Hospital Closures. *Health affairs (Project Hope)*, *37*(1), 111–120. https://doi.org/10.1377/hlthaff.2017.0976

Mackinney, T., Visotcky, A. M., Tarima, S., & Whittle, J. (2013). Does providing care for uninsured patients decrease emergency room visits and hospitalizations? *Journal of primary care & community health*, *4*(2), 135–142. https://doi.org/10.1177/2150131913478981

McCarthy, M. L., Hirshon, J. M., Ruggles, R. L., Docimo, A. B., Welinsky, M., & Bessman, E. S. (2002). Referral of medically uninsured emergency department patients to primary care. *Academic emergency medicine: official journal of the Society for Academic Emergency Medicine*, *9*(6), 639–642. https://doi.org/10.1111/j.1553-2712.2002.tb02305.x

McMorrow S. (2013). Spillover effects of the uninsured: local uninsurance rates and Medicare mortality from eight procedures and conditions. *Inquiry : a journal of medical care organization, provision and financing*, *50*(1), 57–70. https://doi.org/10.5034/inquiryjrnl_50.01.02

McMorrow, S., Kenney, G. M., & Goin, D. (2014). Determinants of receipt of recommended preventive services: implications for the Affordable Care Act. *American journal of public health*, *104*(12), 2392–2399. https://doi.org/10.2105/AJPH.2013.301569

McWilliams J. M. (2009). Health consequences of uninsurance among adults in the United States: recent evidence and implications. *The Milbank quarterly*, *87*(2), 443–494. doi:10.1111/j.1468-0009.2009.00564.

Medford-Davis, L. N., Lin, F., Greenstein, A., & Rhodes, K. V. (2017). "I Broke My Ankle": Access to Orthopedic Follow-up Care by Insurance Status. *Academic emergency medicine : official journal of the Society for Academic Emergency Medicine*, *24*(1), 98–105. https://doi.org/10.1111/acem.13058

Melnick G, Fonkych K. (2013). Fair pricing law prompts most California hospitals to adopt policies to protect uninsured patients from high charges. *Health Aff (Millwood)*; 32:1101–8.

Steven T. Miller: the IRS perspective on charity care. (2007). *Healthcare Financial Management*, *1*, 28.

Mort, E. A., Edwards, J. N., Emmons, D. W., Convery, K., & Blumenthal, D. (1996). Physician response to patient insurance status in ambulatory care clinical decision-making. Implications for quality of care. *Medical care*, *34*(8), 783–797. https://doi.org/10.1097/00005650-199608000-00006

Newman D, Parente S.T, Barrette E, Kennedy K. (2016). Prices For common medical services vary substantially among the commercially insured. *Health Aff (Millwood)*; 35:923–7.

Nikpay, S., Buchmueller, T., & Levy, H. G. (2016). Affordable Care Act Medicaid Expansion Reduced Uninsured Hospital Stays In 2014. *Health Affairs (Project Hope)*, *35*(1), 106–110. https://doi-org.ezproxy.fiu.edu/10.1377/hlthaff.2015.1144

Nguyen, K. H., & Sommers, B. D. (2016). Access and Quality of Care by Insurance Type for Low-Income Adults Before the Affordable Care Act. *American journal of public health*, *106*(8), 1409-15.

Obama B. (2016). United States Health Care Reform: Progress to Date and Next Steps. *JAMA*, *316*(5), 525–532. doi:10.1001/jama.2016.9797

O'Toole, T. P., Simms, P. M., & Dixon, B. W. (2001). Primary care office policies regarding care of uninsured adult patients. *Journal of general internal medicine*, *16*(10), 693–696. doi:10.1111/j.1525-1497.2001.00920.

Pagán, J. A., & Pauly, M. V. (2006). Community-level uninsurance and the unmet medical needs of insured and uninsured adults. *Health services research*, *41*(3 Pt 1), 788–803. https://doi.org/10.1111/j.1475-6773.2006.00506.x

Papanicolas, I., Woskie, L. R., & Jha, A. K. (2018). Health Care Spending in the United States and Other High-Income Countries. *JAMA*, *319*(10), 1024–1039. https://doi.org/10.1001/jama.2018.1150

Patrick, D. L., Madden, C. W., Diehr, P., Martin, D. P., Cheadle, A., & Skillman, S. M. (1992). Health status and use of services among families with and without health insurance. *Medical care*, *30*(10), 941–949. https://doi.org/10.1097/00005650-199210000-00006

Patterson, B. M., Draeger, R. W., Olsson, E. C., Spang, J. T., Lin, F. C., & Kamath, G. V. (2014). A regional assessment of medicaid access to outpatient orthopaedic care: the influence of population density and proximity to academic medical centers on patient access. *The Journal of bone and joint surgery. American volume*, *96*(18), e156. https://doi.org/10.2106/JBJS.M.01188

Pauly, M. V., & Pagán, J. A. (2007). Spillovers and vulnerability: the case of community uninsurance. *Health affairs (Project Hope)*, *26*(5), 1304–1314. https://doi.org/10.1377/hlthaff.26.5.1304

Polsky, D., Richards, M., Basseyn, S., Wissoker, D., Kenney, G. M., Zuckerman, S., & Rhodes, K. V. (2015). Appointment availability after increases in Medicaid payments for primary care. *The New England journal of medicine*, *372*(6), 537–545. https://doi.org/10.1056/NEJMsa1413299

Rama, A., (2018, April) How are Physicians Paid? A detailed look at the methods used to compensate physicians in different practice types and specialties. *AMA Policy ResearchPerspectives*;https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/member/health-policy/prp-how-physicians-paid.pdf

Rhodes, K. V., Bisgaier, J., Lawson, C. C., Soglin, D., Krug, S., & Van Haitsma, M. (2013). "Patients who can't get an appointment go to the ER": access to specialty care for publicly insured children. *Annals of emergency medicine*, *61*(4), 394–403. https://doi.org/10.1016/j.annemergmed.2012.10.030

Rhodes, K. V., Kenney, G. M., Friedman, A. B., Saloner, B., Lawson, C. C., Chearo, D., Wissoker, D., & Polsky, D. (2014). Primary care access for new patients on the eve

of health care reform. *JAMA internal medicine*, *174*(6), 861–869. https://doi.org/10.1001/jamainternmed.2014.20

Richards MR, Nikpay SS, Graves JA. (2016). The Growing Integration of Physician Practices: With a Medicaid Side Effect. *Medical Care.* Jul;54(7):714-718. DOI: 10.1097/mlr.0000000000000546.

Sabik L. M. (2012). The effect of community uninsurance rates on access to health care. *Health services research*, *47*(3 Pt 1), 897–918. https://doi.org/10.1111/j.1475-6773.2011.01364.x

Sabik, L. M., & Gandhi, S. O. (2013). Impact of changes in Medicaid coverage on physician provision of safety net care. *Medical care*, *51*(11), 978–984. https://doi.org/10.1097/MLR.0b013e3182a50305

Saloner, B., Polsky, D., Kenney, G. M., Hempstead, K., & Rhodes, K. V. (2015). Most Uninsured Adults Could Schedule Primary Care Appointments Before The ACA, But Average Price Was $160. *Health affairs (Project Hope)*, *34*(5), 773–780. https://doi.org/10.1377/hlthaff.2014.1258

Saloner, B., Hempstead, K., Rhodes, K., Polsky, D., Pan, C., & Kenney, G. M. (2018). Most primary care physicians provide appointments, but affordability remains a barrier for the uninsured. *Health Affairs*, *37*(4), 627 – 634:

Santerre, R. E., & Neun, S. P. (2000). *Health economics: Theories, insights, and industry studies*. Fort Worth, TX: Dryden Press.

Shi, L. (2012). The impact of primary care: a focused review. *Scientifica*, 432892. https://doi.org/10.6064/2012/432892

Smith, D. A., Akira, A., Hudson, K., Hudson, A., Hudson, M., Mitchell, M., & Crook, E. (2017). The effect of health insurance coverage and the doctor-patient relationship on health care utilization in high poverty neighborhoods. *Preventive medicine reports*, *7*, 158–161. https://doi.org/10.1016/j.pmedr.2017.06.002

Society of General Internal Medicine. (n.d.) Area Health Resource Files AHRF https://www.sgim.org/communities/research/dataset-compendium/area-health-resource-files-ahrf

Thompson JH. (2014, April 15) Statement by Census Bureau Director John H. Thompson on Improved Health Insurance Questions in the current population survey. https://www.census.gov/newsroom/press-releases/2014/cb14-67.html

Timmermans, S., Orrico, L. A., & Smith, J. (2014). Spillover effects of an uninsured population. *Journal of health and social behavior*, *55*(3), 360–374. https://doi.org/10.1177/0022146514543523

Tolbert J., Orgera K. Singer N., & Damico A. (2019, December). Key Facts about the Uninsured Population http://files.kff.org/attachment//fact-sheet-key-facts-about-the-uninsured-population

Vaughan, A. S., Rosenberg, E., Shouse, R. L., & Sullivan, P. S. (2014). Connecting race and place: a county-level analysis of White, Black, and Hispanic HIV prevalence, poverty, and level of urbanization. *American journal of public health*, *104*(7), e77–e84. https://doi.org/10.2105/AJPH.2014.301997

Walker M. (2013). Cost Comparison of Treating Uninsured Patients at a Hospital Based Free Clinic, Emergency Room and Inpatient Hospitalizations: A Retrospective Chart Review. Clinical Scholars Review Apr 1;6(1):47-52

Weissman, J., & Epstein, A. M. (1989). Case mix and resource utilization by uninsured hospital patients in the Boston metropolitan area. *JAMA*, *261*(24), 3572–3576.

Winkelman, T., & Vickery, K. D. (2019). Refining the Definition of US Safety-Net Hospitals to Improve Population Health. *JAMA network open*, *2*(8), e198562. https://doi.org/10.1001/jamanetworkopen.2019.8562

Wishner J. & Burton R. (2017). *How have providers responded to the increased demand for health care under the Affordable Care Act*: The Urban Institute https://www.urban.org/sites/default/files/publication/94396/2001576-how-have-providers-responded-to-the-increased-demand-for-health-care-under-the-affordble-care-act/2017

Woolhandler, S., & Himmelstein, D. U. (2017). The Relationship of Health Insurance and Mortality: Is Lack of Insurance Deadly? *Annals of internal medicine*, *167*(6), 424–431. https://doi.org/10.7326/M17-1403

Wright D. B. (2010). Time is money: opportunity cost and physicians' provision of charity care 1996-2005. *Health services research*, *45*(6 Pt 1), 1670–1692. doi:10.1111/j.1475-6773.2010.01139.

Zhou, M., Liao, J., Hu, N., & Kuang, L. (2020). Association between Primary Healthcare and Medical Expenditures in a Context of Hospital-Oriented Healthcare System in China: A National Panel Dataset, 2012-2016. *International journal of environmental research and public health*, *17*(18), 6917. https://doi.org/10.3390/ijerph17186917

## TABLES

### Table 1.1: Professional Provider Inclusion Table in 2018

| Physicians | Frequency (N) | Percentage (%) |
|---|---|---|
| **Primary Care Physicians (PCP) total** | **304,496** | **32%** |
| **Specialist Physicians total** | **634,484** | **68%** |
| **Anesthesiology** | **42,267** | **7%** |
| **Cardiovascular Medicine** | **22,521** | **4%** |
| **Emergency Medicine** | **45,202** | **7%** |
| **General Surgery** | **25,564** | **4%** |
| **OB/GYN** | **42,720** | **7%** |
| **Orthopedic Surgery** | **19,069** | **3%** |
| **Psychiatric** | **38,792** | **6%** |
| **Radiology** | **28,025** | **4%** |
| **Other** | **370,324** | **58%** |
| **U.S. Physicians Total** | **938,980** | **100%** |

Note: The frequency (N) and percentage (%) of providers in each category, based on Association of American Medical Colleges (AAMC) 2018 report.

**Table 1.2: County Level Population Characteristics in percentage: Mean (SD)**

| Variables | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| **Percent of poverty (under 138% of FPG)** | **26.73 (8.03)** | **27.15 (8.21)** | **27.03 (8.24)** | **26.75 (8.28)** | **26.22 (8.22)** | **25.33 (8.19)** | **24.67 (8.11)** | **23.97 (7.98)** | **23.53 (7.89)** |
| **Percent of under 19** | **29.69 (3.15)** | **29.42 (3.18)** | **29.29 (3.14)** | **29.15 (3.15)** | **29.09 (3.18)** | **29.09 (3.25)** | **29.10 (3.28)** | **29.09 (3.26)** | **29.06 (3.29)** |
| **Percent of over 65** | **15.94 (4.19)** | **16.15 (4.21)** | **16.69 (4.28)** | **17.11 (4.33)** | **17.54 (4.40)** | **17.94 (4.49)** | **18.36 (4.56)** | **18.79 (4.61)** | **19.26 (4.71)** |
| **Percent of Black** | **9.03 (14.56)** | **9.07 (15.56)** | **9.11 (14.53)** | **9.15 (14.52)** | **9.19 (14.53)** | **9.22 (14.50)** | **9.26 (14.49)** | **9.29 (14.49)** | **9.33 (14.48)** |
| **Percent of Hispanic** | **8.33 (13.21)** | **8.51 (13.29)** | **8.67 (13.37)** | **8.83 (13.45)** | **8.98 (13.52)** | **9.15 (13.61)** | **9.31 (13.69)** | **9.49 (13.75)** | **9.63 (13.81)** |
| **Percent of Male** | **50.21 (1.23)** | **50.19 (1.23)** | **50.23 (1.25)** | **50.22 (1.26)** | **50.21 (1.28)** | **50.22 (1.30)** | **50.26 (1.26)** | **50.28 (1.26)** | **50.18 (1.26)** |
| **Uninsurance rate** | **18.53 (5.60)** | **18.00 (5.49)** | **17.58 (5.38)** | **17.58 (5.51)** | **14.41 (5.18)** | **12.04 (5.09)** | **11.13 (4.94)** | **11.47 (5.15)** | **11.49 (5.04)** |

Note: Characteristics of county-level population based on US Census data 2010-2018 and SAHIE. The numbers are the means (SDs) across 3,142 counties for each characteristic in the corresponding year

**Table 1.3: Adjusted LMEM model using PCP per 100,000 population**

| Variables | Estimate | Standard Error (SE) | P-Value | 95% Confidence Interval (CI) |
|---|---|---|---|---|
| **Uninsurance Rate** | **-18.88** | **5.83** | **0.001** | **-30.33, -7.45** |
| **Percent of poverty (< 138% of FPG)** | **-50.16** | **6.70** | **<0.001** | **-63.29, -37.02** |
| **Percent of under 19** | **-128.71** | **13.34** | **<0.001** | **-154.86, -102.56** |
| **Percent of over 65** | **49.99** | **12.68** | **<0.001** | **25.14, 74.83** |
| **Percent of Black** | **-7.35** | **5.27** | **0.163** | **-17.67, 2.98** |
| **Percent of Hispanic** | **2.11** | **5.33** | **0.692** | **-8.34, 12.56** |
| **Percent of Male** | **-170.73** | **24.33** | **<0.001** | **-218.44, 123.04** |

Note: Estimates is the number of PCPs per 100,000 population with 1unit change of the corresponding variables. SEs are the standard errors (SEs) of the estimates. 95% CI is the range of estimates with 95% confidence. These estimates are based on linear mixed effects model (1) ref. Section 1.5.5.

**Table 1.4: Adjusted LMEM model using Specialties per 100,000 population**

| Specialty | Estimate | SE | P-Value | 95% Confidence Interval (CI) |
|---|---|---|---|---|
| **Anesthesiology** | **-5.46** | **2.16** | **0.012** | **-9.69, -1.22** |
| **Cardiovascular Medicine** | **-5.63** | **1.15** | **<0.001** | **-7.89, -3.37** |
| **Emergency Medicine** | **-6.22** | **2.98** | **0.037** | **-12.08, -0.38** |
| **OB/GYN** | **-8.83** | **1.87** | **<0.001** | **-12.49, -5.16** |
| **Orthopedic Surgery** | **-8.11** | **1.74** | **<0.001** | **-11.51, -4.70** |
| **Psychiatric** | **-10.62** | **1.90** | **<0.001** | **-14.35, -6.89** |
| **Radiology** | **-5.67** | **2.07** | **0.006** | **-9.72, -1.61** |
| **General Surgery** | **-11.68** | **2.58** | **<0.001** | **-16.74, -6.62** |

Note: Estimates are the number of specialty physicians per 100,000 population with 1% increase in uninsurance rate. SEs are the standard errors of the estimates. 95% CI is the range of estimates with 95% confidence. These estimates are based on model (2) ref. Section 1.5.5.

**Table 1.5: Comparison between PCP and Specialty Physicians**

**(a) Physician supplies by specialties and year**

| Year / Physicians | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| **PCP** | **225,687** | **229,978** | **233,862** | **239,500** | **241,227** | **242,608** | **243,738** | **245,809** | **248,034** |
| **Anesthesiology** | **42,230** | | | | | **45,518** | | | **46,559** |
| **Cardiovascular** | **22,082** | | | | | **22,564** | | | **22,597** |
| **Emergency Medicine** | **32,305** | | | | | **39,239** | | | **43,389** |
| **OB/GYN** | **37,305** | | | | | **39,019** | | | **39,198** |
| **Orthopedic Surgery** | **24,509** | | | | | **26,039** | | | **26,978** |
| **Psychiatry** | **36,926** | | | | | **38,110** | | | **38,403** |
| **Radiology** | **34,093** | | | | | **36,169** | | | **36,972** |
| **General Surgery** | **35,641** | | | | | **38,314** | | | **39,244** |

Note: The number of physicians in each category and each year from 2010 to 2018 based on the AHRF data

**(b) Estimated change and percent change in physician supplies with 1% increase in uninsurance rate**

| Physicians | Average # of physicians among the study period (9 years for PCP & 3 years for specialty physicians)<br><br>(a) | Change in supply per 100,000 population with 1% increase in uninsurance rate<br><br>(b) | % Change of Physicians<br><br>(c)<br><br>(c) ={(b) / (a)} * 1,000 |
|---|---|---|---|
| Primary Care (PCP) | 238,938 | -18.88 | -7.90 |
| Anesthesiology | 44,769 | -5.46 | -12.17 |
| Cardiovascular | 22,414 | -5.62 | -25.07 |
| Emergency Medicine | 38,311 | -6.22 | -16.23 |
| OB/GYN | 38,507 | -8.82 | -22.94 |
| Orthopedic Surgery | 25,842 | -8.11 | -31.38 |
| Psychiatric | 37,813 | -10.61 | -28.05 |
| Radiology | 35,745 | -5.66 | -15.83 |
| General Surgery | 37,733 | -11.68 | -30.95 |

Note: Column (a) indicates the average number of physicians among the study period (9 years for PCP & 3 years for specialty physicians) based on AHRF; column (b) shows the estimated change in supply per 100,000 population with 1% increase in uninsurance rate from results based on model (1) and (2). Colum (c) provides the calculated percent change (in %) in physicians based on the numbers in (a) and (b).

**Table 1.6: LMEM model using total non-federal M.D.s and D.O.s per 100,000 people among the population under 65, adjusting for poverty rate, percent of Black, percent of Hispanic, percent of population under the age of 19, and percent of male.**

| Total Physicians per100,000 Results | Estimate | SE | P-Value | 95% Confidence Interval (CI) |
|---|---|---|---|---|
| **Uninsurance Rate** | **-28.94** | **7.47** | **<0.001** | **-43.41, -14.14** |
| **Percent of poverty (<138% of FPG)** | **115.29** | **13.54** | **<0.001** | **-141.82, -88.76** |
| **Percent of under 19** | **-279.14** | **27.43** | **<0.001** | **-332.89, -225.39** |
| **Percent of Black** | **108.82** | **19.13** | **<0.001** | **71.33, 146.31** |
| **Percent of Hispanic** | **25.83** | **18.38** | **0.160** | **-10.21, 61.84** |
| **Percent of Male** | **-209.63** | **48.58** | **<0.001** | **-304.75, -114.31** |

Note: Estimates is the number of total physicians (MD.s + DOs) per 100,000 population with 1unit change of the corresponding variables. SEs are the standard errors of the estimates. 95% CI is the range of estimates the 95% confidence. Estimates are based on linear mixed model using the number of total physicians (MD.s + DOs) per 100,000 population as the outcome and independent variables same as those in model (1) ref. Section 1.5.5.

# 2.0 ESSAY 2 – MEDICAID PROGRAM EXPANSION IMPACT ON COMMUNITY PROVIDER AVAILABILITY

## 2.1 ABSTRACT

In this study, we evaluate the impact of Medicaid eligibility expansion on physician supplies by examining the difference in the change of physicians per 100,000 population from 2010 to 2015 (and 2010 to 2018) between Medicaid expansion and non-expansion counties.

The Area Health Resources File data were used to provide the physician supplies in each county within the United States, and the U.S. Census Bureau Annual County Residents Population Estimates data were used to provide county-level population demographics as the covariates. The Medicaid eligibility expansion data were obtained from the U.S. Centers for Medicare and Medicaid Services, Department of Health & Human Services.

Our results showed a statistically significant association between the Medicaid eligibility expansion and physician supplies. The results suggested that the difference in change of the number of physicians is 6.56 (95% CI: 2.83 to 10.28; p-value = 0.001) per 100, 000 population from 2010 to 2015 between those counties whose states expanded Medicaid eligibility guideline before 1/1/2015 and those counties whose states did not expand by that time. From 2010 to 2018, the difference in change of the number of physicians is 12.40 (95% CI: 7.93 to 16.88; p-value < 0.001) per 100, 000 population between those counties whose states expanded Medicaid eligibility guideline before 1/1/2018 and those counties whose states did not expand by the time. The results suggest that professional providers are influenced by the improvement of insured population through Medicaid expansion since this will expand the patients' payment methodologies thus improving their compensation.

## 2.2 INTRODUCTION

This study considers the impact of the expanded Medicaid program on provider availability at the county-level, while holding constant demographic factors. Questions specific to this program and the effect on provider availability are analyzed using two hypotheses. The first being the ratio of providers to people at the county-level decreases in non-expansion states and the second is the ratio of specialist providers to people at the county-level decreases at a higher rate than PCP providers for non-expanded states.

The legislative action taken to adjust the Medicaid eligibility requirements to promote the inclusion of additional insured under Medicaid was motivated by statistics that although the U.S. spends more on healthcare than other industrialized nations, (Papanicolas et al.,, 2018), approximately 27 million non-elderly Americans are uninsured (Berchick et al., 2018).

Recent figures show that over 17.0 % of the Gross Domestic Product (GDP) and $9,892 per capita is spent in comparison to the Organization for Economic Cooperation and Development (OECD) median of 8.9% and $4,033 per capita (Anderson et al., 2019). Furthermore, costs appear to be increasing with projected growth in U.S. healthcare expenditures of 5.6% per year between 2016 – 2025, and at this pace, by 2025, the U.S. will be spending 19.9% of GDP on healthcare. (Keehan et al., 2017)

The professional components are actively engaged within the healthcare system accounting for 20% of healthcare expenditures in the U.S.; roughly $772.1 billion in 2019. And 2019 expenditure figures grew faster at 4.6% compared to the prior year at 4.0%. (CMS, 2021)

From the professional provider perspective, the U.S. has 19.0% fewer practicing physicians per 1000 population than the median OECD countries, with 2.6 compared to

3.2. The trend is not favorable with the U.S. medical schools in 2015, graduating 7.5 physicians per 100,000 population compared to the OECD median of 12.1. And, the U.S. is further distinguished by the lowest percentage of generalist physicians per 100,000 with 11.7% compared to an OECD median of 27.9%. (Anderson et al., 2019). Not surprisingly, the results are reflecting poorly on numerous healthcare indicators such as access to primary care and wait times for specialist appointments, strongly suggesting that the U.S. is not realizing value for the dollars spent. (Rhodes et al., 2013)

Recognizing escalating costs, increased demand for quality health care, and a decrease in the value for dollars spent, in March 2010 a significant step was taken to expand insurance coverage through the passage of the Patient Protection and Affordable Care Act (ACA). It remains one of the most controversial pieces of legislation passed in decades, and despite the criticisms, there are more Americans insured·. The overall uninsured rate declined from 16.0% in 2010 to 9.1% in 2015 (Obama B, 2016) Unfortunately, the gains achieved as a result of the ACA began to reverse under the prior Administration, causing the uninsured rate among working-age adults to rise from 12.7% in 2016 to 15.5% in 2018. (Collins et al., 2018)

Concerns that the uninsured rate will continue to increase (Woolhandler 2017) may be abated by the new Administration in Washington, with the expectation that the ACA will be strengthened and thus the uninsurance trend reversing in the upcoming years. The American Rescue Plan Act (ARPA) enacted in March 2021 encourages states to expand their Medicaid programs to cover adults — up to age 65 — with incomes at or below 138 % of the Federal Poverty Guidelines (FPG) representing $36,570 for a family of four in 2021.

Ongoing research continues to document the benefits afforded by ACA and recent post-ACA studies have concluded that Medicaid expansion contributed to improved

hospital financial performance and substantially lowered the likelihood of closure. (Courtemanche et al. 2017; Lindrooth et al. 2018; Nikpay et al. 2016; Rudowitz & Garfield 2015; Dranove et al. 2016) States with expanded Medicaid experienced a significant reduction in the proportion of uninsured hospitalizations compared with the non-expanded states. (Akhabue et al. 2018; Loehrer et al., 2018) However, studies have largely ignored the professional provider component consisting of primary and specialty physicians that have suffered financial problems and practice closures resulting from high uninsured community rates.

## 2. 3 LITERATURE REVIEW

### 2.3.1 Medicaid Expansion

Originally enacted by Congress in 1965, Medicaid is the single largest insurer in the U.S., accounting for approximately 20% of a state's budget. Created as a healthcare component for those on welfare with dependent children and the aged or disabled, early prior studies had commented that the Medicaid program was generally thought of as the logical vehicle to cover a broader range of the population. (Rosenbaum & Westmoreland, 2012) Thus, this program was selected as the most efficient method of expanding eligibility and developing new programs.

### 2.3.2 Legislative Response to Address Uninsurance

The Patient Protection and Affordable Care Act (PPACA), Pub. L. No. 111-148), now referred to as the Affordable Care Act (ACA) and amended by the Health Care and Education Reconciliation Act (Health Care Education and Reconciliation Act, Pub. L. No. 111-152) was enacted March 2010. In the spirit of the Medicare rollout forty-five (45) years prior, it was a monumental initiative providing affordable insurance coverage to reduce the number of uninsured individuals between ages 0 to 65.

The Act consisting of ten (10) individual legislative titles, was envisioned to accomplish several objectives. The first and most crucial primary goal was to achieve near-universal coverage through shared responsibility among government, individuals, and employers. This legislation also sought to reduce disparities serving a diverse patient population, with more equity and affordability of health insurance coverage. Additionally, more value for healthcare expenditures and reducing unnecessary spending along with greater provider accountability were important targeted areas being addressed. Lastly, strengthening the public health infrastructure and working to create more primary healthcare access with a focus on preventive health care and improved electronic data gathering were other vital priorities. (Rosenbaum, 2011)

Prior research has concluded that the ACA attained some successes. Although not fully functional as initially planned, it is worthy to look at the primary sections it addresses. The individual and employer mandates, tax credits, and cost-sharing reductions were established to address coverage issues. Insurance standards were created with provisions for consumer spending limits, the extension of dependent coverage to age 26, a guaranteed requirement for pre-existing conditions, and rate reviews for premium increases above 10%. Health insurance marketplaces were designed to form regional and more localized exchanges for purchasing insurance coverage with choices. Medicaid expansion including a raise in eligibility to include families with incomes less than 138% of the FPG which the Supreme Court later ruling made this optional for states, and prescription drug enhancements, namely filling the "donut hole" and increasing the discount provided by manufacturers was also included in the ACA. Accountable Care Organizations (ACO's) were designed to focus on cost and quality through forming networks between physicians, hospitals, and other providers coordinating patient care. There were also wellness programs

such as Medicaid coverage for tobacco cessation for pregnant women and penalties for high infection rate hospitals. (PPACA), Pub. L. No. 111-148)

According to Wanamaker & Bean, (2013), one of the more interesting facets is the CMS Center for Medicare and Medicaid Innovation (CMMI) under the Center for Consumer Information and Insurance Oversight, (CCIIO) which encouraged various delivery models and payment methodologies. It was thought that this might provide the most significant opportunity to lead us towards innovative models for future healthcare delivery. (Wanamaker & Bean, 2013; Gold 2015) Although it has been said that the ACA erodes the states' ability to regulate health insurance since the federal government has taken the role of managing the health insurance exchanges, the law does provide for a waiver from federal rules for experimentation. (Moffit, 2016) Woolhandler (2003) suggests that it is an opportunity for building enhancements or developing a better system on a smaller scale as a pilot program to test modifications before expanding to the entire country.

Strong partisan groups previously expressed a desire to repeal the ACA and special interest groups such as insurance companies will continue to have an influence on the final product with politics attempting to guide the future of the ACA. (Quadagno, 2011) In the interim, continuing changes to the ACA are being made and it is important to understand the potential impact of modifications that increase the level of uninsurance affecting the entire healthcare system.

2.3.3 State Level Option

As a policy initiative to provide near-universal healthcare coverage, the ACA through Medicaid offered an opportunity to reduce the uninsured burden on the public health infrastructure by expanding Medicaid and increase eligibility to 138% FPG. The intention was to create more uniform country-wide criteria to cover more individuals.

However, this provision of the law was rescinded in June 2012, when the U.S. Supreme Court ruled in *National Federation of Independent Business v. Sebelius* that the proposed penalty of the loss of federal funding for Medicaid for states that failed to expand, was excessively coercive and thus unconstitutional. (Rosenbaum & Westmoreland, 2012) The result is that Medicaid expansion became optional and as of August 2021, thirty-eight (38) states (plus D.C.) adopted the Medicaid expansion and 12 states, including Florida, have not adopted the expansion. (Kaiser Family Foundation, 2021 July) For those residing in expansion states, many more individuals within the eligible income brackets qualified for coverage and as expected, those in non-expansion states did not benefit from this provision, despite the incentives to expand. Previous studies have documented numerous achievements related to the expansion, including the decline in the uninsurance rate among younger adults well under age 65. **(**McMorrow et al., 2015) Another ACA related study suggested improvement in insured status for Black and Hispanic adults. **(**McMorrow et al., 2015) Expansion was significantly associated with reduced mortality as well as improved coverage, access to care, and self-reported health according to results in a study by Sommers et al., 2012) and published in the New England Journal of Medicine. A recently published JAMA cross-sectional study using National Hospital Ambulatory Care Survey data and Healthcare Cost and Utilization Project data, found that on a proportional basis, Emergency Department (ED) visits and hospital discharges by uninsured patients decreased significantly after the implementation of the ACA. (Singer et al. 2019)

Amid growing pressures from the newly Medicaid eligible and employer health plan insured, there remains a continuing base of uninsured patients requiring services. Prior studies noted reasons for continued uninsurance, namely those individuals in the non-expansion states classified as being in a "coverage gap" whose income is above the

Medicaid eligibility threshold but less than 100% subsidy eligibility for marketplace insurance. Not part of the ACA but still not to be forgotten are the 5.2 million uninsured undocumented individuals that seek healthcare often in emergent conditions with only a few states providing healthcare financial assistance for this population. (Courtemanche et.al. 2017; Kominski et al., 2017) The ACA is responsible for insuring an estimated 20 million that were previously uninsured however, the core of individuals that remain uninsured include not only the ACA's exclusion of undocumented immigrants, but those that reside in a state that chose not to expand Medicaid, unaware of marketplace insurances and subsidy availability, affordability, and lack of guidance to assist in the enrollment process. (Wishner & Burton, 2017). According to a Kaiser study, 45% of uninsured adults did not obtain coverage after the Medicaid expansion because they were over income for the eligibility expansion or the marketplace insurance because the cost was too high. (Tolbert 2019) Prior studies have suggested that the inability to obtain coverage through Medicaid or other third parties cause provider related accessibility issues, (O'Toole et al., 2001; Mort et al. 1996; Hafner-Eaton et al., 1993; Hadley et al., 1991: Patrick et al., 1992; Weissman & Epstein, 1989)issues (O'Toole et al., 2001; Mort et al., 1996; Hafner-Eaton et al., 1993; Hadley et al., 1991; Patrick et al., 1992; Weissman & Epstein 1989) giving pause to consider further ACA expansion for those states that did not expand in addition to future policy enhancements beyond ACA..

### 2.3.4 Expansion vs. Non-Expansion - Benefits, Consequences and Effects

As of August 2021, with 12 remaining non-expanded states, the federal government has strongly encouraged adoption by paying 90% of the cost of expansion for adults. (Kaiser Family Foundation, 2021, July) Although the initial intention was to create nationwide uniformity, this two-tiered infrastructure enables studies such as this one to

compare changes in accessibility and health outcomes in expansion versus non-expansion states. It is not a natural experiment; however, these comparisons can view trends occurring in expansion vs. non-expansion states, providing insight into the impact related to uninsurance. The status of Medicaid expansion as of August 2021 is presented in a table format in Table 2.1.

### 2.3.5 Systemwide Benefits

Acknowledging that there is a strong interdependency between healthcare organizations, hospitals, and associated professionals, changes in payment methodologies logically have an effect on the full spectrum of service providers within the healthcare system. Using the CMS Provider of Services file, Healthcare Provider Cost Reporting Information System reports and a difference in difference statistical model, previous studies found that the ACA's Medicaid expansion was associated with improved hospital fiscal performance and substantially lowered the possibility of closure, especially in rural markets and counties with large numbers of uninsured adults before Medicaid expansion. (Lindrooth, 2018; CMS.gov 2019.) Prior studies found that Medicaid enrollment has a positive impact on the associated providers connected to hospitals in maintaining a workforce base within the community and also provided access to care for individuals residing in these areas. (Lindrooth, 2018; CMS.gov) However, prior studies have strongly suggested that in those states that did not expand Medicaid, hospitals and particularly those in rural communities were at risk for closure. (Kaufman et al., (2016). From 2013 to 2017, 64 rural hospitals closed, more than twice as many as during the previous 5-year period because of financial distress. (GAO.gov 2018) Using Medicare Cost Report Data and a difference in difference statistical approach, the Kaufman study observed disparity between urban facilities and rural institutions, leading to a finding that these health

provider systems should be considered separately. (Kaufman et.al. (2016). And, as can be expected, the professionals working adjacent to these closed hospitals are impacted and may choose to leave the area for more urban centers. Prior studies have documented that the patient-to- primary care physician ratio in rural areas are compromised with only 39.8 physicians per 100,000 people, compared to 53.3 physicians per 100,000 in urban areas. (Hing & Hsiao, 2014) This uneven distribution of physicians and particularly specialists have a significant impact on the health of the rural population that is difficult to overcome. (Hing & Hsiao, 2014; Germack et.al., 2019)

Changes in hospital ownership and eventual closures that result from consolidations to achieve efficiencies affect other providers in the chain. Governmental and non-profit community hospitals have not gone unscathed by these conversions and felt the effects as for-profit chains had made inroads in acquisitions expanding market share. However, for-profit portfolio additions have little interest in those patients with limited insurance coverage. Safety net hospitals make up about 5% of U.S. hospitals, and in 2017, these institutions provided 17.4% of uncompensated care, totaling $6.7 billion, and 23% of the charity care, totaling to $5.5 billion. (AHA, 2017). These expenses, in addition to other governmental cuts in reimbursement under Medicaid and Medicare, have placed severe financial pressure on these providers.

#### 2.3.6 Reduction in the Uninsured and Uncompensated Care

Uninsurance and underinsurance generally translate into uncompensated care for hospitals or professional/physician providers. Although the uninsured are fewer in number than in the years before ACA, the trend reflected some changes, and various agencies and current studies are beginning to report increasing numbers. (Tolbert, 2019) There are trend differences in those states that expanded Medicaid compared to those states that did not

expand eligibility to 138% of FPG (Tolbert, 2019) Using Medicare Hospital Cost Reports and other hospital financial data, studies have shown that the ACA had a positive effect reducing the uncompensated care figures for most providers in expanded states. However, some recent studies have reported an uptick in unpaid coinsurance, and deductible amounts since more employer-based insurances have raised these thresholds. (Dranove et al., 2016; Barkholz 2016; Cohen & Zammitti 2018) High deductible health plans (HDHP) between 2013-2017 are defined as $1,300 for a single member and $2,600 for family. (Cohen & Zammitti, 2018). These large self-pay portions for the insured have expanded the financial class of patients known as underinsured. According to prior research, under the ACA, the reduction in the number of uninsured patients through conversions via insurance exchanges or Medicaid has enabled some healthcare systems to provide a measure of assistance to the underinsured with patient discounts for those having difficulties meeting their deductibles. (Cohen & Zammitti 2018; Nikpay et al. 2016) Healthcare providers categorize any unpaid balance as uncompensated care, and in 2017, $38.4 billion attributed to this cost. (AHA 2017) It is acknowledged that these numbers could be overstated and imperfect since, by definition, it is a variety of unpaid amounts, including rarely paid list prices known as gross charges and bad debt balances, left uncollected. Distinctions should be drawn between bad debt and charity care definitions using FPG criteria to understand the magnitude of the issue (Miller 2007). However, studies have shown that providers generally are determined to maintain their revenue cycle income stream for those patients deemed as financially able to pay. (Cohen & Zammitti 2018). The obligation to treat those in need regardless of payment status and forgo collection of incurred charges is under pressure given evolving changes in U.S. healthcare coverage and compensation. (Hadley & Holahan, 2003)

On an individual level, both hospitals and physicians typically associate the uninsured patient with bad debt or charity care and a loss in compensation. (Wright 2010) However with the advent of the ACA, more individuals secured Medicaid or insurance offered through the exchanges. (Courtemanche et al. 2017; Cohen & Martinez 2015) These initiatives helped to reduce the number of unreimbursed services to relieve some of this pressure. Earlier research work in uninsurance and Medicaid expansion generally focused on hospitals and large healthcare entities excluding the professional component. (Blumenthal & Rizzo, 1991). However more research is needed to understand the relationship between physician provider availability and third-party insurances such as Medicaid offering compensation for services rendered.

### 2.3.7 Impact on Provider Availability

Studies have suggested that Medicaid insured patients saw an improvement in provider availability under ACA. And previous studies have attributed this to a level of professional compensation afforded by Medicaid in place of charity or uncompensated care. However, Medicaid physician fee schedules vary by state, and study results point to states paying a higher reimbursement for primary care visits as mandated by the ACA during the two years 2013 and 2014 are correlated with an increase in available appointments for Medicaid enrollees. (Polsky 2015; Candon et al. 2018) Conversely, Medicaid patients in states paying lower reimbursement rates and those states post-2014 after the increase expired, encountered more difficulties in obtaining appointments. (Polsky et al. 2015; Candon et al. 2018) The study conducted by Polsky et al., (2015) estimated that there was an estimated increase of 1.25 percentage points in availability per 10% increase in Medicaid reimbursements further providing evidence that physician compensation is a strategic component in the access to services. Study findings also indicate that in

comparison to uninsured patients, Medicaid patients experience better access to primary care services parallel to insured patients. However, prior studies have also suggested that those with Medicaid have worse access issues related to specialists than those without insurance (Christopher et al. 2016; Nguyen & Sommers, 2016)

### 2.3.8 Impact on Emergency Departments (ED) and Safety Net Providers

One of the objectives of the ACA was to steer Medicaid enrollees to primary care, reducing the burden on emergency departments and related safety net providers. According to Singer's research work (2019), positive gains have been recognized. (Singer et al., 2019) However, other studies still suggest a continuing volume of patients treated at the various safety net providers albeit insured through Medicaid. A prior longitudinal observational study by Angier et al., (2015) analyzed the impact of Medicaid expansion on Medicaid and uninsured visits to community safety net clinics using the 12 months before the expansion and six months after. The findings reflected a significant decrease in uninsured visits and an increase in Medicaid patient visits to safety-net clinics in expanded states, whereas those states that did not expand continued to have a high number of uninsured in the payer mix. (Angier et.al. 2015) Specific to ED usage, a post-ACA study by Ndumele et al., (2014) assessed the impact of Medicaid expansions on self-reported access to care, and ED visits resulting in no evidence that increasing the number of Medicaid enrollees negatively impacted their perceived accessibility to care or increased use of ED's. (Ndumele et al., .2014) In another very recent study, Gotanda (2020) used a difference-in-differences analysis to compare outcomes between Medicaid covered survey participants in 32 states that expanded Medicaid versus Medicaid covered survey participants in 19 non-expansion states. With over 17,000 total participants, the study concluded that ACA Medicaid

expansions were associated with a minor improvement in access to PCPs without an increase in ED use. **(**Gotanda, et al. 2020)

These recent studies post ACA continue to challenge the notion that insurance coverage reduces ED visits. Study results have contradicted the theory and concluded that the uninsured use the ED substantially less than Medicaid enrollees. (Singer et.al. 2019: (Zhou et al., 2017; Finkelstein et al., 2016**;** Sommers & Simon, 2017) Similar findings were reported for outpatient visits and hospitalizations. (Zhou et al. 2017)

A study by Finkelstein et al., **(**2016**)** further supported the finding that new recently enrolled Medicaid patients utilized the ED an additional 40% in the first 15 months of coverage. Findings were inconclusive as to whether these were short term or long-term effects. Possible explanations include patients not yet established with primary care providers and primary care providers recommending the ED for acute care situations that offices are unable to handle. **(**Finkelstein et al. 2016**)** The randomized studies such as RAND reflect an increase in insured ED usage by those with comprehensive coverage. In contrast, quasi-experimental studies with possible unmeasured bias have more mixed results. (Zhou et al., 2017; Sommers & Simon, 2017) Conflicting conclusions in these investigations point to the suggestion that the relationship between ED usage and insurance coverage is driven by numerous factors including but not limited to population characteristics, and type of insurance coverage. (Zhou et al., 2017; Sommers & Simon 2017) Interestingly, these recent investigations suggested that insurance increases access to and use of healthcare (Zhou et al., 2017), and even in studies showing a reduction in ED usage, the healthcare expense does not decline with expanded coverage. **(**Sommers & Simon, 2017)

From the ER professional provider perspective, approximately 63% of Emergency Room physicians are primarily compensated on a salary basis and hired by the hospitals as a group practice. (Rama, 2018) Therefore, this specialty is less sensitive to productivity and insurance related concerns. However, it has been commented that the variance in overall physician supply compared to demand affects the ED more than other specialty groups. Emergency Department professional providers make up less than 5% of all physicians, however they provide the services for twenty-five percent of all acute care encounters. (Pear, 2018) thus placing a stress on this overburdened specialty group.

### 2.3.9 Professional Provider Rational and Response

As previously discussed in Essay 1, prior studies have suggested that physicians are motivated by a variety of factors; however, financial concerns are an important consideration in a profession where time is equated to money. (Wright, 2010). Financial aspects influence physicians and their decision where to locate, particularly if they are in a singular or group and not paid a salary. (Wright, 2010). Carpenter and colleagues (1999) reported reasons that may impact the geographic location decisions such as cost of living, low crime rates, and excessive taxes, while Chou and Lo Sasso, (2009) reported that high-cost malpractice insurance premiums and maximum caps were factors particularly for surgeons. Additionally, the level of personal debt including student loans was identified as a concern and that subsidies for practicing in more rural or shortage areas may not offer sufficient financial incentives to motivate newly graduated providers to select a compromised community. (Chou & Lo Sasso, 2009). Another important component in selecting a practice location is the strength of the medical community. As cited in previous studies, co-locating with other professionals and hospital systems is part of the decision process. (Kazanjian & Pagliccia, 1996). This is of particular interest to those in more rural

settings that may not have the level of professional support found in more urban areas. (Kazanjian & Pagliccia, 1996).

However, even with other contributing influences, numerous prior research work has indicated that there is a strong measure of physician self-interest in maintaining sufficient income levels to support their practice. These consistent findings are factors facing future healthcare policy development. (Jacobson & Jazowski, 2011; Cunningham & Hadley, 2008). The premises are that providers gravitate toward a profit motive which compels them to locate in geographic areas with higher percentages of insured individuals. (Santerre, & Neun, 2000) This reason influences those providing healthcare services to be situated where practices can thrive. (Santerre & Neun 2000) And according to Wright (2010), the professional providers are deeply concerned about the loss of income and the opportunity cost of providing uncompensated care. Therefore, any noticeable shift of a segment of the uninsured population to insured holds promise for more availability.

Physician resource allocation and uneven geographic distribution created additional pressure on the professional components. The newly enrolled Medicaid population under ACA drove more patients to primary care, which was already experiencing a short supply of physicians. (Jacobson & Jazowski, 2011; Zuckerman & Goin, 2011; Zuckerman et al., 2014; Zuckerman et al., 2009). Prior studies have reported that those newly enrolled Medicaid patients are taking advantage of improved access in obtaining medical care which corresponds to an increase in identified illnesses and a continuation of follow-up care improving the opportunity for positive health outcomes. (Kaufman, **e**t al. 2015) According to a study funded in part by the Robert Wood Johnson Foundation (RWJF) in partnership with The Urban Institute, before the enactment of the ACA, there were shortages and an uneven distribution of healthcare resources. The increase in volume created in post ACA

environment exacerbated unmet needs in many communities related to primary care, specialty care, and behavioral health. Professional providers responded to the increase in demand through staffing increases, hiring advanced nurse practitioners, expanding to new geographic locations or enlarging existing sites, and extending practice office hours. Lastly, urgent care centers and retail medicine outlets have expanded the point of service care options, which has spread the demand over a broader range of providers. (Wishner & Burton, 2017). Other changes are occurring related to physician practices impacting their response to Medicaid eligibility expansion such as telemedicine and electronic health records (EHR) which not only has the potential to improve clinical health-related communication; but can also provide support in maintaining insurance coverage through electronic documentation of enrollment dates and eligibility information. (DeVoe et al., 2014)

However, studies have also observed a significant strain on the professional providers in the system beyond the additional volume of new Medicaid enrollees. Stress has been intensified by aging baby boomers, physician retirements, and more desirable lifestyle choices, limiting those interested in demanding health services careers. (Institute of Medicine (U.S.) 2009) Lastly, a relatively new category known as "concierge medicine" whereby 1 in 5 of the wealthiest Americans pay an additional fee to obtain more personized healthcare services is propagating a two-tiered healthcare system and further reducing the supply of available professional providers to the Medicaid eligible population and others in less affluent categories. (Brennan, 2002)

## 2.4 CONCEPTUAL FRAMEWORK

The purpose of this study is to examine the association between Medicaid expansion and the physician (total MDs and DOs, PCP, and eight specialties in Table 2.2)

supplies. This study specifically questions if the increase in physician supplies (from 2010 to 2015, and from 2010 to 2018) is greater in counties whose states expanded Medicaid eligibility guidelines. A secondary investigation considers the availability of specialty physicians compared to PCPs in non-expanded states. I assume that Medicaid expansion will decrease the uninsurance rate of counties whose states expanded the Medicaid eligibility guidelines, which further improves the physicians supply in these counties. On the other hand, Medicaid expansion may have a direct effect on the physicians supply for the counties whose states expanded the Medicaid eligibility guidelines. I did not control for the county-level uninsurance rate in the model, therefore the effect of Medicaid expansion on physician supplies will include both direct and indirect effects. Linking the Health Resources and Services (HRSA) data with the Area Health Resources File (AHRF) data makes it available for us to estimate the impact of Medicaid eligibility expansion on the change of physician supplies at the county-level.

The potential confounders include proportion of population under 138% poverty guideline, the proportion of males, proportion of population under the age of 19, proportion of population over the age of 65, proportion of Hispanics, and proportion of Blacks. These variables were controlled for in the regression model.

## 2.5 DATA AND METHODS

A longitudinal ecological design was used for this essay. A panel data set was created using primarily open access secondary sources to evaluate the effect of the Medicaid expansion on the provider supply applying multivariable models controlling for the county-level socio-economic status. Linear mixed effects models (LMEM) were used in this essay. The year 2010 was used as the reference year, and I will investigate the change

in physician supplies from 2010 to 2015, and from 2010 to 2018. Therefore, only two repeated measurements were used in each of the change models.

### 2.5.1 Data Resources and Variables

The Health Resources and Services Administration (HRSA) database, known as the Area Health Resources File (AHRF), was used to provide the outcome of this research, which is the physician supplies at the county-level. This data source is generated from the American Medical Association (AMA) Physician Masterfile. It was used to obtain the numbers and proportions of primary care physicians as well as the numbers and proportion of specialists in each county. AHRF and U.S. Census datasets were linked by counties' Federal Information Processing Standards (FIPS). During the data confirmation process. The total number of counties in the analysis is 3,142.

### 2.5.2 Dependent Variables – Outcome

The supply of total MD's and DO's, the primary care (PCP), and specialty providers are the primary outcomes for this study. Definitions and volume information for primary care and specialty providers was identified using the Association of American Medical Colleges (AAMC) sourced from the AMA Masterfile. Primary care was defined as those practicing under Internal Medicine, Family Medicine/General Practice, and Pediatrics. Obstetrics and Gynecology (OB/GYN) is categorized separately in AHRF and thus will be reported independently from primary care data. Specialty providers investigated were selected based upon the eight (8) highest specialist percentages of the total specialist practicing physicians using the AAMC source data. Professional providers are distinguished by allopathic physicians (M.D.'s) and osteopathic (D.O.'s); however, these are combined and not separated for of these studies. The eight (8) specialties I considered in this study include Anesthesiology, Cardiovascular Medicine, Emergency Medicine,

General Surgery, OB/GYN, Orthopedic Surgery, Psychiatry, and Radiology and Diagnostic Radiology. For the purposes of this discussion forward, both Radiology and Diagnostic Radiology will be referred to under the heading of Radiology. Table 2.2 summarizes the physician supplies and allocations, by specialty, in 2018.

The AHRF data included non-Federal and Federal providers however only non-Federal data was selected to use for these studies. This data file contains the professional provider information related to both primary care and specialist physicians. Both primary care and specialty physician data were available and downloaded for three (3) years (2010, 2015, 2018).

The number of primary care Non-Federal providers from AHRF was calculated for each county selected and merged by the FIPS. A total of 3,142 counties were included in the final analytical data.

The proportion of the providers were calculated as the number of providers (total MD's and DO's, PCP, and specialty physicians) per 100,000 county population. To compute this figure, I divided the total number of physicians in each category (total MD's and DO's, PCP, and specialty physicians) by the county population, and then multiplied the number by 100,000.

2.5.3 Exposure

The Medicaid expansion status by the end of 2014, and by the end of 2018 is the exposure in our analysis. The expansion status is at the state level but is distributed to the county-level and merged with our county-level AHRF data. The state level expansion status was manually created using the information provided in Table 2.1 and was later merged with the county-level physician supplies and socio-economic data based on state FIPS.

### 2.5.4 Control Variables - Covariates

Poverty rate, age, race, and gender have been previously stated in prior literature as the confounders for physician supplies. Hence, these variables were adjusted for in the model. Hence, the covariates in this essay include the county-level poverty rate, county-level percent of population over the age of 65, percent of population under age 19, percent of county-level NH Blacks, percent of county-level Hispanics, and percent of county-level males in 2010, 2015, and 2018.

The variable of county-level poverty rate was calculated by dividing the total number of county population under 138% of FPG by the total county population and times 100% in each year; the county-level percent of population under the age of 65 was calculated by dividing the number of people over age 65 by the total county population and multiplying by 100% in each year; the percent of population under age 19 in each county was calculated by taking the number in this demographic group and dividing by the total number in each county and multiplying by 100% in each year; the percent of Non-Hispanic (NH) African Americans in each county was calculated by dividing the number of NH Blacks in each county by the total number of people in each county in each year; the percent of Hispanic in each county was calculated by dividing the number of Hispanic in each county by the total number of people in that county in each year. Finally, the percent of male in each county was calculated by dividing the number of males in each county by the total number of people in that county in each year.

### 2.5.5. Statistical Analysis

The County-Year level data set was used for analysis using data from 2010 to 2015, and from 2010 to 2018. The primary outcomes include proportion of total MD's and DO's, proportion of PCPs, and proportion of eight specialty providers. A linear mixed effects

model (LMEM) was used to investigate the association between the exposures (the Medicaid expansion grouping status) and the study outcome (the number of providers per 100,000 people) with the pre- and post- data (2010 and 2015 for pre- and post- years in the 2010-2015 model, and 2010 and 2018 for pre- and post- years in the 2010-2018 model). The standard statistical approach of LMEM has been used to evaluate the influence of health policy changes (Zhou, et al., 2020) and was selected in this study to assess the effect of Medicaid expansion on the change in the number of providers per 100,000 population. The LMEM was presented as follow:

$$
\begin{aligned}
&\boldsymbol{E(The\ number\ of\ providers\ per\ 100{,}000\ People_{it}\ )} \\
&\quad = \boldsymbol{\beta_0 + \beta_1 Treat_i + \beta_2 Post_i} \\
&\quad + \boldsymbol{\beta_3 Treat_i * Post_i\ +\ \beta_4 Share\ Below\ 138\%\ Poverty\ rate_{it}} \\
&\quad + \boldsymbol{\beta_5 Share\ Black\ NH_{it} + \beta_6 Share\ Hispanic_{it} +\ \beta_7 Share\ over\ 65_{it}} \\
&\quad + \boldsymbol{\beta_8 Share\ Under\ 19_{it}\ +\ \beta_9 Share\ Male_{it}}
\end{aligned}
\qquad (1)
$$

where *i* denotes the index of county (i = 1, 2, …, 3142) and *t* indicates the year (t=0 for 2010; t=1 for 2015 for 2010-2015 change model, and t=0 for 2010; t=1 for 2018 for 2010-2018 change model), $\beta_1$ is the regression parameter for the expansion grouping status at baseline (2010), which indicates the difference in the expected number of physician per 100,000 population between the expanded states and non-expanded states in 2010; $\beta_2$ is the parameter that indicates the difference in the expected number of physician per 100,000 population between baseline (2010) and post-intervention (2015 or 2018) for counties without Medicaid expansion; and $\beta_3$ is the parameter indicating the difference in the *change* of the number of physicians per 100,000 population from 2010 to 2015 (or from 2010 to 2018) between expanded counties and non-expanded counties; Finally, $\beta_4$ to $\beta_9$ are regression parameters for confounding variables. In this model, the

data were also considered to be clustered within each county *i* (*i* = 1, 2, …, 3142) and measurements across the 2 selected years within each cluster were correlated. Using the LMEM, the standard error (SE) estimated were adjusted for the clustering by assuming the exchangeable correlation structure (i.e., the correlation between each pair of measurements within a given county were assumed to be the same).

All analyses were performed using STATA (StataCorp., College Station, TX, USA) version 16 and SAS (SAS Inst. Inc., Cary, NC, USA) version 9.4. All tests are two-sided; p-values < 0.05 indicate statistically significant results.

## 2.6. RESULTS

### 2.6.1. Descriptive Statistics

Table 2.3 reports the descriptive statistics of the county-level population characteristics the Medicaid expansion status by January 1st, 2015, and by January 1st, 2018. Before the beginning of 2015, there are a total of 1,039 (33.07%) counties within states that expanded Medicaid. The number increased to 1,449 (47.71%) by the starting of 2018. The mean county-level poverty rate (based on 138% of FPG guideline) declined from 26.73% in 2010 to 25.33% in 2015, and further down to 23.53% in 2018. Percent of population over 65 increased from 15.94% in 2010 to 17.94% in 2015, and further increased to 19.26% in 2018. The percentage of Hispanic population increased from 8.33% in 2010 to 9.63% in 2018. Other demographic variables in Table 2.3 did not have obvious change from 2010 to 2018.

### 2.6.2 Association between Medicaid Expansion and Total Physicians Supply

A LMEM was fit to evaluate the association between Medicaid expansion and total physicians supply (represented by total MDs and DOs) and the results are reported in Table 2.4 The results suggest that the difference in change of the number of physicians is 6.56

(95% CI: 2.83 to 10.28; p-value = 0.001) per 100, 000 population from 2010 to 2015 between those counties whose states expanded Medicaid eligibility guideline before 1/1/2015 and those counties whose states did not expand by that time. From 2010 to 2018, the difference in change of the number of physicians is 12.40 (95% CI: 7.93 to 16.88; p-value < 0.001) per 100, 000 population between those counties whose states expanded Medicaid eligibility guideline before 1/1/2018 and those counties whose states did not expand by that time.

2.6.3 Association between Medicaid Expansion and PCP Supply

A LMEM was fit to evaluate the association between Medicaid expansion and PCP supply and the results are reported in Table 2.5 The results suggest a statistically significant difference in change of the number of PCPs per 100, 000 population from 2010 to 2018 between those counties whose states expanded Medicaid eligibility guideline before 12/31/2018 and those counties whose states did not expand by that time. The expected difference is 3.30 (95% CI: 1.22 to 5.37; p-value =0.002) per 100,000 people in this period. However, difference in change of the number of PCPs per 100, 000 population from 2010 to 2015 is not statistically significant between counties whose states expanded Medicaid eligibility guideline before 1/1/2015 and those counties whose states did not expand by that time, with an expected difference of 1.73 (95% CI: - 0.14 to 3.60; p-value =0.070) PCPs per 100,000 people.

2.6.4 Association between Medicaid Expansion and Specialists Supply

LMEMs were fit to evaluate the association between Medicaid expansion and supply for each of the eight specialists. Table 2.6 reports the result for each of the eight specialists from 2010 to 2015, as well as from 2010 to 2018. The results suggest a statistically significant difference in change of physician supplies from 2010 to 2018 in all

specialties except for Psychiatry and Radiology. From 2010 to 2018, the expected difference is 0.80 (95% CI: 0.39 to 1.21; p-value <0.001) per 100,000 people for specialists in Anesthesiology, 0.23 (95% CI: 0.03 to 0.43; p-value = 0.022) per 100,000 people for specialists in Cardiovascular Medicine, 0.85 (95% CI: 0.22 to 1.49; p-value = 0.008) per 100,000 people for specialists in Emergency Medicine, 0.71 (95% CI: 0.35 to 1.07; p-value < 0.001) per 100,000 people for specialists in OB/GYN, 0.66 (95% CI: 0.33 to 0.99; p-value < 0.001) per 100,000 people for specialists in Orthopedic Surgery, and 0.91 (95% CI: 0.43 to 1.38; p-value < 0.001) per 100,000 people for specialists in General Surgery.

## 2.7 DISCUSSION

The findings of this study imply that Medicaid expansion had a positive effect on availability of professional providers. The results suggest a statistically significant difference in change of the number of total physicians, PCPs, Anesthesiologists, Cardiovascular Medicine physicians, Emergency Medicine physicians, OB/GYN physicians, Orthopedic Surgeons, and General Surgeons per 100,000 population from 2010 to 2018 located in those counties whose states expanded Medicaid eligibility guidelines before 1/1/2018 and those counties whose states did not expand by that time.

Given the objective of Medicaid expansion covering those individuals that were previously uninsured, this finding is consistent with other similar studies that investigated physician geographical practice location decisions based on personal financial considerations. And as suggested in prior studies and as discussed in Essay 1, financial aspects influence physicians and their decision where to locate and practice, particularly if they are in a singular or group and not paid a salary. (Wright, 2010) This study results support the suggestion that physicians follow the money, and the specialty physicians are more sensitive to compensation changes than their PCP counterparts.

To understand the relationship between Medicaid expansion and professional providers, previous research analyzed the payment methodology and the patient volume increase created by the eligibility expansion. Specific to this group, Medicaid has traditionally paid physicians' lower fees for similar services than other third-party insurances or Medicare. Prior studies had strongly suggested that before the ACA was implemented, low Medicaid fees presented a barrier to health care access for Medicaid enrollees because of physicians' lack of enthusiasm to assume new Medicaid patients (Berman et al. 2002; Davidson 1982; Decker 2012; Sloan, et al.,1978; Zuckerman et al. 2004).

The ACA did offer supplemental payments to avert issues with primary physicians and encourage the acceptance of Medicaid patients; however, specialists did not receive similar compensation enhancements. The fee structure for primary care services was increased for 2013 and 2014 on a par with Medicare levels for both Medicaid fee-for-service and Medicaid managed care to accommodate the increased need of primary care providers and to make Medicaid enrollees more desirable. The federal government paid for this increase, thus upgrading fees for primary care physicians and pediatricians. Difficulties during implementation caused delays and many eligible physicians did not begin receiving higher fees until mid- to late 2013. However, physicians received the higher primary care fees retroactively through the beginning of 2013. (Callison & Nguyen, 2018; Saulsberry, 2019) The funding for the increased payments to primary care services was not reauthorized and ended in December 2014. States could continue to finance the higher primary care payments using their funds and federal matching dollars, or fees could be reduced to previous levels. Most states rolled fees back; however, some continued the fee bump in whole or in part. (Callison & Nguyen, 2018)

In general, prior study results were inconclusive on whether the increase in primary care fees increased access to primary care for Medicaid enrollees. (Saulsberry 2019) According to a recent systematic review on the effect of changing Medicaid fees on provider participation and care accessibility conducted by Saulsberry (2019), the evidence did not clearly show a positive relationship between the Medicaid fee structure and *provider participation* in the program. The results however did report an improvement in *accessibility to care*. (Saulsberry 2019) A study by Callison & Nguyen (2018) concluded that the boost in fees increased outpatient visits, emergency department utilization and pharmaceutical orders but only minor improvements in access to care. (Callison & Nguyen 2018) Another study found a 7.7 % increase in the availability of appointments for Medicaid enrollees between 2012 and 2014 in ten (10) states (Polsky et al., 2015). The increase in availability was more significant for states with more substantial increases in reimbursement rates, suggesting that the fee increase likely contributed to the greater availability of physicians. Another study found that the increased payments had, at most, a modest effect on providers willing to take on new Medicaid patients (MACPAC 2015). A similar study concluded that there was no overall increase in primary care physicians' acceptance of new Medicaid patients from 2011 to 2014, using the National Electronic Health Records Survey and the National Health Interview Survey (Decker 2016).

This is an important distinction in that although there is greater availability to care, providers may not be participating in Medicaid at the same level as better paying third party insurances. According to the MACPAC report, more physicians would be interested in Medicaid if the fee schedule was similar to Medicare's reimbursement.

Medicaid typically pays 72% of the Medicare payment for equivalent services in 2016 when comparing fee for service payments, according to the U.S. Centers for Medicaid

and Medicare. As explained by Birdman, (2015), low reimbursement and differing state rates have resulted in some physicians refusing to accept Medicaid patients. (Bindman 2015; Zuckerman et.al., 2017)) Upon the expiration of the primary care physician increase, a study by Rosenbaum published in the New England Journal of Medicine (2014) suggested that removing the reimbursement incentive reduced provider motivation to accept Medicaid patients and concluded that of the 85% of physicians accepting new patients, only 65% had accepted Medicaid patients. In addition to low reimbursement rates, physician providers have cited other reasons that have discouraged them from offering care, including complex billing regulations, slow payments, and risks associated with a high level of social and health issues. (Rosenbaum, 2014). However, according to a recent study by Neprash et.al., (2018) it was suggested that Medicaid typically represented a small share of most physician's payer mix. And, after Medicaid expansion occurred in 2014, most physicians continued to treat Medicaid patients at the same level or slightly increased their Medicaid participation, with more participation observed in states that expanded eligibility. Nevertheless, according to Neprash, Medicaid patients remained clustered among relatively few physicians after expansion with many still seeking patients with better paying physician fee schedules.

Although the literature and prior studies reflect some open-ended questions regarding the desirability of adding Medicaid patients to an individual or group practice that is compensated on productivity, there are few uncertainties regarding the systemwide benefits afforded by Medicaid expansion. Prior studies concluded that Medicaid expansion was strongly associated with improved hospital financial performance and substantially lowered the potential for closure, especially in rural markets and counties with a high percentage of uninsured adults before Medicaid expansion. (Lindrooth, 2018; CMS.gov

2019.) The corresponding interdependency of the associated providers connected to hospitals and healthcare systems more clearly explains the gravitation of the professional workforce to communities with strong healthcare infrastructures. Similarly, these studies concluded that in those states that did not expand Medicaid, hospitals and particularly those in rural communities were at risk for closure. Professional providers within those communities face potential unemployment or lack of a patient volume to grow their practice, and therefore seek geographic areas with less financial risk.

For further context, a 2018 physician census summary prepared by the Federation of State Medical Boards (FSMB) reported that the population of licensed physicians increased by 16% between 2010 to 2018. (Young et al, 2019). However, although the number of physicians graduating medical school grew, it was at a slower rate than the number of retiring physicians. And with health care demands increasing and population shifts occurring, shortages and resource distribution problems are becoming more evident.

### 2.7.1 Limitations

Limitations include the possibility that some unmeasured variables or characteristics could explain differences in the outcome. In recent years, professional providers have engaged in vertical integration with hospitals and healthcare systems and become paid employees who could impact their practice patterns. Another limitation lies on the nature of the study. This is an ecological study that used county-level data. Hence, the conclusions I obtained from this research cannot be extended and interpreted on patients' individual level. Disadvantages or weaknesses can occur in the data being used, although the best available data sets were selected for these studies. Incomplete or inaccurate data is a potential threat in any of the sources; however, care is being taken to minimize this threat to validity. The U.S. Census Bureau data set was the source for the covariates. The

professional data was obtained from the Area Health Resource File (AHRF), which is a publicly available dataset that aggregates data from disparate data sources. It contains county-level and state-level data on healthcare workers and other demographic and health-related variables. Some variables are based on data from the American Dental Association (ADA), the American Hospital Association (AHA), and the American Medical Association (AMA). The AHRF has some recognized limitations. The years for which data are available differ across the variables, which may limit provider related longitudinal research. Data on physician variables are available on an annual basis, but data on some other health professions and many socio-demographic variables are available on only a decennial basis because they are obtained from the U.S. Census. Additionally, professional data is obtained from the AMA Masterfile containing the physician workforce files. Prior research studies have analyzed data on physicians collected by state licensing boards that have found significant discrepancies between the numbers of physicians reported by licensing boards and the AMA. The AMA data may be less accurate than licensing board data because physicians have a stronger incentive to update their licensure records than to fill out AMA surveys. Also, the numbers of physicians in each county are determined based on physicians' preferred mailing addresses, which are not necessarily their practice addresses. (Society of General Internal Medicine, n.d.) This may impact the county-level physicians supply in each county among those physicians who practice cross counties.

## 2.8 CONCLUSION

The implications of this study are relevant to current policy debates addressing further expansion initiatives assuring that the supporting health care resources are available and accessible. First and foremost, states that have not expanded may wish to reconsider this option with the multitude of study results pointing to the benefits of strengthening the

healthcare infrastructure, improving community-wide availability and accessibility to health care through specifically attracting professional providers to their communities. According to estimates from the Kaiser Family Foundation (2021), 2.2 million low-income uninsured people are currently in a "coverage gap" in the twelve states that did not expand, by not meeting eligibility criteria for either ACA marketplace insurance or Medicaid. An additional 1.8 million individuals in these states would have been eligible for Medicaid if their state expanded to 138% of the FPG. (Rudowitz, 2021) With the federal government covering 90% of the cost of Medicaid adult coverage through the ACA expansion, and temporary incentives through the American Rescue Plan Act (ARPA), additional states may choose to expand which would likely have a positive effect on the professional physician providers within the healthcare system. Additional benefits may be afforded through the American Families Plan as details are rolled out in the near future. Secondly, private insurance and Medicaid/Medicare governmental plans will also be guided by the changes in demographics identified in the 2020 U.S. Census which found that the US population grew by 7% and became more diverse with people of color representing 43% of the total population up from 34% in 2010. The proportion of adults increased from 76% in 2010 to 78% in 2020. Population growth mostly occurred in metropolitan areas, while about half of US counties saw a reduction in their population count. (U.S. Census Bureau, 2020) Accounting for the shift in population will require strategic planning for determining resource allocations towards meeting the various healthcare community needs.

Given the evolving political, demographic and social environment, converting more of the uninsured to insured through adoption of expanded Medicaid would reduce the charity care and uncompensated care expense burden throughout the healthcare provider spectrum. And, as prior research work and this study has indicated, the professional

component has the proclivity to be driven by compensation incentives which should be considered to better balance resources throughout the system. An important step is to develop the payment mechanisms to motivate professionals to locate to underserved communities, thus assuring sufficient physician resources and availability. For future policy deliberations and to measure program success, availability should not only be measured by physician supply, but be gauged by the actual participation in Medicaid at an equal level as other third-party insurances in order to reduce community healthcare disparities. With insufficient numbers of participating physicians, patients may have insurance coverage but not real accessibility to care. It is recommended that incentivizing physicians through compensation should be a part of future Medicaid expansion initiatives to provide both availability and accessibility to primary care and specialty professional providers.

## REFERENCES


AHA American Hospital Association Uncompensated Care Fact Sheet (2017) https://www.aha.org/system/files/2018-01/2017-uncompensated-care-factsheet.pdf

Akhabue, E., Pool, L. R., Yancy, C. W., Greenland, P., & Lloyd-Jones, D. (2018). Association of State Medicaid Expansion With Rate of Uninsured Hospitalizations for Major Cardiovascular Events, 2009-2014. *JAMA network open*, *1*(4), e181296. doi:10.1001/jamanetworkopen.2018.1296

Angier, H., Hoopes, M., Gold, R., Bailey, S. R., Cottrell, E. K., Heintzman, J., Marino, M., & DeVoe, J. E. (2015). An early look at rates of uninsured safety net clinic visits after the Affordable Care Act. *Annals of family medicine*, *13*(1), 10–16. https://doi.org/10.1370/afm.1741

Anderson, G. F., Hussey, P., & Petrosyan, V. (2019). It's Still The Prices, Stupid: Why The US Spends So Much On Health Care, And A Tribute To Uwe Reinhardt. *Health affairs (Project Hope)*, *38*(1), 87–95. https://doi.org/10.1377/hlthaff.2018.05144

Barkholz D. Moving patient payment upfront. (2016, May 23). *Modern Healthcare*, *46*(21), 0022.

Berchick, E.R., Barnett J.C., Upton R.D. (2019) Current Population Reports, P60-267(RV), Health Insurance Coverage in the United States: (2018), U.S. Government Printing Office,WashD.C.https://www.census.gov/content/dam/Census/library/publications/2019/demo/p60-267.

Berman, S., Dolins, J., Tang, S. F., & Yudkowsky, B. (2002). Factors that influence the willingness of private primary care pediatricians to accept more Medicaid patients. *Pediatrics*, *110*(2 Pt 1), 239–248. https://doi.org/10.1542/peds.110.2.239

Bindman A. B. (2015). The other physician payment problem. *JAMA*, *313*(21), 2112–2113. https://doi.org/10.1001/jama.2015.4797

Brennan T. A. (2002). Luxury primary care--market innovation or threat to access? *The New England journal of medicine*, *346*(15), 1165–1168. https://doi.org/10.1056/NEJM200204113461513

Callison, K., & Nguyen, B. T. (2018). The Effect of Medicaid Physician Fee Increases on Health Care Access, Utilization, and Expenditures. *Health services research*, *53*(2), 690–710. https://doi.org/10.1111/1475-6773.12698

Candon, M., Zuckerman, S., Wissoker, D., Saloner, B., Kenney, G. M., Rhodes, K., & Polsky, D. (2018). Declining Medicaid Fees and Primary Care Appointment Availability for New Medicaid Patients. *JAMA internal medicine*, *178*(1), 145–146. https://doi.org/10.1001/jamainternmed.2017.6302

Carpenter,B. & Neun S, (1999), An analysis of the location decision of young primary care physicians, *Atlantic Economic Journal*, 27, issue 2, p. 135-149.

Christopher, A. S., McCormick, D., Woolhandler, S., Himmelstein, D. U., Bor, D. H., & Wilper, A. P. (2016). Access to Care and Chronic Disease Outcomes Among Medicaid-Insured Persons Versus the Uninsured. *American journal of public health*, *106*(1), 63–69. https://doi.org/10.2105/AJPH.2015.302925

Chou, C. F., & Lo Sasso, A. T. (2009). Practice location choice by new physicians: the importance of malpractice premiums, damage caps, and health professional shortage area designation. *Health services research*, *44*(4), 1271–1289. https://doi.org/10.1111/j.1475-6773.2009.00976.x

CMS/Centers for Medicare & Medicaid Services; National Health Expenditure Data, (2021) https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/highlights.pdf

CMS/Centers for Medicare and Medicaid Services (2019, September) https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/Improving-Access-to-Maternal-Health-Care-in-Rural-Communities-An-Issue-Brief.

Cohen R, & Martinez M. (2015, Aug) *Health Insurance Coverage: Early Release of Estimates from the National Health Interview Survey, January-March 2015:* US Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Health Statistics.

Cohen, R. A., & Zammitti, E. P. (2018). High-deductible Health Plan Enrollment Among Adults Aged 18-64 With Employment-based Insurance Coverage. *NCHS data brief*, (317), 1–8.

Collins S. R.Gunja M.Z. , Doty M.M. , Bhupal H.K., (2018) *First Look at Health Insurance Coverage in 2018 Finds ACA Gains Beginning to Reverse*: Findings from the Commonwealth Fund Affordable Care Act Tracking Survey, Feb.–Mar., *To the Point* (blog), Commonwealth Fund, May.

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

Cunningham, P. J., & Hadley, J. (2008). Effects of changes in incomes and practice circumstances on physicians' decisions to treat charity and Medicaid patients. *The Milbankquarterly*,*86*(1),91–123.https://doi.org/10.1111/j.1468-0009.2007.00514.x

Davidson S. M. (1982). Physician participation in Medicaid: background and issues *Journal of health politics, policy and law*, *6*(4),703–717. https://doi.org/10.1215/03616878-6-4-703

Decker S. L. (2012). In 2011 nearly one-third of physicians said they would not accept new Medicaid patients, but rising fees may help. *Health affairs (Project Hope)*, *31*(8), 1673–1679. https://doi.org/10.1377/hlthaff.2012.0294

Decker, S.L. (2016) The 2013–2014 Medicaid Primary Care Fee Bump, Primary Care Physicians' Medicaid Participation, and Patient Access Measures. Paper presented at the Association for Public Policy Analysis and Management annual fall research conference, Washington, DC, November 3–5

DeVoe, J. E., Angier, H., Burdick, T., & Gold, R. (2014). Health information technology: an untapped resource to help keep patients insured. *Annals of family medicine*, *12*(6), 568–572. https://doi.org/10.1370/afm.1721

\

Dranove, D., Garthwaite, C., & Ody, C. (2016). Uncompensated Care Decreased At Hospitals In Medicaid Expansion States But Not At Hospitals In Nonexpansion States.*Healthaffairs(ProjectHope)*,*35*(8),1471–1479. https://doi.org/10.1377/hlthaff.2015.1344

Finkelstein, A. N., Taubman, S. L., Allen, H. L., Wright, B. J., & Baicker, K. (2016). Effect of Medicaid Coverage on ED Use - Further Evidence from Oregon's Experiment.

*The New England journal of medicine*, *375*(16), 1505–1507. https://doi.org/10.1056/NEJMp1609533

GAO Government Accountability Office (2018 August); Rural Hospital Closures; Numbers and Characteristics of Affected Hospitals and Contributing Factors; https://www.gao.gov/assets/gao-18-634.pdf

Germack, H. D., Kandrack, R., & Martsolf, G. R. (2019). When rural hospitals close, the physician workforce goes. *Health Affairs*, *38*(12), 2086-2094.

Gold, J. (2015) The ABC's of ACO's *Kaiser Family Foundation* https: khn.org/news/aco-accountable-care-organization

Gotanda, H., Kominski, G., & Tsugawa, Y. (2020). Association Between the ACA Medicaid Expansions and Primary Care and Emergency Department Use During the First 3 Years. *Journal of general internal medicine*, *35*(3), 711–718. https://doi.org/10.1007/s11606-019-05458

Hadley, J., & Holahan, J. (2003). How much medical care do the uninsured use, and who pays for it? *Health Affairs, ,* W3-66-81.

Hadley, J., Steinberg, E. P., & Feder, J. (1991). Comparison of uninsured and privately insured hospital patients. Condition on admission, resource use, and outcome. *JAMA*, *265*(3), 374–379.

Hafner-Eaton C. (1993). Physician utilization disparities between the uninsured and insured. Comparisons of the chronically ill, acutely ill, and well nonelderly populations. *JAMA*, *269*(6), 787–792.

Health Care Education and Reconciliation Act, Pub. L. No. 111-152, 124 Stat. 1029 (March 30, 2010).

Hing, E., & Hsiao, C. J. (2014). State variability in supply of office-based primary care providers: United States, 2012. *NCHS data brief*, (151), 1–8.

Institute of Medicine (US) National Cancer Policy Forum. (2009). *Ensuring Quality Cancer Care through the Oncology Workforce: Sustaining Care in the 21st Century*. National Academies Press (US).

Jacobson, P. D., & Jazowski, S. A. (2011). Physicians, the Affordable Care Act, and primary care: disruptive change or business as usual?. *Journal of general internal medicine*, *26*(8), 934–937. https://doi.org/10.1007/s11606-011-1695-8

Kaiser Family Foundation (2021, July) https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions

Kaufman, H. W., Chen, Z., Fonseca, V. A., & McPhaul, M. J. (2015). Surge in newly identified diabetes among medicaid patients in 2014 within medicaid expansion

States under the affordable care act. *Diabetes care, 38*(5), 833–837. https://doi.org/10.2337/dc14-2334

Kaufman, B. G., Reiter, K. L., Pink, G. H., & Holmes, G. M. (2016). Medicaid Expansion Affects Rural And Urban Hospitals Differently. *Health affairs (Project Hope), 35*(9), 1665–1672. https://doi.org/10.1377/hlthaff.2016.0357

Kazanjian, A., & Pagliccia, N. (1996). Key factors in physicians' choice of practice location: findings from a survey of practitioners and their spouses.*Health &Place*, 2(1), 27–34

Kominski, G. F., Nonzee, N. J., & Sorensen, A. (2017). The Affordable Care Act's Impacts on Access to Insurance and Health Care for Low-Income Populations. *Annual review of public health*, *38*, 489–505. doi:10.1146/annurev-publhealth-031816-044555

Keehan, S. P., Stone, D. A., Poisal, J. A., Cuckler, G. A., Sisko, A. M., Smith, S. D., . . . Lizonitz, J. M. (2017). *Health Affairs*, 36, 553-563. National health expenditure projections, 2016–25: Price increases, aging push sector to 20 percent of economy. doi:10.1377/hlthaff.2016.1627

Lindrooth, R. C., Perraillon, M. C., Hardy, R. Y., & Tung, G. J. (2018). Understanding The Relationship Between Medicaid Expansions And Hospital Closures. *Health affairs (Project Hope), 37*(1), 111–120. https://doi.org/10.1377/hlthaff.2017.0976

Loehrer, A. P., Chang, D. C., Scott, J. W., Hutter, M. M., Patel, V. I., Lee, J. E., & Sommers, B. D. (2018). Association of the Affordable Care Act Medicaid Expansion with Access to and Quality of Care for Surgical Conditions. *JAMA surgery*, *153*(3), e175568.

MACPAC (Medicaid and CHIP Payment and Access Commission). An Update on the Medicaid Primary Care Payment Increase. March 2015 Report to Congress on Medicaid and CHIP, 129–38. Washington, DC: MACPAC.

McMorrow S**,** Kenney GM**,** Long SK**,** Anderson N**. (**2015**).** Uninsurance among young adults continues to decline, particularly in Medicaid expansion states. *Health Aff*. 34:616–20

McMorrow S**,** Long SK**,** Kenney GM**,** Anderson N**. (**2015**)** Uninsurance disparities have narrowed for black and Hispanic adults under the Affordable Care Act. *Health Aff*. 34:1774–78

Miller, S.T.; The IRS perspective on charity care. (2007). *Healthcare Financial Management, 1*, 28.

Moffit, R. (2016) Six Years of the Affordable Care Act: Obama's Mounting Problems. *The Heritage Foundation.* http://www.heritage.org/health-care-reform/report/year-six-the-affordable-care-act-obamacares-mounting-problems

Mort, E. A., Edwards, J. N., Emmons, D. W., Convery, K., & Blumenthal, D. (1996). Physician response to patient insurance status in ambulatory care clinical decision-making. Implications for quality of care. *Medical care*, *34*(8), 783–797.

Neprash, H. T., Zink, A., Gray, J., & Hempstead, K. (2018). Physicians' Participation In Medicaid Increased Only Slightly Following Expansion. *Health Aff (Millwood)*, *37*(7), 1087–1091. https://doi.org/10.1377/hlthaff.2017.1085

Nikpay, S., Buchmueller, T., & Levy, H. G. (2016). Affordable Care Act Medicaid Expansion Reduced Uninsured Hospital Stays In 2014. *Health Affairs (Project Hope)*, *35*(1), 106–110. https://doi-org.ezproxy.fiu.edu/10.1377/hlthaff.2015.1144

Ndumele, C. D., Mor, V., Allen, S., Burgess, J. F., Jr, & Trivedi, A. N. (2014). Effect of expansions in state Medicaid eligibility on access to care and the use of emergency department services for adult Medicaid enrollees. *JAMA internal medicine*, *174*(6), 920–926. https://doi.org/10.1001/jamainternmed.2014.588

Nguyen, K. H., & Sommers, B. D. (2016). Access and Quality of Care by Insurance Type for Low-Income Adults Before the Affordable Care Act. *American journal of public health*, *106*(8), 1409–1415. https://doi.org/10.2105/AJPH.2016.303156

Obama B. (2016). United States Health Care Reform: Progress to Date and Next Steps. *JAMA*, *316*(5), 525–532. doi:10.1001/jama.2016.9797

O'Toole, T. P., Simms, P. M., & Dixon, B. W. (2001). Primary care office policies regarding care of uninsured adult patients. *Journal of general internal medicine*, *16*(10), 693–696.

Patrick, D. L., Madden, C. W., Diehr, P., Martin, D. P., Cheadle, A., & Skillman, S. M. (1992). Health status and use of services among families with and without health insurance. *Medical care*, *30*(10), 941–949.

Papanicolas, I., Woskie, L. R., & Jha, A. K. (2018). Health Care Spending in the United States and Other High-Income Countries. *JAMA*, *319*(10), 1024–1039. https://doi.org/10.1001/jama.2018.1150

Pear R. (2018, June 5) Medicare's Trust Fund Is Set to Run Out in 8 Years. Social Security. *The New York Times*. https://www.nytimes.com/2018/06/05/us/politics/medicare-social-security-finances.html.

Polsky, D., Richards, M., Basseyn, S., Wissoker, D., Kenney, G. M., Zuckerman, S., & Rhodes, K. V. (2015). Appointment availability after increases in Medicaid payments for primary care. *The New England journal of medicine*, *372*(6), 537–545. https://doi.org/10.1056/NEJMsa1413299

PPACA The Patient Protection and Affordable Care Act (PPACA), Pub. L. No. 111-148, 124 Stat 119 (March 23, 2010).2.

Quadagno J. (2011). Interest-group influence on the Patient Protection and Affordability Act of 2010: winners and losers in the health care reform debate. *Journal of health politics, policy and law*, *36*(3), 449–453. https://doi.org/10.1215/03616878-1271081

Rama, A., (2018, April) How are Physicians Paid? A detailed look at the methods used to compensate physicians in different practice types and specialties. *AMA Policy ResearchPerspectives*;https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/member/health-policy/prp-how-physicians-paid.pdf

Rhodes, K. V., Bisgaier, J., Lawson, C. C., Soglin, D., Krug, S., & Van Haitsma, M. (2013). "Patients who can't get an appointment go to the ER": access to specialty care for publicly insured children. *Annals of emergency medicine*, *61*(4), 394–403. https://doi.org/10.1016/j.annemergmed.2012.10.030

Rosenbaum S. (2014). Medicaid payments and access to care. *The New England journal of medicine*, *371*(25), 2345–2347. https://doi.org/10.1056/NEJMp1412488

Rosenbaum S. (2011). Law and the Public's Health. *Public Health Reports*, *126*(1), 130.
4. NASHP Chart – An Overview of ACA Provisions and Their Repeal Implications forStates.http://nashp.org/wp-content/uploads/2017/01/NASHP-ACARepealImpactsChart.pdf

Rosenbaum, S., & Westmoreland, T. M. (2012). The Supreme Court's surprising decision on the Medicaid expansion: how will the federal government and states proceed?. *Healthaffairs(ProjectHope)*, *31*(8),1663–1672. https://doi.org/10.1377/hlthaff.2012.0766

Rudowitz R., Garfield R., Levitt L. (2021, April) Filling the coverage gap: policy options and considerations, *Kaiser Family Found*. Issue Brief

Rudowitz R**,** Garfield R**. (**2015, Sept.) New analysis shows states with Medicaid expansion experienced declines in uninsured hospital discharges. *Kaiser Family Found*. Issue Brief

Santerre, R. E., & Neun, S. P. (2000). *Health economics: Theories, insights, and industry studies*. Fort Worth, TX: Dryden Press.

Saulsberry, L., Seo, V., & Fung, V. (2019). The Impact of Changes in Medicaid Provider Fees on Provider Participation and Enrollees' Care: a Systematic Literature Review. *Journalofgeneralinternalmedicine*, *34*(10),2200–2209. https://doi.org/10.1007/s11606-019-05160-x

Singer, A. J., Thode, H. C., Jr, & Pines, J. M. (2019). US Emergency Department Visits and Hospital Discharges Among Uninsured Patients Before and After

Implementation of the Affordable Care Act. *JAMA network open*, *2*(4), e192662. https://doi.org/10.1001/jamanetworkopen.2019.2662

Sloan, F., Mitchell, J., & Cromwell, J. (1978). Physician participation in state Medicaid programs. *The Journal of human resources*, *13 Suppl*, 211–245.

Sommers BD**,** Baicker K**,** Epstein AM**.** 2012. Mortality and access to care among adults after state Medicaid expansions. *N. Engl. J. Med.* 367:1025–34

Sommers, B. D., & Simon, K. (2017). Health Insurance and Emergency Department Use - A Complex Relationship. *The New England journal of medicine*, *376*(18), 1708–1711. https://doi.org/10.1056/NEJMp1614378

Tolbert J., Orgera K. Singer N., & Damico A. (2019, December). Key Facts about the Uninsured Population http://files.kff.org/attachment//fact-sheet-key-facts-about-the-uninsured-population

U.S. Census Bureau. (2020). *2020 census results* Retrieved from https://www.census.gov/programs-surveys/decennial-census/decade/2020/2020-census-results.html

Wanamaker, B. & Bean B., Seize the ACA; (2013): The Innovators Guide to the Affordable Care Act. *The Clayton Christensen Institute*; https://www.christenseninstitute.org/wp-content/uploads/2013/09/Seize_the_ACA_

Weissman, J., & Epstein, A. M. (1989). Case mix and resource utilization by uninsured hospital patients in the Boston metropolitan area. *JAMA*, *261*(24), 3572–3576.

Wishner J. & Burton R. (2017). *How have providers responded to the increased demand for health care under the Affordable Care Act*: The Urban Institute https://www.urban.org/sites/default/files/publication/94396/2001576-how-have-providers-responded-to-the-increased-demand-for-health-care-under-the-affordble-care-act/2017

Woolhandler, S., Campbell, T., & Himmelstein, D. U. (2003). Costs of health care administration in the United States and Canada. *The New England journal of medicine*, *349*(8), 768–775. https://doi.org/10.1056/NEJMsa022033

Woolhandler, S., & Himmelstein, D. U. (2017). The Relationship of Health Insurance and Mortality: Is Lack of Insurance Deadly? *Annals of internal medicine*, *167*(6), 424–431. https://doi.org/10.7326/M17-1403

Wright D. B. (2010). Time is money: opportunity cost and physicians' provision of charity care 1996-2005. *Health services research*, *45*(6 Pt 1), 1670–1692. doi:10.1111/j.1475-6773.2010.01139.

Young A., Chaudhry,H.J.; Pei, X. ; Arnhart,K.; Dugan, M; Steingard,S.A. (2019) FSMB Census of Licensed Physicians in the United States. 2018; *Federation of State Medical Boards (FSMB)* Physician Census; https://www.fsmb.org/siteassets/advocacy/publications/2018census.pdf

Zhou, R. A., Baicker, K., Taubman, S., & Finkelstein, A. N. (2017). The Uninsured Do Not Use The Emergency Department More-They Use Other Care Less. *Health affairs (Project Hope)*, *36*(12), 2115–2122. https://doi.org/10.1377/hlthaff.2017.0218

Zuckerman, S., McFeeters, J., Cunningham, P., & Nichols, L. (2004). Changes in medicaid physician fees, 1998-2003: implications for physician participation. *Health affairs (Project Hope)*, *Suppl Web Exclusives*, W4–384. https://doi.org/10.1377/hlthaff.w4.374

Zuckerman, S., Williams, A. F., & Stockley, K. E. (2009). Trends in Medicaid physician fees, 2003-2008. *Health affairs (Project Hope)*, *28*(3), w510–w519. https://doi.org/10.1377/hlthaff.28.3.w510

Zuckerman S, Goin D. How much will Medicaid physician fees for primary care rise in 2013? Evidence from a 2012 survey of Medicaid physician fees; (2012, Dec.) Washington (DC): Kaiser Commission on Medicaid and the Uninsured;

Zuckerman, S., Skopec L., McCormack K. (2014, Dec.) Reversing the Medicaid Fee Bump: How Much Could Medicaid Physician Fees for Primary Care Fall in 2015? Washington, DC: Urban Institute.

Zuckerman, S., Skopec L.,Epstein, M.; (2017, Mar.) Medicaid Physician Fees After the ACA Primary Care Bump; Washington, DC: Urban Institute.

**TABLES**

**Table 2.1: U.S. States Medicaid expansion status to 138% FPL, pre & post 1/2014**

| State | Adopted & Implemented 1/2014 | Post 1/2014 Adoption Date | | Not Adopted |
|---|---|---|---|---|
| Alabama | | | | X |
| Alaska | | 9/2015 | | |
| Arizona | X | | | |
| Arkansas | X | | | |
| California | X | | | |
| Colorado | X | | | |
| Connecticut | X | | | |
| Delaware | X | | | |
| District of Columbia | X | | | |
| Florida | | | | X |
| Georgia | | | | X |
| Hawaii | X | | | |
| Idaho | | 1/2020 | | |
| Illinois | X | | | |
| Indiana | | 2/2015 | | |
| Iowa | X | | | |
| Kansas | | | | X |
| Kentucky | X | | | |
| Louisiana | | 7/2016 | | |
| Maine | | 1/2019 (Retro to 7/18) | | |
| Maryland | X | | | |
| Massachusetts | X | | | |
| Michigan | | 4/2014 | | |
| Minnesota | X | | | |
| Mississippi | | | | X |
| Missouri | | 8/2021 (Retro to 7/21) | | |
| Montana | | 1/2016 | | |
| Nebraska | | 10/2020 | | |
| Nevada | X | | | |
| New Hampshire | | 8/2014 | | |
| New Jersey | X | | | |
| New Mexico | X | | | |
| New York | X | | | |
| North Carolina | | | | X |
| North Dakota | X | | | |
| Ohio | X | | | |
| Oklahoma | | 7/2021 | | |
| Oregon | X | | | |
| Pennsylvania | | 1/2015 | | |
| Rhode Island | X | | | |
| South Carolina | | | | X |
| South Dakota | | | | X |
| Tennessee | | | | X |
| Texas | | | | X |
| Utah | | 1/2020 | | |
| Vermont | X | | | |
| Virginia | | 1/2019 | | |
| Washington | X | | | |
| West Virginia | X | | | |
| Wisconsin | | | | X |
| Wyoming | | | | X |

Note: The Medicaid eligibility expansion status in the above table is based on U.S. Centers for Medicaid and Medicare as of August 2021.

**Table 2.2: Professional Provider Inclusion Table (2018)**

| Physicians | Frequency (N) | Percentage (%) |
|---|---|---|
| **Primary Care Physicians (PCP) total** | **304,496** | **32%** |
| **Specialist Physicians total** | **634,484** | **68%** |
| **Anesthesiology** | **42,267** | **7%** |
| **Cardiovascular Medicine** | **22,521** | **4%** |
| **Emergency Medicine** | **45,202** | **7%** |
| **General Surgery** | **25,564** | **4%** |
| **OB/GYN** | **42,720** | **7%** |
| **Orthopedic Surgery** | **19,069** | **3%** |
| **Psychiatric** | **38,792** | **6%** |
| **Radiology** | **28,025** | **4%** |
| **Other** | **370,324** | **58%** |
| **U.S. Physicians Total** | **938,980** | **100%** |

Note: The frequency (N) and percentage (%) of providers in each category, based on Association of American Medical Colleges (AAMC) 2018 report.

**Table 2.3: County Level Population Characteristics in percentage: Mean (SD)**

| Variables | 2010 | 2015 | 2018 |
|---|---|---|---|
| **Counties with Medicaid eligibility guideline expansion: N (%)** | **N/A** | **1,039 (33.07) *** | **1,449 (47.71) **** |
| **Percent of poverty (under 138% of FPG): Mean (SD)** | **26.73 (8.03)** | **25.33 (8.19)** | **23.53 (7.89)** |
| **Percent of under 19: Mean (SD)** | **29.69 (3.15)** | **29.09 (3.25)** | **29.06 (3.29)** |
| **Percent of over 65: Mean (SD)** | **15.94 (4.19)** | **17.94 (4.49)** | **19.26 (4.71)** |
| **Percent of Black: Mean (SD)** | **9.03 (14.56)** | **9.22 (14.50)** | **9.33 (14.48)** |
| **Percent of Hispanic: Mean (SD)** | **8.33 (13.21)** | **9.15 (13.61)** | **9.63 (13.81)** |
| **Percent of Male: Mean (SD)** | **50.21 (1.23)** | **50.22 (1.30)** | **50.18 (1.26)** |

Note: This table summarize the mean and SD of each county-level population characteristics across 3,142 counties.
* Indicates the frequency and percent of county with Medicaid expansion by 1/1/2015.
** Indicate the frequency and percent of county with Medicaid expansion by 1/1/2018.

**Table 2.4: Difference in change of expected number of total physicians per 100,000 population between expanded and non-expanded counties**

| | Difference* | P Value** | 95% CI*** |
|---|---|---|---|
| Difference in change of expected number of total physicians **from 2010 to 2015** between expanded and non-expanded counties (Adjusted model) | **6.56** | **0.001** | **2.83, 10.28** |
| Difference in change of expected number of total physicians **from 2010 to 2018** between expanded and non-expanded counties (Adjusted model) | **12.40** | **< 0.001** | **7.93, 16.88** |

Note: *indicates the expected difference in the change of expected number of total physicians per 100,000 population from 2010 to 2015 (or from 2010 to 2018) between expanded and non-expanded counties based on the $\beta_3$ parameter in the LMEM model (1) ref. Section 2.5.5; **shows the p-value for testing if the difference is statistically significant (test level =0.05); ***indicates the range of difference with 95% confidence.

**Table 2.5: Difference in change of expected number of Primary Care Providers (PCP) per 100,000 population between expanded and non-expanded counties**

| | Difference* | P Value** | 95% CI*** |
|---|---|---|---|
| Difference in change of expected number of PCP **from 2010 to 2015** between expanded and non-expanded counties (Adjusted model) | **1.73** | **0.070** | **-0.14, 3.60** |
| Difference in change of expected number of PCP **from 2010 to 2018** between expanded and non-expanded counties (Adjusted model) | **3.30** | **0.002** | **1.22, 5.37** |

Note: * indicates the expected difference in the change of expected number of PCPs per 100,000 population from 2010 to 2015 (or from 2010 to 2018) between expanded and non-expanded counties based on the $\beta_3$ parameter in the LMEM model (1) ref. Section 2.5.5; ** shows the p-value for testing if the difference* is statistically significant (test level =0.05); ***indicates the range of difference with 95% confidence.

**Table 2.6: Difference in change of expected number of Specialists per 100,000 population between expanded and non-expanded counties**

| Difference in change of expected number of Specialty Care Providers between expanded and non-expanded counties (Adjusted model) | From 2010 to 2015 | | | From 2010 to 2018 | | |
|---|---|---|---|---|---|---|
| | Difference* | P Value** | 95% CI*** | Difference# | P Value## | 95% CI### |
| Anesthesiology | 0.41 | 0.007 | 0.11, 0.70 | 0.80 | <0.001 | 0.39, 1.21 |
| Cardiovascular Medicine | 0.19 | 0.020 | 0.03, 0.35 | 0.23 | 0.022 | 0.03, 0.43 |
| Emergency Medicine | -0.21 | 0.482 | -0.36, 0.78 | 0.85 | 0.008 | 0.22, 1.49 |
| OB/GYN | 0.33 | 0.031 | 0.03, 0.62 | 0.71 | <0.001 | 0.35, 1.07 |
| Orthopedic Surgery | 0.35 | 0.019 | 0.06, 0.63 | 0.66 | <0.001 | 0.33, 0.99 |
| Psychiatric | 0.21 | 0.180 | -0.10, 0.51 | 0.29 | 0.105 | -0.06, 0.63 |
| Radiology & Diag. Radiology | -0.003 | 0.987 | -0.34, 0.33 | 0.25 | 0.212 | -0.14,0.63 |
| General Surgery | 0.74 | 0.001 | 0.30, 1.18 | 0.91 | <0.001 | 0.43, 1.38 |

Note: * indicates the expected difference in the change of expected number of PCPs per 100,000 population from 2010 to 2015 between expanded and non-expanded counties based on the $\beta_3$ parameter in the LMEM model (1) ref. Section 2.5.5; ** shows the p-value for testing if the difference * is statistically significant (test level =0.05); indicates the range of difference* with 95% confidence. # indicates the expected difference in the change of expected number of PCPs per 100,000 population from 2010 to 2015 between expanded and non-expanded counties based on the $\beta_3$ parameter in the LMEM model (1) ref. Section 2.5.5; ## shows the p-value for testing if the difference# is statistically significant (test level =0.05); ###indicates the range of difference# with 95% confidence.

## 3.0 ESSAY 3 - COMMUNITY PUBLIC HEALTH INFRASTRUCTURE IMPACT ON INSURANCE ENROLLMENT

### 3.1 ABSTRACT

A central principle of the public health system in the U.S. is to advocate and safeguard communities' health. Strong and effective community healthcare infrastructures have recently been tested during a pandemic environment and network weaknesses have been exposed. Prior studies have shown that communities with a high insured population enjoy system-wide benefits including greater provider accessibility and improved health outcomes. ([1]IOM 2002). This study evaluates the community insurance rate and the relationship to the public health infrastructure. Infrastructure strength has been described in other studies using various measures however this study defines a proxy of the infrastructure strength as a Public Health Accreditation Board (PHAB) accredited county health department or system within a given county. The PHAB began accrediting health agencies in 2013 however the importance of achieving accreditation status goes beyond prestige and an enhanced reputation. Prior studies have documented that accredited local health departments represent a more robust public health infrastructure. (Ingram, et al. 2018; Allen, et al. 2019). These studies found that collaboration with other local agencies and various organizations required to achieve accreditation has a positive impact on the overall community's health. The hypothesis for this essay is that increases in insurance enrollment would be greater in counties with a stronger public health system infrastructure following the passage of Patient Protection and Affordable Care Act (ACA) (Affordable Care Act 2010) A supportive and well-developed public health infrastructure will likely offer a broad range of services, including the ability to navigate patients towards third-party insurance coverage.

This study suggests that increases in insurance enrollment are greater in counties with stronger public health infrastructures. There is a 0.68 (95% CI: 0.28 to 1.08; p-value < 0.001) per 100,000 population increase in the improvement of insurance enrollment rate for counties with a stronger public health infrastructure (PHAB accreditation as the proxy) when controlling for the county-level poverty rate, percentage of Black, percentage of Hispanic, percentage of over 65, percentage of under 19, and percentage of male.

Outcome data also suggests that Medicaid expansion is a more significant factor than accreditation. When examining whether the association between the change in insurance rate and accreditation status was modified by the Medicaid expansion status of the counties, Medicaid expansion, on average, increased the change of insurance rate by 3.95 (95% CI: 3.72 to 4.18; p-value<0.001) per 100,000 population, and accreditation increased the change of insurance rate by 1.02 (95% CI: 0.53 to 1.51; p-value <0.001). A statistically significant interaction was found between accreditation status and expansion status with a point estimate of -0.82 (95% CI: -1.51 to -0.14; p-value = 0.018) per 100,000 population, indicating the Medicaid expansion status significantly modifies the association between accreditation status and the change in insurance rate.

Lastly, study results indicate that stronger county public health infrastructures in non-expanded states can help close the uninsurance gap with a greater improvement in the county-level medical insurance enrollment rate.

## 3.2 INTRODUCTION

This study considers the strength of the public health system as it relates to insurance enrollment and if counties with stronger public health infrastructures had greater insurance enrollment increases following the 2010 passage of the ACA. Healthcare

infrastructure strength has been measured to assess community health outcomes; however, its relationship with health care insurance coverage has not been examined.

Under the provisions of the ACA, Medicaid eligibility expanded up to an income of 138% Federal Poverty Guidelines (FPG). Despite the criticisms, more individuals became insured, and the overall uninsured rate declined from 16.0% in 2010 to 9.1% in 2015. (Obama, 2016). However, not all states participated in the expansion, and therefore eligibility and coverage inconsistencies exist in the U.S. (APPENDIX 1)

Educating the community regarding insurance coverage options has been previously recognized as a method to increase enrollment. Previous studies have shown that without proper guidance towards insurance and third-party programs such as Medicaid, individuals may not be aware of eligibility. (Collins et al., 2018). The ACA Section 3510 awarded grants for patient navigators to help the public understand insurance marketplace choices for coverage options. (Affordable Care Act 2010) Contained in this legislation in Section 3306.was a funding total of approximately $54 million budgeted for state outreach and enrollment assistance in low-income programs. (Affordable Care Act 2010) States and local governments used various strategies to reach out to and enroll newly eligible people, and these program designs have differed by geographic location as described in various Centers for Medicare and Medicaid Services (CMS) publications and websites. Specially trained navigators funded through the ACA were hired with direct connections to the community health system, including health departments and religious organizations, to increase coverage. (Galewitz, 2018) However, with an average cost per enrollment calculated at $768.00 and only 1% of enrollees citing the help of a navigator, the Department of Health and Human Services (HHS) found the $62.5 million program to be ineffective and could not cost-justify its continued existence. (U.S. Dept. of Health &

Human Services, 2017[1]) In 2018, the program confronted a severe 80% decrease in funding to $10 million rendering it to be further ineffective. (U.S. Dept. of Health & Human Services, 2017[2]) I Options were recommended, such as using licensed insurance agents since only one in five navigators achieved their projected goals; however, these brokers have little incentive to enroll eligible individuals in Medicaid. Reasons for the lack of success possibly include insufficient marketplace insurance product offerings with high deductibles, and limited funding spread too thin.

Given that this first foray into using dedicated insurance enrollment resources did not prove as effective as planned, a critical question remains about the influence the overall public health infrastructure has on insurance enrollment. And although many stakeholders have been involved in these prior efforts, state and local health departments (LHDs) still remain likely and untapped resources to increasing insurance enrollment as promoted in the Centers for Medicare and Medicaid Services website as a potential "champion for coverage". (CMS, 2021[1]) Prior research has pointed to the significance of localized efforts impacting health-related issues, including mortality outcomes and variations in life expectancy reflected at the countywide level (Dwyer-Lindgren et al., 2007), however, there has been no substantial research studying the strength of the public health infrastructure and insurance enrollment activity which this study intended to do.

## 3.3 LITERATURE REVIEW

### 3.3.1 Uninsurance within the Public Health System

Prior studies have concluded that even with comprehensive and integrated strong healthcare systems providing long term economic and health benefits, uninsurance in a community impacts the entire healthcare network structure. Numerous studies have documented the impact of uninsurance to health outcomes, and multiple studies have

investigated the effects that uninsurance has on the insured within a community. Unfortunately, the proportion of the U.S. population without health insurance is higher than in other similar high-income countries with coverage ranging from 99-100% (Papanicolas et al., 2018).

Specific to health outcomes, there is ample evidence that persons lacking health insurance delay or forego care, resulting in worse health outcomes, including lower health stock, more considerable morbidity, and higher mortality rates, placing a burden on the healthcare infrastructure. ([1]Woolhandler, 2017; Tolbert, 2019) Prior studies have focused on access to care and shown that the uninsured use primary care services at relatively low rates (Hadley et al., 2007; [1]McMorrow et al., 2014). Preventative care and follow through with major surgical procedures and disease management for chronic conditions are regularly left untreated (Hadley et al. 2007; Shi 2012) Initial and follow-up physician office visit fees are not affordable by many uninsured, and therefore medical care may be deferred. ([1]Saloner et al. .2015; Melnick et al. 2013; [3]Himmelstein et al. 2009; [2]Saloner et al. 2018). Delays in treatment are responsible for higher cost hospitalizations and more extensive medical procedure protocols. ([1]Woolhandler, 2017; Castaneda & Saygili, 2016; Smith et al., 2017; Christopher,2016) Numerous studies have identified poorer health among those not obtaining the necessary diagnostic tests, treatment, medications, and other regular follow-up needed to manage chronic illnesses. (Christopher et al. 2016; Ayanian et al. 2000; Levy & Meltzer, 2004, 2008: McWilliams, 2009) The conclusion drawn from McWilliams systematic literature research work strongly indicates a significant relationship between health insurance coverage and health outcomes. (McWilliams, 2009). Prior studies have supported the evidence that mortality and health insurance are related, with higher odds of

an uninsured patient dying at 0.97 compared to an insured patient at 0.71 ([1]Woolhandler, 2017)

The consequences of uninsurance or under-insurance weakens not only the community's healthcare infrastructure but affects the individual. From that perspective, medical bills are the number one cause of personal bankruptcy. (Himmelstein et al., 2015[1]) Approximately 62% of individuals filing for bankruptcy is a result of unexpected medical bills driven by those without insurance coverage, as well as the under-insured with high deductibles and copayments. (Himmelstein et al., 2015[2]) Even with the ACA passage, medical procedure-related bankruptcies have not been reduced in part because the coverage is insufficient to mitigate financial exposure with higher balances designated as a patient responsibility. (Himmelstein et al., 2015[2]) After procedures, expectations for large remaining balances place stress on the individual to forgo treatment and create more emergency visits. These high out of pocket deductibles and copayments paid by the patient, are a component in all types of health insurance, including governmental payers, which usually have a patient owed amount known as "cost-sharing". This concept's roots found support through the landmark Health Insurance Experiment (HIE) Rand study (Brook et al., 2016), which demonstrated the effects of cost-sharing on service use. However, numerous studies have documented cost-sharing amounts as extreme, placing health care at an unaffordable level (Emanuel et al. 2017; Newman et al. 2016) and classifying this population underinsured.

Of critical importance to financially supporting the healthcare infrastructure is the correlation between uninsurance and bad debt or charity care expense for hospitals and healthcare providers. According to the Health Services and Resource Administration (HRSA), hospital closures are likely to increase, and it is not only rural facilities impacted

by this trend. (HRSA 2017). Urban safety-net health systems are also affected and at risk. The Congressional Budget Office (CBO) has estimated an additional 13 million will become uninsured by 2027 due to eliminating the individual mandate penalty. (CBO 2017) In 2016. Hospital providers recorded $38.3 billion in uncompensated care. (Khullar et al. 2018) Prior studies have reflected different methods providers use to compensate for losses, such as reducing charity care and staffing cuts or reductions in pay. (Hadley & Feder, 1985) However, adjustments of various types are acknowledged to make up for lost revenues. Medicaid typically insures a portion of this population; however, varying eligibility requirements between states create population segments without coverage.

As explained through prior research, within the healthcare infrastructure, there is an interdependency between hospitals and physicians. And both hospitals and physicians typically associate the uninsured with bad debt or charity care. (Wright, 2010). However, with the advent of ACA, more individuals secured Medicaid or insurance offered through the exchanges. (Courtemanche et al. .2017; Cohen & Martinez 2015) These initiatives helped to reduce the number of unreimbursed services; however, the remaining uninsured population continues to encounter access issues as physician practices adapt to increases in Medicaid enrollees. (Sabik, & Gandhi, 2013).

It is also essential to consider that there is a core of individuals ineligible for coverage, such as individuals over income guidelines, undocumented immigrants, or those who choose not to participate in any coverage. (Wright, 2010). Safety net providers such as hospital emergency departments and FQHC's support the community by offering care to those unable to obtain appointments or afford the self-pay visit fee charge. (Sabik, & Gandhi, 2013). The burden placed on safety-net institutions without the capacity to serve, further weaken the healthcare infrastructure. Cost shifting to commercial insureds or

anticipating local governmental assistance is not a likely or viable option. (Khullar et al. 2018). Prior history has demonstrated that community safety net urban hospitals in Tampa, FL, or Boston, Massachusetts, have been forced to restructure or merge amid insurmountable financial burdens. (Khullar et al. 2018)

Approximately one-fifth of the U.S. population resides in rural areas, and the interaction between geographic location and health status has been extensively studied. (Dwyer-Lindgren et., al., 2017) These studies compared the differences between urban and rural settings; however, health status can be analyzed at the county-level and even Zip code level to identify trends, variations, and disparities. (Dwyer-Lindgren et al., 2017). Unique challenges face rural hospitals in comparison to urban facilities and practices. Previous studies have shown that low bed census and a high percentage of bad debt cause many smaller communities to lose their hospitals and force patients to travel to larger tertiary care facilities miles from their home (Hart et al.1994). Additionally, prior studies have documented that the associated physicians seek privileges at other hospitals, and many relocate to maintain their practices (Iglehart, 2018). The ratio of patients to primary care physicians in rural areas is 39.8 per 100,000 compared to 53.3 per 100,000 in more urban areas. (Hing & Hsiao, 2014); thus, access to care is compromised based on the socioeconomic status of the patient. The socioeconomic factors of rural residents with a lower-than-average per capita income, a higher percentage of unemployment, and uninsurance combined with the lack of professional medical providers within their communities contribute to the disparity in healthcare. an inability for residents residing in rural areas to have access to obtain needed primary or specialist medical care. (Patterson et.al. 2014; Aboagye et.al. 2013; Medford-Davis et al., 2017).

### 3.3.2 Legislative Response to Address Community Insurance

The Patient Protection and Affordable Care Act (PPACA), Pub. L. No. 111-148), now referred to as the Affordable Care Act (ACA) and amended by the Health and Education Reconciliation Act (Health Care Education and Reconciliation Act, Pub. L. No. 111-152) was enacted March 2010. In the spirit of the Medicare rollout forty-five (45) years prior, it was a monumental initiative providing affordable insurance coverage to reduce the number of uninsured individuals between ages 0 to 65. The Act consisting of ten (10) individual legislative titles, was envisioned to accomplish several objectives (Rosenbaum, 2011)) The first and most crucial primary goal was to achieve near-universal coverage through shared responsibility among government, individuals, and employers. (Rosenbaum, 2011) This legislation also sought to reduce disparities serving a diverse patient population, more equity, fairness, and affordability of health insurance coverage. (Rosenbaum, 2011) Additionally, increasing value for healthcare expenditures and reducing unnecessary spending along with more provider accountability were important targeted areas being addressed (Rosenbaum, 2011) Lastly, strengthening the public health infrastructure and working to create more primary healthcare access with a focus on preventive health care and improved electronic data gathering were other critical priorities. (Rosenbaum, 2011)

Prior research has concluded that the ACA has enjoyed some successes. Although not fully functional as initially planned, it is worthy of looking at the primary sections it addresses: The individual and employer mandates, tax credits, and cost-sharing reductions were established to address coverage issues. Insurance standards were created with provisions for consumer spending limits, the extension of dependent coverage to age 26, a guaranteed requirement for pre-existing conditions, and rate reviews for premium increases

above 10%. Health insurance marketplaces were designed to form regional and more localized exchanges for purchasing insurance coverage with choices. Medicaid expansion including a raise in eligibility to include families with incomes less than 138% of the FPG (Supreme Court ruling made this optional for states), and prescription drug enhancements, namely filling the "donut hole" and increasing the discount provided by manufacturers was also included in the ACA. Accountable Care Organizations were designed to focus on cost and quality through forming networks between physicians, hospitals, and other providers coordinating patient care. There were also wellness programs such as Medicaid coverage for tobacco cessation for pregnant women and penalties for high infection rate hospitals. (PPACA)

One of the more interesting facets is the CMS Center for Medicare and Medicaid Innovation (CMMI) under the Center for Consumer Information and Insurance Oversight (CCIIO), which encouraged various delivery models and payment methodologies. (Christensen Institute, 2013). It was thought that this might provide the most significant opportunity to lead us towards innovative models for future healthcare delivery. (Christensen Institute, 2013; KHN, 2015). Since the federal government has taken the role of regulating health insurance exchanges, some critics believe that the ACA erodes the states' ability to regulate health insurance; however, the law does provide a waiver option from federal rules for experimentation. (Heritage Foundation, 2016). Herein lies some opportunity for building enhancements or developing a better system on a smaller scale as a "pilot program" to test modifications before expanding to the entire country. ([2]Woolhandler et.al. (2003)

Strong partisan groups wanted to repeal the ACA, and prior to the 2020 presidential election, it was at risk for demise. Although proposals have yet to achieve consensus or

agreement on Capitol Hill, special interest groups will continue to influence the final product, and insurance companies will be looking out for their best interest. (Quadagno, 2011). The result of the 2020 election has offered some guidance for the future of the ACA and in all likelihood, it will continue in some form. Specific provisions may be bolstered to ensure that rollbacks to pre-ACA uninsured rates do not occur. In the interim, continuing changes to the ACA are being made, and it is imperative to understand the impact of any modifications that could increase the level of uninsurance affecting the entire healthcare system.

Medicaid is still a significant insurer for lower-income community members. There is a clear distinction between states that expanded Medicaid eligibility under ACA and those that did not. Initially enacted in 1965, Medicaid is the single largest insurer in the U.S., accounting for approximately 20% of a state's budget. (Rosenbaum & Westmoreland, 2012) Created as a healthcare component for those on welfare with dependent children and the aged or disabled, prior studies had commented that during ACA development, the Medicaid program was thought of as the logical vehicle to cover a broader range of the population. (Rosenbaum & Westmoreland, 2012) And, as a policy initiative to provide near-universal healthcare coverage, the ACA through Medicaid offered an opportunity to reduce the uninsured burden on the public health infrastructure. The ACA gave states the option to expand Medicaid and increase eligibility to 138% of FPG. The intention was to create more uniform country-wide criteria to cover more individuals. However, this provision of the law was rescinded in June 2012, when the U.S. Supreme Court ruled in *National Federation of Independent Business v. Sebelius* that the proposed penalty of the loss of federal funding for Medicaid for states that failed to expand was excessively coercive and thus unconstitutional. (Rosenbaum & Westmoreland, 2012). As a result,

Medicaid expansion became optional. As of March 2020, thirty-five **(**35) states (plus D.C.) adopted the Medicaid expansion, and one state adopted but has not implemented the expansion, and 14 states, including Florida, have not adopted the expansion. (Kaiser Health 2020) For those residing in expansion states, many more individuals within the eligible income brackets qualified for coverage (Kaiser Health, 2020), and as expected, those in non-expansion states did not benefit from this provision. Previous studies have documented numerous achievements related to the expansion, including the decline in the uninsurance rate among young adults. ([2]McMorrow et al. 2015) Another ACA-related study suggested improvement in insured status for Black and Hispanic adults. **(**[3]McMorrow et al 2015) Expansion was significantly associated with reduced mortality as well as improved coverage, access to care, and self-reported health according to results in another study published in the New England Journal of Medicine. (Sommers et al. 2012**)** Other investigations have provided support specific to the benefits of expansion while still noting reasons for continued uninsurance, namely those in the non-expansion states classified as being in a "coverage gap" whose income is above the Medicaid eligibility threshold less than 100% subsidy eligibility for marketplace insurance. (Courtemanche et al., 2017; Kominski et.al. 2016) Not part of the ACA but still not to be forgotten are the 5.2 million uninsured undocumented individuals that seek healthcare often in emergent conditions with only a few states providing healthcare financial assistance for this population. (Courtemanche et al. 2017; Kominski, et al. 2016) Although the initial intention was to create nationwide uniformity, this two-tiered infrastructure enables studies such as this one to compare changes in accessibility and health outcomes in expansion versus non-expansion states. Although this study is not directly addressing this confounder, it is

recognized that a state's decision to expand Medicaid may be a strengthening factor contributing to the conclusion in a post ACA environment.

The status of Medicaid expansion by state as of August 2021 is presented in Appendix section (APPENDIX 1).

3.3.3 Public Health System Infrastructure and Insurance Enrollment

Prior studies have suggested that a strong public health system infrastructure has the potential to encourage insurance enrollment. **(**Blumberg et al. 2016; Davidoff et al., 2003; Mays et al., 2006). According to preceding research, a well-organized infrastructure develops a coordinated community effort identifying those that need services or, in this case, health insurance coverage. **(**Blumberg et al. 2016; Davidoff et al., 2003; Mays et al., 2006) In this context, the Medicaid eligible and the low-income marketplace tax credit eligible would be the best individuals to target for insurance coverage, along with those presenting characteristics identified such as a high percentage of school-age children in the household, households in receipt of other non-health public benefits, firm-based employment, and single-parent households. **(**Blumberg et.al., 2016; Davidoff et al., 2003; Mays et.al, 2006). Prior studies strongly suggest that obtaining insurance for the adults in the household has positive spillover effects on the children. (Davidoff et al., 2003), Accordingly, linking individuals to governmental and employer insurance enrollment can be considered an important public health infrastructure activity and would be particularly beneficial for adult preventable diseases and children's health issues since parents are navigators for their health care. (Davidoff et al., 2003).

To provide context for addressing insurance enrollment in this study, previous studies presented historical observations when examining the public health infrastructure's current strength. Prior research work explained that public health has roots in many

centuries of epidemics and widespread infectious diseases. (Turnock, 2001). The U.S. began a more serious effort to develop a public health system in the late 1800s by establishing state and local health departments focusing on sanitation, communicable diseases, and vital statistics. (Turnock, 2001). The federal government had minimal involvement since it lacked an implicit charge to intervene, and therefore, this responsibility was left to the states and local governments. (Turnock, 2001). However, in 1994, the Core Public Health Functions Steering Committee was formed with representatives from U.S. Public Health Service agencies and other major public health organizations to develop the basic working definition of public health and a guiding framework including the ten (10) Essential Public Health Services and responsibilities of the local public health systems. (CDC). These essential public health services were later updated in 2020 to reflect a framework to build future infrastructures. (CDC). Public health infrastructure took on a heightened interest after 9/11 with concerns regarding potential bioterrorist activities. (Baker & Koplan, 2002) Further progress included chronic disease prevention, health promotion, environmental and occupational health, injury prevention, mental health, substance abuse prevention, and other population-based services. (Baker & Koplan, 2002) Given this basic level of organization, researchers began to evaluate the public health infrastructure using specific indicators to assess the performance of essential public health services by local or state health systems. (Halverson & Mays, 2001; Miller et al., 1994) A prior study showed that the nation's largest health departments deliver only 64 percent of the activities related to the essential public health services. (Turnock & Handler,1985). Given the deficiencies in traditional service providers, it is of value to look at public health infrastructure in a broader context, including outreach affiliates that are

part of the overall community network, particularly when investigating insurance enrollment activities.

A robust public health infrastructure will likely seek community partnerships to enhance their neighborhood role, and these opportunities should not be overlooked. (Halverson & Mays, 2001; Miller C.A. et al.1994) Healthcare delivery has been viewed in previous studies personal services with relationships and interactions occurring between known entities. (Blanchet & James, 2012) Relationships in this context can be defined as doctor-patient interactions, trust in community clinics and hospital providers, or other types of knowledge informational transfer methods.(Blanchet & James, 2012) The theory of social networks has historically been a key to understanding a spreading epidemic or disease transmission, however, because the definition now includes information flow, it has implications for understanding the problem of community uninsurance.(Blanchet & James, 2012.). Healthcare delivery is dispersed among various providers' and thereby, network analysis is recognized as a strategic player contributing to the understanding of the public health system. (Halverson & Mays, 2001; Miller et al., 1994; Blanchet & James 2012; Mays et al., 2010). Social network theory is highly applicable to uninsurance in the U.S. and can be an effective method to increase the number of insured within a community as part of developing a robust public health infrastructure. (Blanchet & James, 2012) Studies have indicated that lower-socioeconomic classes have a greater reliance on social networks to have strong ties. (Granovetter,1983). An excellent example of social network strength is the churches located in black communities, a long-standing trusted resource for information with congregational connections that are considered reliable. (Harmon et al., 2014). Traditionally, the black community churches have been a central repository for education, business, political activism and promoting healthcare. (Markens et al., (2002).

Data from previous studies strongly suggest that providing insurance enrollment information and support through these channels works well when attempting to reach a target group in need of material. (Harmon et al., 2014; Markens et al. 2002) Activism continues as the black churches generally support Medicaid expansion in states that have not taken advantage of this option. (Malveaux, 2016)

3.3.4 Public Health Accreditation Board (PHAB) and Public Health System Infrastructure

The PHAB accreditation program was initiated by those seeking to quantify measurable improvements in public health system infrastructure and specifically health department related entities. In the landmark report, The Future of Public Health, prepared by the Institute of Medicine (IOM), a methodology was recommended using a public health framework naming three (3) core functions of assessment, policy development, and assurance. ([2]IOM, 2002).

Building upon these concepts, studies documented the ongoing community efforts using different appraisal tools to evaluate performance measurement activities. (Handler et al. 2001; NRC, 1999; Halverson, 2001). Through collaboration between multiple government and non-government agencies including the Centers for Disease Control (CDC), Association of State and Territorial Health Officials (ASTHO), American Public Health Association (APHA), and the National Association of County and City Health Officials (NACCHO), the National Public Health Performance Standards (NPHPS or the Standards) was created to assess capacity and performance through the 10 Essential Public Health Services. The National Public Health Performance Standards Program (NPHPSP), which is part of the CDC, provides guidance and support to bolster services at the federal, state, and local levels. (APPENDIX 2).

The need to broaden the platform for continued process improvement became increasingly apparent. Enhancements to build infrastructure strength prompted the addition of Seven Foundational Public Health Capabilities supported by the Institute of Medicine (IOM) in 2012 (APPENDIX 3) and was subsequently promoted for use by the Public Health National Center for Innovations. (PHNCI, 2021) Independent academic research-related infrastructure studies using these accepted principles for measurement with a random sampling of local health departments and a self-reported compliance survey questionnaire were published. (Handler & Turnock, 1996). However, to add credibility and more formality to these studies, a professional association survey and an accreditation program were developed to focus on local health department process improvements. A partnership between the NACCHO and the CDC lead to developing an extensive survey assessment instrument to measure the activities occurring at the local health department level. The 10 Essential Public Health Services criteria are incorporated into the self-reported survey known as the National Profile of Public Health Departments (Profile) conducted every three years to document improvement initiatives as part of the Mobilizing for Action through Planning and Partnership (MAPP) community strategic planning process under the auspices of NACCHO. In 2011, the CDC began a partnership with the Robert Wood Johnson Foundation to support the voluntary accreditation for public health departments under the Public Health Accreditation Board (PHAB), an independent non-profit 501(c) 3 entity. The PHAB began accrediting health departments in 2013. NACCHO surveys include questions specific to accreditation, and feedback is provided back to the respondents with the PHAB accreditation process information to encourage them to work on deficiencies. As reported in prior studies, the PHAB accreditation program prompts the use of their guidelines for other programs to develop strategic initiatives such as

Community Health Assessments (CHA) or Community Health Improvement Plans (CHIP). (Heffernan et.al. 2018).

The PHAB accreditation process includes twelve domains containing multiple standards within the context of the ten (10) Essential Public Health Services and recognizes networking and partnerships in their model. (Healthypeople.gov/2020); PHAB) There are seven (7) steps in the accreditation process, from pre-application through re-accreditation. Prior studies have shown that this designation facilitates improvement in patient care through the accreditation process and benchmarking, identifies system weaknesses, improves network communication, and promotes higher standards. (Ingram et al., 2018; Allen et al 2019)

For the purposes of this study, I reviewed the PHAB accreditation survey tool and noted specific questions measuring the depth of the relationship relating to collaboration with healthcare insurers. Shared resources, written agreements, regularly scheduled meetings, and exchanges of information with health insurers are queried in the survey and included in the final scoring for determining if a local health department meets standards for accreditation.

Although prior studies have documented that accredited local health departments promote a stronger public health infrastructure, studies have suggested that a higher proportion of smaller local health departments have not pursued accreditation due to practicality or the need to adjust standards to accommodate community size better. (Ingram et al. 2018; Allen et al 2019; Leider et al 2021)

And in some cases, given that the accreditation process is labor-intensive, some county health departments have chosen to utilize the parts that are most relevant to meet

current guidance needs with plans to apply for accreditation at a future date. (Heffernan et.al. 2018)

### 3.4 CONCEPTUAL FRAMEWORK

The hypothesis for this study was guided by the principles of network theory, recognizing that it is the collective actions of government and private industry contributing to an individual's positive health outcomes. A robust infrastructure utilizes various connection methods and create multiple interaction platforms which can directly or indirectly lend support a higher community-wide insured percentage increase. (Varda, Danielle M. et.al 2008) Network theory and analysis has been used in previous studies to determine "tie strength" measuring the number of healthcare related activities jointly produced as it is a collective effort that builds strong infrastructures. ((Mays et al. 2010; Mays & Scutchfield, 2010; Mattie et al. 2018) State and local public health agencies in addition to hospitals, physician offices, schools, social service agencies, faith-based organizations, employers, and insurers among other smaller players are part of the community infrastructure and have a role in promoting the effectiveness and strength of the network. A high level of participation builds healthcare system capital through network density, centrality and the scope of activities ((Mays et al. 2010; Mays & Scutchfield 2010; NCC, 2015).

### 3.5. DATA AND METHODS

The purpose of this study is to evaluate the relationship between the improvement of insurance enrollment rate and the strength of the county's public health system infrastructure while holding constant the control variables. The hypothesis is that increases in insurance enrollment were greater in counties with stronger public health system infrastructures.

### 3.5.1 Study Design

A cross-sectional design was used to assess the effect of county-level public health infrastructure strength on the improvement of medical insurance enrollment rate. To calculate the change of the insurance enrollment rate, 2012 was used as the pre-intervention (before accreditation) year and 2018 as the post-intervention (after accreditation) year.

### 3.5.2. Data Resources and Variables

Using PHAB accreditation as a proxy for public health network strength, this study questions explicitly the impact that local healthcare infrastructures have on the community insurance rate. Previous studies have used different databases to conduct similar research; however, this is the first study to evaluate insurance's relationship to using county-level data and community healthcare infrastructure strength. This retrospective descriptive study was accomplished using pre-existing datasets that have observations for each county in each year.

Data at the county-year-level was aggregated and merged onto existing datasets beginning with the most recent release of the Small Area Health Insurance Estimates (SAHIE) to provide single-year estimates of health insurance coverage in U.S. counties. The SAHIE database is generated from aggregated American Communities Survey (ACS) data. Both are derived from the U.S. Census. However, SAHIE is the only source of data for single-year estimates of health insurance coverage status for all counties in the U.S. by selected economic and demographic characteristics. The ACS data does provide detailed survey estimates of health insurance coverage for counties with small populations as multi-year estimates. However, these multi-year estimates are period in time estimates not reflecting on an annual basis, and therefore, the estimates do not reveal annual changes such as a yearly impact that the ACA would have on the uninsured. Since the SAHIE

program models 1-year ACS estimates using administrative records to provide health insurance coverage estimates for every county in the United States annually, this is better able to capture trends being sought that would otherwise not be discernable. To obtain the share of insured and for a primary measure of the insured rate, SAHIE data was used as the best source for this variable. The methodology selected was similar to other previous studies using SAHIE county-level demographic and insurance data, using robust standard errors referenced to support this analysis. (Dalzell et al. 2015; Garthwaite et al. 2019; Vaughan et al. 2014; Lobo et al. 2020). Since SAHIE only comprised of data for individuals under 65 years of age, and race is summarized at the state level instead of county-level, the U.S. Census Bureau Annual County Resident Population Estimates (U.S. Census) data was used that contains all covariates at the county-level.

The public health infrastructure strength defined as PHAB accreditation as the proxy, was obtained directly from the PHAB, including name of the accredited entity, location and accreditation date. The PHAB list of accredited health departments has been used in prior studies to evaluate the effectiveness of building community healthcare infrastructure strength (Singleton, 2014; Erwin, 2020; McLees, 2014) The addition of the PHAB accredited database with SAHIE and U.S. Census data enables a response to the research question if stronger public health system infrastructures promote a higher percentage of insured within a community, as defined as a county unit. No prior studies could be identified that combined SAHIE data with PHAB Accredited Health Departments database since prior work did not investigate insurance-related subjects. Previous studies, however, have assessed the relative contribution of local public health system organization and community demographic factors to evaluate the impact on health outcomes through regression models. (Rodriguez et al. 2012; Mays et al. 2004)

### 3.5.3. Measures

SAHIE and the U.S. Census data were downloaded for years 2012 and 2018. SAHIE and the U.S. Census data sets were matched by county FIPS as the key for the data linkage.

During the data confirmation process, it was noted that after combining the over-65 data from the U.S. Census with SAHIE, there were three (3) county entities listed in SAHIE but not in the U.S. Census. These 3 counties were removed from our data, and 3,142 counties were contained in the final dataset. The U.S. territories included in U.S. Census data but not in SAHIE were also removed from our data. This data file was named "County ID" data set to represent the working file for this study.

The PHAB provided the information to create the variable representing infrastructure strength through in an Excel listing of accredited city, county, and regionally accredited health departments with the effective accreditation date. A FIPS code identifier was required and it was manually assigned to each approved entity on the list to match the County ID data set. The selected variables from the SAHIE and U.S. Census data file were reshaped from long format to wide format and merged using the County ID, and the PHAB accreditation file was converted from Excel in STATA to merge to the County ID data set. Additional data management research was performed to resolve four (4) FIPS clerical coding errors appearing that were not in the SAHIE and Census data file.

The final total matched 3,142 counties with 454 or 14.5% accredited and 2,688 or 85.5% were not accredited as of March 2021. However, an accreditation approval cutoff date was established as 12/31/17 to use the most recent available SAHIE 2018 data. The cutoff date reduced the number of accredited counties to 329 for this study.

These accredited County I.D.s were assigned a treatment variable of "1," and all other County I.D.s were assigned a "0". In the base year 2012, all counties were considered unaccredited and assigned as "0" since accreditation was launched in September 2011.

The Medicaid expansion treatment variable was assigned a "1" as expanded or "0" as not expanded and was merged using the first two digits of the county FIPS code

3.5.4 Dependent Variables – Outcome

The percentage of the change in the insurance rate pre- and post-ACA at the county-level is the outcome for this study. SAHIE data was used to obtain the percent of insured (NIC) by county. To compute the change in the percentage of insured between 2012 to 2018, the county level share of the insurance for year 2018 was subtracted from the county-level share insurance 2012 and then divided by county-level share insurance 2012; multiplied by 100% to equal the percent change in the insurance rate by county.

3.5.5 Exposure

Prior studies have used a variety of assessment tools to measure public health infrastructure strength (Derose, 2002) however I selected Public Health Accreditation Board (PHAB) accreditation as the proxy for infrastructure strength. It was chosen because it represents the least biased and most comprehensive measurement method. The PHAB accreditation program is recognized by the Office of Disease Prevention and Health Promotion (ODPHP) Healthy People.gov as an essential initiative towards developing strong public health infrastructures and defines an accredited department as meeting standards for providing public health-related services. (Healthypeople.gov 2021; PHAB, 2021)

The PHAB accreditation is on the local health agency level. There might be multiple agencies within a county, and there could be multiple counties that share one

agency. Therefore, counties were manually matched with agencies that achieved an accreditation before December 31, 2017. A total of fourteen (14) county-related redundancies were removed from the analysis. A couple of clerical errors in PHAB were identified and corrected. Some accredited agencies are responsible for multiple smaller counties, in which case all counties served by the agencies were assigned as accredited at the county-level to reflect the accreditation of those agencies. A rule was also established that if an accredited county agency covered the same physical area as an accredited city agency, the county accreditation date superseded the city accreditation date. If there were multiple city agencies accredited within the same county, the first accredited health department date was used for this study.

3.5.6 Control Variables - Covariates

County-level demographic features, such as poverty rate, age, race, and gender have been previously stated in prior literature as factors that impacted the insurance rate within a county. So, these factors were used and measured in the baseline (year of 2012) as confounding variables in the model. The specific variables include county-level poverty rate defined as the percent of population under 138% of FPG, percent of population under 19, percent of population over 65, percent of Non-Hispanic (NH) Black, percent of Hispanic, and percent of male. Since SAHIE provided totals for only those under age 65 poverty level, it is not sufficient for the county-level demographics as listed above. The U.S. Census data was used calculate all county-level demographics that are necessary in the model.

The variable of county-level poverty rate was calculated by dividing the total number of county population under 138% of FPG by the total county population and times 100%.

The county-level percent of population under the age of 65 was calculated by dividing the number of people over age 65 by the total county population and multiplying by 100%.

The percent of population under age 19 in each county was calculated by taking the number in this demographic group and dividing by the total number in each county and multiplying by 100%.

The percent of non-Hispanic African Americans in each county was calculated by dividing the number of NH Black in each county by the total number of people in each county.

The percent of Hispanic in each county was calculated by dividing the number of Hispanic in each county by the total number of people in that county.

The percent of male in each county was calculated by dividing the number of males in each county by the total number of people in that county.

3.5.7 Statistical Analysis

The change in insurance rate before and after ACA implementation reported in the SAHIE data set is the outcome variable. To calculate the change of insurance enrollment rate for each county, we used 2012 as the baseline year and 2018 as the post-intervention year. The outcome, change in insurance enrollment rate, was calculated using the difference in insurance enrollment rate from 2012 to 2018 divided by the enrollment rate in 2012 (in terms of percentage) for each county. The percentage of change in medical insurance enrollment rate ranges from 0 to 100%.

The county-level accreditation status by December 31, 2017 was used as the proxy for the exposure, indicating the strength of public health infrastructure of each county.

The confounders being controlled for included the county level poverty rate, percent of non-Hispanic Black, percent of Hispanic, percent of population over the age of 65, and percent of population under the age of 19, and percent of male.

A linear ordinary least squared (OLS) regression models below was used to investigate the association between exposures and outcomes adjusting for the confounding variables, as done in similar type studies:

$$E(\textbf{Change in Insurance Rate from 2012 to 2018}_i) = \beta_0 + \beta_1 PH\ \ Infrastructure\ Strength_i + \beta_2\ County\ level\ poverty\ rate_i + \beta_3 County\ level\ percent\ of\ NH\ Black_i + \beta_4 County\ level\ percent\ of\ Hispanic_i + \beta_5 County\ level\ percent\ of\ age\ over\ 65_i + \beta_6 County\ level\ percent\ of\ under\ 19_i + \beta_7 County\ level\ percent\ of\ Male_i$$

In this model, I assume all counties are independent regardless of which state they are in, so this is the model for independent observations.

Standard statistical approaches for evaluating the effect of insurance and the influence of health policy changes were selected based on similar studies methods. (Dalzell et al., 2015; Garthwaite et al., 2019; Vaughan et al., 2014; Lobo et al., 2020).

Standard model checking procedure was used for model diagnostics. Standardized residual plot was used for checking the unequal variance (heteroskedasticity) and linearity. Q-Q plot was used to assess the normality of the residuals. Pearson's correlation coefficient was used to check correlations between pairs of independent variables, and variance inflator factor (VIF) was used to check the multicollinearity.

All analyses were performed using Stata (StataCorp., College Station, TX, USA) version 16 and SAS (SAS Inst. Inc., Cary, N.C., USA) version 9.2. All tests are two-sided, and p values $< 0.05$ indicate statistically significant results.

## 3.6 RESULTS

### 3.6.1 Descriptive Statistics

Three hundred twenty-nine (10.47%) counties received PHAB accreditation before December 31, 2017. Among these 329 counties, one hundred and seventy-four (174; 52.9%) were among the counties whose states expanded their Medicaid eligibility before December 31, 2017. Since expansions occurred at varying times, a rule for the analysis was established to include those expansions occurring up to December 2017.

Table 3.1 shows the summary statistics of all county-level variables in 2012 and 2018. The mean insurance enrollment rate in the 3,142 counties increased from 82.43% in 2012 to 88.50% in 2018. The percent of population over 65 jumped from 16.69% in 2012 to 19.26% in 2018, and the percent of Hispanic increased from 8.67% to 9.63% within the same period. Between 2012 and 2018, the mean percent of male are almost constant (50.23% in 2012 and 50.18% in 2018).

### 3.6.2 Association between Accreditation and Change in Insurance Rate

When county-level poverty rate, percent of Black, percent of Hispanic, percent of over 65, percent of under 19, and percent of male in the year of 2012 are held constant, counties with PHAB accreditation (as a proxy as strong healthcare infrastructures), on average, had a 0.68 (95% CI: 0.28 to 1.08; p-value = 0.001) per 100,000 population higher insurance rate change from 2012 to 2018 (Table 3.2; Model 1). All covariates used in the model had a statistically significant association with the change in the insurance rate (all p-values<0.001). The change in insurance rate increased by 21.89 (95% CI: 20.17 to 23.61) per 100,000 population with every 1% increase in the count- level poverty rate. In addition, the change in insurance rate decreased by 3.69 (95% CI: 2.57 to 4.81) per 100,000 population with 1% increase in the Black; increased by 3.76 (95% CI: 2.75 to 4.76) per

100,000 with 1% increase in the Hispanic population; decreased by 6.29 (95% CI: 3.05 to 9.53) per 100,000 with 1% increase in the population over 65 years of age; decreased by 31.11 (95% CI: 26.65 to 35.58) per 100,000 population with a 1% increase in the population under 19 years of age; and increased by 25.70 (95% CI: 13.92 to 37.47) per 100,000 population with a 1% increase in the male.

By using Medicaid eligibility expansion as another factor for the change in medical insurance rate, we ran another model that include PHAB accreditation status (by December 31, 2017), Medicaid eligibility expansion status (by December 31, 2017), and the interaction between accreditation and expansions status adjusting for the same confounding variables (Table 3.2; Model 2). we examined whether the association between the change in insurance rate and accreditation status was modified by the Medicaid expansion status of the counties. The Medicaid expansion, on average, increased the change of insurance rate by 3.95 (95% CI: 3.72 to 4.18; p-value<0.001) per 100,000 population, and accreditation increased the change of insurance rate by 1.02 (95% CI: 0.53 to 1.51; p-value <0.001). A statistically significant interaction was found between accreditation status and expansion status with a point estimate of -0.82 (95% CI: -1.51 to -0.14; p-value = 0.018) per 100,000 population, indicating the Medicaid expansion status significantly modifies the association between accreditation status and the change in insurance rate. Based on Table 3.2, among all counties with weaker healthcare infrastructures (without accreditation), those counties whose states expanded the Medicaid eligibility had a medical insurance enrollment rate 3.95 per 100,000 population higher than those counties whose states did not expand the Medicaid eligibility. On the other hand, among all counties with stronger healthcare infrastructures, those counties whose states expanded the Medicaid eligibility had a medical insurance enrollment rate 4.15 (1.02+3.95-0.82) per 100,000

population higher than those counties whose states did not expand the Medicaid eligibility. Those counties whose states expanded Medicaid eligibility have a significantly less impact by accreditation. In Model 2, all covariates used in the model had a statistically significant association with the change in the insurance rate (p-values<0.001) except for percent of Black and percent of people over 65 (p-value = 0.531 and 0.713, respectively). The change in insurance rate increased by 22.91 (95% CI: 21.45 to 24.38) per 100,000 population with every 1% increase in the county-level poverty rate; increased by 4.82 (95% CI: 3.96 to 5.68) per 100,000 with 1% increase in the Hispanic population; decreased by 18.16 (95% CI: 14.29 to 22.04) per 100,000 population with a 1% increase in the population under 19 years of age; and increased by 24.30 (95% CI: 14.25 to 34.36) per 100,000 population with a 1% increase in the male.

When measurements in confounding variables in 2017 and 2018 were used in Model 1, there were only a minor impact on the point estimates and 95% CIs for all variables in the model, and none of the p-values changed. Each contributes but some of the effect cancels through overlap of an estimated value of .83.

**3.7 DISCUSSION**

This study showed that public health infrastructure strength (accreditation by PHAB) is significantly associated with the improvement in medical insurance enrollment rate. In addition, it was found that the impact of accreditation on improvement in the medical insurance enrollment rate in counties within the non-expansion states is significantly lower than the impact of accreditation in counties located in expanded states. Additionally, those counties located in non-expanded states without strong public health infrastructures had lowest increase in enrollment rate.

The outcome data suggests that expansion was a more significant factor than accreditation in counties located in expanded states however a strong public health infrastructure can close the gap between insured and uninsured in non-expanded states.

To explain this result, I submit for consideration a marketing model that refers to the component mix of product, price, place, and promotion. (McCarthy, 1960; Sigurdsson, 2019) Accordingly, these elements are important to result in a sale. Thus, having a product to sell can be equated with "expanded" Medicaid as the product with increased FPG eligibility to insure a broader range of uninsured individuals. The results related to success in improving the health insurance enrollment rate achieved through expansion are supported by numerous studies including a recent systematic review examining the effect of Medicaid expansion from January 2014 through January 2020. (Guth, 2020) Studies in this review concluded that all states experienced insured rate improvement after the implementation of the ACA in 2014, however the expanded states had more significant reductions in uninsurance than non-expanded states (Guth, 2020). A prior study comparing expanded states to non-expanded states using the American Community Survey, a derivative of the U.S. Census, suggested that expanded states had a 5.9% increase in the health insurance enrollment rate compared to non-expanded states with only a 3.0% increase in insurance rate (Courtemanche, 2017).

Other studies have concluded similar findings using the measure of reductions in the uninsured rate. The uninsured rate for children aged less than 19 and under age 65 adults decreased from 16.4 percent to 7.6 percent between 2010 to 2017. The rate in non-expansion counterparts fell from 20.3% to 15.7%, a 3.6% reduction which is smaller than the 8.8% reduction in expansion states. (Cohen, 2019)

Continuing with the marketing analogy, when faced with the reality of "selling" an inferior product such as non-expanded Medicaid, the "marketer" or in this case, the actors within the healthcare infrastructure are left with few alternatives, thus rendering place and promotion as the available options for increasing insurance enrollment. Strong linkages to the community and to the third-party insurers encouraging those that are eligible, albeit with stricter FPG guidelines, to enroll becomes more critical for those communities without the benefit of Medicaid expansion. And the communities with neither expanded Medicaid or a strong healthcare infrastructure are at a significant disadvantage in terms of insurance enrollment.

The importance of the Medicaid eligibility expansion to 138% of poverty, for which the federal government covers 90% of the cost cannot be over-stated. Providing a broader program and a wider net to capture more of the population is an important component in combatting uninsurance. However, it should be noted that enrollment in expansion states that already had liberal eligibility criteria further increased their rate of insured under ACA, suggesting more straightforward enrolment processes and focused media promotions are to be credited for additional improvements in the insurance rate. (Denham & Veazie, 2019).

Increases in the poverty rate increased the insurance rate which would be explained as a result of more of the population eligible and approved for Medicaid coverage under the expansion.

Rural communities are prime targets for public health infrastructure improvements, however rural communities are least likely to have an accredited health department because of difficulties meeting the requirements. (Rider et al. 2018; Ingram et al. 2018). (Allen et al., 2019; Leider et al 2021) Prior studies reflecting on the impact of Medicaid expansion on rural areas noting that the uninsured rate remains higher in the rural areas than that in

metropolitan areas. (Hadley, 2018). A stronger infrastructure would provide some benefit to these communities.

This study showed the effect of expanded eligibility guidelines is stronger when paired in counties benefiting from both a strong infrastructure located within a Medicaid expanded state with a 4.15 per 100,000 population increase in the enrollment rate. Those counties with only accreditation will have 1.02 per 100,000 population increase in enrollment. And the implications for public policy discussion reflect the importance of strong healthcare infrastructures, especially in areas with more restrictive insurance coverage criteria. With the expanded Medicaid eligibility threshold covering almost all adults with incomes up to 138% of the FPG [*1*] there are approximately 4 million under age 65 adults remaining uninsured that potentially would be covered if their state had chosen to expand eligibility. (Cohen, 2019). Communities with remaining uninsured in unexpanded states, should consider strengthening their healthcare infrastructure including accreditation to reduce the disparity.

### 3.7.1 Limitations

As with any study, it is essential to note the limitations. Multivariable linear regression models are used to determine the relative influence of one or more independent variables on the dependent variable. The difference in change model was selected for this study to estimate the treatment effects of accreditation, comparing the pre- and post-ACA differences. To ensure internal validity, some assumptions should be addressed. One fundamental assumption is that in the absence of treatment, the difference between the "treatment" and the "control" group is constant over time. Otherwise, there could be a

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[*1*] In 2021, 138% of FPG is $17,774 for an individual; $36,570 for a family of four

potential for a biased estimation of the causal effect. Other limitations include the possibility that some unmeasured variables or characteristics could explain differences in the outcome. As noted in prior health-related studies, individuals generally choose where they live. Individual characteristics and traits may be related to these choices, which affects their decision regarding insurance coverage and, therefore, could confound the study findings causing an endogeneity problem. Disadvantages or weaknesses can occur in the data being used, although the best available data sets were selected for these studies. Incomplete or inaccurate data is a potential threat in any source; however, care is being taken to minimize this threat to validity. The Annual Social and Economic Supplement to the Current Population Survey (CPS ASEC) and the American Community Survey (ACS) are two national household surveys produced by the U.S. Census Bureau have sufficient sample size to support reliable estimates of health insurance coverage at the national, state, or sub-state levels.

The Census Bureau also produces the Small Area Health Insurance Estimates (SAHIE) that match the source data at the national level while attaining more detail at the state and local levels. The Census Bureau data sources such as SAHIE use estimates based on responses from a sample of the population and may differ from actual values because of sampling and non-sampling error. Estimates of sampling error are provided; however, estimates of non-sampling error cannot be determined. (U.S. Census Bureau) SAHIE contains errors stemming from model error, sampling error, and non-sampling error, although confidence intervals (CI) are provided to indicate the reliability of the estimates. (U.S. Census Bureau) Subject to the validity of the underlying model assumptions, these reflect uncertainty due to the effects of model error and sampling error but do not account for the effects of non-sampling error. (U.S. Census Bureau). The data sources continue to

evolve with the ACA's implementation, and the Census Bureau has made some changes to the data sources, including SAHIE, to reflect the implementation. (Thompson, 2014; Medalia, 2014). Beginning with the 2014 survey, the health insurance questions were redesigned to include questions on health insurance exchanges; however, in previous studies, these variations were not distinguished. (Thompson, 2014; Medalia, 2014)

The PHAB accredited dataset has fewer biases or limitations than other county healthcare infrastructure strength measures that were initially investigated and under consideration. Accreditation status is validated over some time by an independent non-profit 501-C-3 organization, and thereby weaknesses resulting from subjective, non-responding, or possible recall bias using self-administered questionnaires were eliminated. A potential limitation is that a significant amount of dedicated resources is used to achieve accreditation status, and smaller, less well-funded communities may not meet the rigorous, stringent requirements. However, that fact provides a descriptive characterization for strength that was sought for this study.

## 3.8 CONCLUSION

This essay explored the relationship between the improvement of insurance enrollment rate and the strength of the county's public health system infrastructure. The proxy and thus exposure is accredited status with accredited defined by having the accreditation status as of 2017; and it was an appropriate match to 2018 SAHIE data. Accredited status defined a county as "strong" vs. non-accredited is described as "not as strong". In 2017, there were 329 counties that met the accredited status. I used 2012 (SAHIE and Census) as the base year representing before ACA (and all counties at that time were considered non-treated and conversely a treatment variable was added to those counties that expanded Medicaid by the end of 2017.

Prior research focused on the benefits of measuring public health infrastructures and health-related outcomes however, there had been no substantial research studying the strength of the public health infrastructure and insurance enrollment activity. Lastly, I used P =.001 in this result as statistically significant using $P < 0.05$.

This study concluded that healthcare infrastructure (by PHAB accreditation) significantly improves the health care insurance rate. The improvement in health care enrollment by the healthcare infrastructure in the Medicaid expansion counties are significantly less than the improvement in the non-expansion counties. Poverty rate, percent of population over 65, percent of population under 19, percent of Black, percent of Hispanic, and percent of male/female also significantly associated with the improvement of health care enrollment rate when health infrastructure is considered.

This represents a significant finding that can be applied to other counties in the U.S. Additionally, the analysis results show that all of the covariates predict a significant effect on the insurance rate change. This change occurred between the time of the initial measured year 2012 representing pre-ACA implementation and 2018 as the post ACA date. The Medicaid expansion to 138% of FPG was not uniform throughout the country and therefore likely had a positive impact on those communities within states that expanded. The community's ability to steer the income eligible population to Medicaid provides a strength factor contained within the higher insured rate results. As described by the NACCHO, a strong public health infrastructure needs a systems approach with parallel and integrated partnership efforts among all participants to achieve success across the many objectives incorporated into their mission.

REFERENCES


Aboagye JK, Kaiser H.E, Hayanga AJ. (2013) Rural-urban differences in access to specialist providers of colorectal cancer care in the United States: a physician workforce issue. *JAMA Surg*.;149(6):537-543.

ACA Affordable Care Act, 42 USC §18031 (2010) PPAC 2010 The full text of the bill, Patient Protection and Affordable Care Act, 42 U.S.C. §18001 (2010), can be found at https://www.govtrack.us/congress/bills/111/hr3590/text (accessed June 8, 2020). *also*
PPACA Patient Protection and Affordable Care Act (PPACA), Pub. L. No. 111-148, 124 Stat 119 (March 23, 2010).2.

Allen, P., Mazzucca, S., Parks, R. G., Robinson, M., Tabak, R. G., & Brownson, R. (2019). Local Health Department Accreditation Is Associated with Organizational Supports for Evidence-Based Decision Making. *Frontiers in public health*, *7*, 374. https://doi.org/10.3389/fpubh.2019.00374

Ayanian J.Z, Weissman JS, Schneider EC, Ginsburg JA, Zaslavsky AM. (2000) Unmet health needs of uninsured adults in the United States. *JAMA* ;284:2061–9.

Baker E. L., Koplan J., (2002) Strengthening the Nation's Public Health Infrastructure: Historic Challenge, Unprecedented Opportunity, *Health Affairs,* v. 21, no. 6, Nov./Dec.

Blanchet, K., & James, P. (2012). How to do (or not to do) ... a social network analysis in health systems research. *Health policy and planning*, *27*(5), 438–446. https://doi.org/10.1093/heapol/czr055

Blumberg LJ**,** Karpman M**,** Buettgens M**,** Solleveld P**. (**2016**)** Who Are the Remaining Uninsured, and What Do Their Characteristics Tell Us About How to Reach Them? *Washington, DC: Urban Inst.*

Brook, R. H., Keeler E.B., Lohr, K.N. Newhouse J.P., Ware J.E., Rogers W.H., Davies A.R., Sherbourne, C.D. Goldberg G.A., Camp P., Kamberg C., Leibowitz A., Keesey J Reboussin D., (2006) The Health Insurance Experiment: A Classic RAND Study Speaks to the Current Health Care Reform Debate. Santa Monica, CA: *RAND Corporation*

Castaneda M.A. Saygili M., (2016). The health conditions and the health care consumption of the uninsured, *Health Economics Review*

CBO Congressional Budget Office, (2017, November) *Repealing the Individual Health Insurance Mandate: An Updated Estimate*,
https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/53300-individualmandate.pdf

CDC Centers for Disease Control; HHS U.S. Department of Health and Human Services (HHS), (1995) From Public Health in America Public Health Functions Steering Committee, https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html

Christensen Institute: (2013) Seize the ACA: The Innovators Guide to the Affordable Care Act.https://www.christenseninstitute.org/wpcontent/uploads/2013/09/Seize_the_ACA_midres.pdf

Christopher, A. S., McCormick, D., Woolhandler, S., Himmelstein, D. U., Bor, D. H., & Wilper, A. P. (2016). Access to Care and Chronic Disease Outcomes Among Medicaid-Insured Persons Versus the Uninsured. *American journal of public health*, *106*(1), 63-9.

[1]CMS Centers for Medicare and Medicaid Services, *Health Insurance Marketplace;(* 2021, April) https://marketplace.cms.gov/technical-assistance-resources/assister-programs/champion.html.

Cohen R, & Martinez M. (2015, Aug) Health Insurance Coverage: Early Release of Estimates from the National Health Interview Survey, January-March 2015: US Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Health Statistics.

Cohen RA, Terlizzi EP, Martinez ME. (2019, May) Health insurance coverage: Early release of estimates from the National Health Interview Survey, 2018. National Center for Health Statistics. Available from: https://www.cdc.gov/nchs/nhis/releases.htm

Collins S.R, Bhupal, H.K., Doty M.M., (2019) Health Insurance Coverage Eight Years After the ACA: Fewer Uninsured Americans and Shorter Coverage Gaps, But More Underinsured *Commonwealth Fund,* (Feb.)

Committee on Public Health Strategies to Improve Health, & Institute of Medicine. (2012). *For the Public's Health: Investing in a Healthier Future*. National Academies Press (US).

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

Dalzell, L. P., Tangka, F. K., Powers, D. S., O'Hara, B. J., Holmes, W., Joseph, K., & Royalty, J. (2015). Data sources for identifying low-income, uninsured populations: application to public health-National Breast and Cervical Cancer Early Detection Program. *Cancer causes & control: CCC*, *26*(5), 699–709.

Davidoff A, Dubay L, Kenney G, Yemane A. (2003) The effect of parents' insurance coverage on access to care for low-income children. Inquiry. 2003 Fall;40(3):254-68. doi: 10.5034/inquiryjrnl_40.3.254. PMID: 14680258.

Denham, A., & Veazie, P. J. (2019). Did Medicaid expansion matter in states with generous Medicaid?. *The American journal of managed care*, *25*(3), 129–134.

Derose, S. F., Schuster, M. A., Fielding, J. E., & Asch, S. M. (2002). Public health quality measurement: concepts and challenges. *Annual review of public health*, *23*, 1–21. https://doi.org/10.1146/annurev.publhealth.23.092601.095644

Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, et al. (2017) Inequalities in Life Expectancy Among US Counties, 1980 to 2014: Temporal Trends and Key Drivers. *JAMA Intern Med.*;177(7):1003–1011. doi:https://doi.org/10.1001/jamainternmed.2017.0918

Emanuel E.J, Glickman A, Johnson D. (2017) Measuring the Burden of Health Care Costs on US Families: The Affordability Index. *JAMA.*;318(19):1863–1864.

Erwin, P. C., Padek, M.M. Allen, P. Smith, R.; Brownson, R.C. (2020) The Association Between Evidence-Based Decision Making and Accreditation of State Health Departments, *Journal of Public Health Management and Practice:* September/October- Volume 26 - Issue 5 - p 419-427 doi: 10.1097/PHH.0000000000001162

Garthwaite C. , Graves J , Gross T, Karaca Z , Marone V, Notowidigdo, M.J. (2019.) All Medicaid Expansions Are Not Created Equal: The Geography and Targeting of the Affordable Care Act. Brookings Papers on Economic Activity, vol 2019(2), pages 1-92.

Galewitz, P. (2018) https://khn.org/news/outrageous-or-overblown-hhs-announces-another-round-of-aca-navigator-funding-cuts/ (August)

Gorenflo G. (2007). Accreditation: time to get ready. *Journal of public health management and practice : JPHMP*, *13*(4), 432–434. https://doi.org/10.1097/01.PHH.0000278041.92259.87

Granovetter M. (1983) The strength of weak ties: A network theory *Sociological Theory*, 1, 201-233

Guth,M. Garfield, R., Rudowitz R. (2020, March) The Effects of Medicaid Expansion under the ACA: Studies from January 2014 to January 2020, KFF,https://www.kff.org/medicaid/report/the-effects-of-medicaid-expansion-under-the-aca-updated-findings-from-a-literature-review/accessed March 2021

Handler, AS.., Issel, M., & Turnock, B.J. (2001). A conceptual framework to measure performance of the public health system. *American journal of public health*, *91*(8), 1235–1239. https://doi.org/10.2105/ajph.91.8.1235

Handler AS, Turnock B.J. (1996) Local health department effectiveness in addressing the core functions of public health: essential ingredients. *J Public Health Policy*.; 17:460–483.

Hadley J., Feder F. (1985) Hospital Cost Shifting and Care for the Uninsured; *Health Aff* 4:3, 67-80

Hadley J., (2007) Insurance Coverage, Medical Care Use, and Short-term Health Changes Following an Unintentional Injury or the Onset of a Chronic Condition. *JAMA* 297, no. 10 March:1073-84.26

Halverson P.K. (2001) Improving Public Health Infrastructure: Old Wine in New Bottles, *Journal of Public Health Management and Practice* (September).

Halverson P. K. and Mays G.P. (2001) Public Health Assessment in Public Health Administration, ed. L.E. Novick and G.P. Mays (Gaithersburg, Md.): Aspen Publishers

Harmon, B. E., Kim, S. H., Blake, C. E., & Hébert, J. R. (2014). Health care information in African American churches. *Journal of health care for the poor and underserved*, *25*(1), 242–256. https://doi.org/10.1353/hpu.2014.0047

Hart GL, Pirani MJ, Rosenblatt RA. (1994) Most rural towns lost physicians after their hospitals closed. *Rural Development Perspectives*.;10(1):17-21.

Healthypeople.gov; (2020) Objectives https://www.healthypeople.gov/2020/topics-objectives/topic/public-health-infrastructure

Health Care Education and Reconciliation Act, Pub. L. No. 111-152, 124 Stat. 1029 (March 30, 2010).

Health Resources and Services Administration (2017, October 19) Hospital Closings Likely to Increase; https://www.hrsa.gov/enews/past-issues/2017/october-19/hospitals-closing-increase.html

Heffernan, M., Kennedy, M., Siegfried, A., & Meit, M. (2018). Benefits and Perceptions of Public Health Accreditation Among Health Departments Not Yet Applying. *Journal of public health management and practice: JPHMP*, *24 Suppl 3*, S102–S108. https://doi.org/10.1097/PHH.0000000000000739

HIAA Health Insurance Association of America, (1982) Hospital Cost Shifting: The Hidden Tax (Washington, D.C)

[1]Himmelstein D.U. Warren E, Thorne D, Woolhandler S, Illness and Injury as Contributors to Bankruptcy, (2005): *Health Affairs* 24 w63–w73 (published online 2 February 2005

[2]Himmelstein D.U., Lawless R.M., Thorne, D. Foohey P., Woolhandler S., (2019) *Medical Bankruptcy: Still Common Despite the Affordable Care Act, American Journal of Public Health* 109, no. 3 March: pp. 431-433.

[3]Himmelstein DU, Thorne D, Warren E, Woolhandler S. (2009) Medical bankruptcy in the United States, 2007: results of a national study. *Am J Med*; 122:741–6.

Hing, E, Hsiao, C. (2014) US Department of Health and Human Services. State Variability in Supply of Office-based Primary Care Providers: United States 2012. *NCHS Data Brief*, May; No. 151,

Hoadley J. Alker J. Holmes M. (2017) Medicaid in Small Towns and Rural America: A Lifeline for Children, Families, and Communities" (Washington: Georgetown University Center for Children and Families and North Carolina Rural Health Research Program, (June), available at https://ccf.georgetown. edu/2017/06/06/rural-health-report/.

Iglehart J.K. (2018) The challenging quest to improve rural health care. *N Engl J Med*.;378(5):473-479. doi:10.1056/NEJMhpr1707176

Ingram, R. C., Mays, G. P., & Kussainov, N. (2018). Changes in Local Public Health System Performance Before and After Attainment of National Accreditation Standards. *Journal of public health management and practice: JPHMP, 24 Suppl 3*, S25–S34. https://doi.org/10.1097/PHH.0000000000000766

[1]IOM Institute of Medicine (US) Committee on the Consequences of Uninsurance. *Care Without Coverage: Too Little, Too Late.* Washington (DC): National Academies Press (US); 2002. 3, Effects of Health Insurance on Health. Available from: https://www.ncbi.nlm.nih.gov/books/NBK220636/

[2]IOM Institute of Medicine. (1988). *The future of public health.* Washington, DC: National Academy Press.

KFF Kaiser Family Foundation (2020) https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/2020

KHN Kaiser Health News (2015) The ABC's of ACO's (2015) https: khn.org/news/aco-accountable-care-organization-faq/

Khullar D. Song, Z, Chokshi D. (2018) Safety-Net Health Systems at Risk: Who Bears the Burden of Uncompensated Care? *Health Affairs Blog*, May 10, 2018, DOI: 10.1377/hblog20180503.138516

Kominski, G. F., Nonzee, N. J., & Sorensen, A. (2017). The Affordable Care Act's Impacts on Access to Insurance and Health Care for Low-Income Populations. *Annual review of public health*, *38*, 489–505. doi:10.1146/annurev-publhealth-031816-044555

Leider, J. P., Kronstadt, J., Yeager, V. A., Hall, K., Saari, C. K., Alford, A., Freeman, L. T., & Kuehnert, P. (2021). Application for Public Health Accreditation Among US Local Health Departments in 2013 to 2019: Impact of Service and Activity Mix. *American journal of public health*, *111*(2), 301–308. https://doi.org/10.2105/AJPH.2020.306007

[1]Levy H, Meltzer D. (2004) What Do We Really Know about Whether Health Insurance Affects Health? In: McLaughlin CG, editor. Health Policy and the Uninsured. Washington, D.C.: Urban Institute Press; pp. 179–204.

[2]Levy H**,** Meltzer D**.** The impact of health insurance on health. (2008), *Annu. Rev. Public Health* 29:399–409

Lobo, J. M., Kim, S., Kang, H., Ocker, G., McMurry, T. L., Balkrishnan, R., Anderson, R., McCall, A., Benitez, J., & Sohn, M. W. (2020). Trends in Uninsured Rates Before and After Medicaid Expansion in Counties Within and Outside of the Diabetes Belt. *Diabetes care*, *43*(7), 1449–1455. https://doi.org/10.2337/dc19-0874

Malveaux, J. The Atlanta Voice (2016) https://www.theatlantavoice.com/articles/julianne-malveaux

Markens, S., Fox, S. A., Taub, B., & Gilbert, M. L. (2002). Role of Black churches in health promotion programs: lessons from the Los Angeles Mammography Promotion in Churches Program. *American journal of public health*, *92*(5), 805–810. https://doi.org/10.2105/ajph.92.5.805

Mattie, H., Engø-Monsen, K., Ling, R. *et al.* Understanding tie strength in social networks using a local "bow tie" framework. *Sci Rep* **8,** 9349 (2018). https://doi.org/10.1038/s41598-018-27290-8

Mays, G. P., Halverson, P. K., Baker, E. L., Stevens, R., & Vann, J. J. (2004). Availability and perceived effectiveness of public health activities in the nation's most populous communities. *American journal of public health*, *94*(6), 1019–1026. https://doi.org/10.2105/ajph.94.6.1019

Mays G.P., Mamaril, C.B. Timsina L.R. (2016) Preventable Death Rates Fell Where Communities Expanded Population Health Activities Through Multisector Networks; *Health Affairs* (2016) 35:11, 2005-2013

Mays, G. P., & Scutchfield, F. D. (2010). Improving public health system performance through multiorganizational partnerships. *Preventing chronic disease*, *7*(6), A116.

Mays, G. P., Scutchfield, F. D., Bhandari, M. W., & Smith, S. A. (2010). Understanding the organization of public health delivery systems: an empirical typology. *The Milbank quarterly*, *88*(1), 81–111. https://doi.org/10.1111/j.1468-0009.2010.00590.x

McCarthy J. Basic marketing: A managerial approach. Homewood, IL: Irwin; 1960.

McLees, A. W., Thomas, C. W., Nawaz, S., Young, A. C., Rider, N., & Davis, M. (2014). Advances in public health accreditation readiness and quality improvement: evaluation findings from the National Public Health Improvement Initiative. *Journal of public health management and practice: JPHMP*, *20*(1), 29–35. https://doi.org/10.1097/PHH.0b013e31829ff726

[1]McMorrow S., Kenney G.M., and Goin D., (2014) Determinants of Receipt of Recommended Preventive Services: Implications for the Affordable Care Act, *American Journal of Public Health* 104, no. 12 Dec 2392-9

[2]McMorrow S**,** Kenney GM**,** Long SK**,** Anderson N**. (**2015) Uninsurance among young adults continues to decline, particularly in Medicaid expansion states. *Health Aff*. 34:616–20

[3]McMorrow S**,** Long SK**,** Kenney GM**,** Anderson N**. (**2015)**.** Uninsurance disparities have narrowed for black and Hispanic adults under the Affordable Care Act. *Health Aff*. 34:1774–78

McWilliams J. M. (2009). Health consequences of uninsurance among adults in the United States: recent evidence and implications. *The Milbank quarterly*, *87*(2), 443–494. doi:10.1111/j.1468-0009.2009.00564.

Medalia C, O'Hara B, Rodean J, Steinweg A, Brault M. Changing the CPS Health Insurance Questions and the implications on the uninsured rate: redesign and production estimates. 2014 http://www.census.gov/hhes/www/hlthins/publications/sehsd_wp_2014-16.pdf.

Medford-Davis LN, Lin F, Greenstein A, Rhodes KV.(2017) I broke my ankle: Access to orthopedic follow-up care by insurance status. *Acad Emerg Med*.;24:98–105. doi: 10.1111/acem.13058.

Melnick G, Fonkych K. (2013) Fair pricing law prompts most California hospitals to adopt policies to protect uninsured patients from high charges. *Health Aff (Millwood)*; 32:1101–8.

Miller, C. A., Moore, K. S., Richards, T. B., & Monk, J. D. (1994). A proposed method for assessing the performance of local public health functions and practices. *American journal of public health*, *84*(11), 1743–1749. https://doi.org/10.2105/ajph.84.11.1743

NCC National Coordinating Center for Public Health Services and Systems Research, Defining Comprehensive Public Health Delivery Systems (2015). *Health Management and Policy Reports*. 5. https://uknowledge.uky.edu/hsm_reports/5

Newman D, Parente S.T, Barrette E, Kennedy K. (2016) Prices For common medical services vary substantially among the commercially insured. *Health Aff (Millwood)*; 35:923–7.

NRC National Research Council (US) Panel on Performance Measures and Data for Public Health Performance Partnership Grants; Perrin EB, Durch JS, Skillman SM, editors. Health Performance Measurement in the Public Sector: Principles and Policies for Implementing an Information Network. Washington (DC): National Academies Press (US); 1999. 2, Putting Performance Measurement in Context.

Obama B. (2016). United States Health Care Reform: Progress to Date and Next Steps. *JAMA*, *316*(5), 525–532. doi:10.1001/jama.2016.9797

Pagán, J. A., & Pauly, M. V. (2006) Community-Level Uninsurance and the Unmet Medical Needs of Insured and Uninsured Adults. *Health Services Research*, (2006) *41*(3 Pt 1), 788–803. http://doi.org/10.1111/j.1475-6773.2006.00506.

Papanicolas I, Woskie LR, Jha AK. (2018) Health Care Spending in the United States and Other High-Income Countries. *JAMA;* 319(10):1024–1039.

Patterson BM, Draeger RW, Olsson EC, Spang JT, Lin FC, Kamath GV. (2014) A regional assessment of Medicaid access to outpatient orthopedic care: the influence of population density and proximity to academic medical centers on patient access. *J Bone Joint Surg Am*;96: e156.

Pauly, M. V. Pagan, J. A.. (2007) Spillovers And Vulnerability: The Case of Community Uninsurance, *Health Affairs* 26, no. 5 (2007); 1304-1314; http;//doi:10.1377/hlthaff.26.5.1304

PHAB Public Health Accreditation Board https://phaboard.org Standards and Measures, Version 1.5**,** https://www.phaboard.org/wp-content/uploads/2019/01/PHAB-Standards-Overview-Version-1.5.pdf

PHNCI Public Health National Center for Innovations;(2018) Fact Sheet; https://phnci.org/uploads/resource-files/FPHS-Factsheet-November-2018.pdf

PPACA Patient Protection and Affordable Care Act (PPACA), Pub. L. No. 111-148, 124 Stat 119 (March 23, 2010).2.

Quadagno J. (2011) Interest-Group Influence on the Patient Protection and Affordability Act of 2010: Winners and Losers in the Health Care Reform Debate. *J Health Polit Policy Law* 1 June; 36 (3): 449–453.

Rider, N., Frazier, C. M., McKasson, S., Corso, L., & McKeever, J. (2018). Achieving Public Health Standards and Increasing Accreditation Readiness: Findings From the National Public Health Improvement Initiative. *Journal of public health management and practice : JPHMP*, *24*(4), 392–399. https://doi.org/10.1097/PHH.0000000000000660

Rodriguez, H. P., Jie Chen, Owusu-Edusei, K., Sun, A., & Bekemeier, B. (2012). Local Public Health Systems and the Incidence of Sexually Transmitted Diseases. *American Journal of Public Health*, *102*(9), 1773–1781. https://doi-org.ezproxy.fiu.edu/10.2105/AJPH.2011.300497

Rosenbaum S. (2011). Law and the Public's Health. *Public Health Reports*, *126*(1), 130.4 NASHP Chart – An Overview of ACA Provisions and Their Repeal Implications for States. http://nashp.org/wp-content/uploads/2017/01/NASHP-ACARepealImpactsChart.

Rosenbaum S. Westmoreland T. M. (2012) The Supreme Court's Surprising Decision on The Medicaid Expansion: How Will the Federal Government and States Proceed? *Health Aff* 31:8, 1663-1672

Sabik, L., & Gandhi, S.. (2013) Impact of Changes in Medicaid Coverage on Physician Provision of Safety Net Care. *Medical Care*, *51*(11), 978-984. Retrieved from: http://www.jstor.org.ezproxy.fiu.edu/stable/42568846

SAHIE US Census Bureau. Small Area Health Insurance Estimates (SAHIE). Available at: http://www.census.gov/did/www/sahie/data/20082012/index.html. Accessed July 20, 2020.

[1]Saloner B, Polsky D, Kenney GM, Hempstead K, Rhodes KV. Most uninsured adults could schedule primary care appointments before the ACA, but average price was $160. *Health Aff (Millwood)* 2015; 34:773–80.

[2]Saloner, B., Hempstead, K., Rhodes, K., Polsky, D., Pan, C., & Kenney, G. M. (2018). Most primary care physicians provide appointments, but affordability remains a barrier for the uninsured. *Health Affairs*, *37*(4), 627 – 634:

Scott, L. C., Barker, L. E., & Richardson, L. C. (2019). Using Population Health Measures to Evaluate the Environmental Burden of Cancer at the County Level. *Preventing chronic disease*, *16*, E45. https://doi.org/10.5888/pcd16.180530

Sigurdsson, V., Saevarsson, H., & Foxall, G. (2009). Brand placement and consumer choice: an in-store experiment. *Journal of applied behavior analysis*, *42*(3), 741–745. https://doi.org/10.1901/jaba.2009.42-741

Shi L. (2012) The impact of primary care: a focused review. *Scientifica*, 432892. https://doi.org/10.6064/2012/432892

Singleton C, Corso L, Koester D, Carlson V, Bevc CA, Davis MV. (2014) Accreditation and emergency preparedness: linkages and opportunities for leveraging the connections. *J Public Health Manag Pract*; 20(1):119-124

Smith DA, Akira A, Hudson K, Hudson A, Hudson M, Mitchell M, Crook E. (2017) The effect of health insurance coverage and the doctor-patient relationship on health care utilization in high poverty neighborhoods. *Preventive Medicine Reports.*;7:158–161. doi: 10.1016/j.pmedr.2017.06.002.

Sommers BD**,** Baicker K**,** Epstein AM**. (**2012) Mortality and access to care among adults after state Medicaid expansions. *N. Engl. J. Med.* 367:1025–34

The Heritage Foundation (2016) Six Years of the Affordable Care Act: Obama's Mounting Problems. http://www.heritage.org/health-care-reform/report/year-six-the-affordable-care-act-obamacares-mounting-problems

Thompson JH. Statement by Census Bureau Director John H. Thompson on Improved Health Insurance Questions in the current population survey. 2014 http://www.census.gov/newsroom/releases/archives/directors_corner/cb14-67.html.

Tolbert J., Orgera K. Singer N., and Damico A.; (2019, December) Key Facts About The Uninsured Population http://files.kff.org/attachment//fact-sheet-key-facts-about-the-uninsured-population.

Turnock, B.J. (2001) Public Health: What It Is and How It Works, 2d ed. (Gaithersburg, Md.: Aspen Publishers.

Turnock, B. J., & Handler, A. (1995). Evaluating the performance of local health agencies. 2. The 10 public health practices vs the 10 public health services: a clarification. *American journal of public health*, *85*(9), 1295–1297. https://doi.org/10.2105/ajph.85.9.1295-a

U.S. Census Bureau. Table CC-EST2009–6RACE: annual estimates of the resident population by sex, race, and Hispanic origin for counties: April 1, 2000 to July 1, 2009. Available at: http://www.census.gov/popest/data/counties/asrh/2009/index.html. Accessed July 15, 2020.

[1]U.S. Dept. of Health and Human Services, Centers for Medicare and Medicaid Services, *CMS Announcement on ACA Navigator Program and Promotion for Upcoming Open Enrollment* (August 31, 2017) https://www.cms.gov/newsroom/press-releases/cms-announcement-aca-navigator-program-and-promotion-upcoming-open-enrollment

[2]U.S. Dept. of Health and Human Services, Centers for Medicare and Medicaid Services, *Grants awarded for the Federally Facilitated Exchange Navigator Program* (September 12, 2018) https://www.cms.gov/newsroom/press-releases/grants-awarded-federally-facilitated-exchange-navigator-program

Varda, Danielle M. PhD; Chandra, Anita DrPH; Stern, Stefanie A. MA; Lurie, Nicole MD, MSPH Core Dimensions of Connectivity in Public Health Collaboratives, *Journal of Public Health Management and Practice*: September-October 2008 - Volume 14 - Issue 5 - p E1-E7 doi: 10.1097/01.PHH.0000333889.60517.46

Vaughan, A. S., Rosenberg, E., Shouse, R. L., & Sullivan, P. S. (2014). Connecting race and place: a county-level analysis of White, Black, and Hispanic HIV prevalence, poverty, and level of urbanization. *American journal of public health*, *104*(7), e77–e84. https://doi.org/10.2105/AJPH.20

[1]Woolhandler S, Himmelstein DU. (2017) The Relationship of Health Insurance and Mortality: Is Lack of Insurance Deadly?. Ann Intern Med;167:424–431. [Epub ahead of print 27 June 2017].

[2]Woolhandler, S., M.P.H., Campbell T, M.H.A., Himmelstein DU, M.D. Costs of health care administration in the united states and canada. *N Engl J Med*. 2003;349(8):768-75.

Wright D. B. (2010). Time is money: opportunity cost and physicians' provision of charity care 1996-2005. *Health services research*, *45*(6 Pt 1), 1670–1692. doi:10.1111/j.1475-6773.2010.01139.

## TABLES

**Table 3.1: Summary statistics among 3142 counties in the US, 2012 and 2018: Mean (SD)**

| Variables | 2012* | 2018** |
|---|---|---|
| **Insurance rate** | **82.43 (5.38)** | **88.50 (5.04)** |
| **Percent of poverty under 138% of FPG** | **27.03 (8.24)** | **23.53 (7.89)** |
| **Percent of under 19** | **29.29 (3.14)** | **29.06 (3.29)** |
| **Percent of over 65** | **16.69 (4.28)** | **19.26 (4.71)** |
| **Percent of Black** | **9.11 (14.53)** | **9.33 (14.48)** |
| **Percent of Hispanic** | **8.67 (13.37)** | **9.63 (13.81)** |
| **Percent of Male** | **50.23 (1.25)** | **50.18 (1.26)** |

Note: * reports the statistics in mean (SD) for the corresponding county-level characteristics in 2012; ** reports the statistics in mean (SD) for the corresponding county-level characteristics in 2018.

**Table 3.2. Regression model results of insurance rate (%) change in 3142 counties from 2012 to 2018 using the ordinary least squares (OLS) method**

| | Model 1* | | | Model 2** | | |
|---|---|---|---|---|---|---|
| | Estimate | P-value | 95% CI*** | Estimate | P-value | 95% CI*** |
| **Accreditation by 1/1/2018** | 0.68 | 0.001 | 0.28 to 1.08 | 1.02 | < 0.001 | 0.53 to 1.51 |
| **State expansion by 1/1/2018** | N/A | N/A | N/A | 3.95 | < 0.001 | 3.72 to 4.18 |
| **Interaction between Accreditation and Expansion** | N/A | N/A | N/A | -0.82 | 0.001 | -1.51 to -0.14 |
| **Percent of poverty under 138% of FPG** | 21.89 | < 0.001 | 20.17 to 23.61 | 22.91 | < 0.001 | 21.45 to 24.38 |
| **Percent of Black** | -3.69 | < 0.001 | -4.81 to -2.57 | -0.31 | 0.531 | -1.28 to 0.66 |
| **Percent of Hispanic** | 3.76 | < 0.001 | 2.75 to 4.76 | 4.82 | < 0.001 | 3.96 to 5.68 |
| **Percent of over 65** | -6.29 | < 0.001 | -9.53 to -3.05 | 0.53 | 0.713 | -2.28 to 3.33 |
| **Percent of under 19** | -31.11 | < 0.001 | -35.58 to -26.65 | -18.16 | < 0.001 | -22.04 to -14.29 |
| **Percent of Male** | 25.70 | < 0.001 | 13.92 to 37.47 | 24.30 | < 0.001 | 14.25 to 34.36 |

Note: Estimates are the estimated difference in the insurance rate (%) between counties with and without accreditation (for the first row) as of 1/1/2018 and between counties with and without Medicaid eligibility expansion as of 1/1/2018 (for the second row), the estimated difference in change of the insurance rate (Medicaid vs. non-expanded) between counties with and without accreditation (for the third row), and the estimated difference in insurance rate with 1 % change in covariates (all other rows); P-values indicate the significance for testing the corresponding estimates; 95% CIs indicate the range of the corresponding estimates with 95% confidence. *Model 1: multivariable model with accreditation as the exposure **Model 2: multivariable model with accreditation, expansion, and the interaction between accreditation and expansion

## 4.0 SYNTHESIS OF EVIDENCE

These essays suggest a relationship between physician supply and the uninsurance rate, which can be improved by expanding Medicaid eligibility and developing supportive county-level public health infrastructures. Findings indicate that the uninsurance rate of the location significantly impacted county-level physician supply, and it has a stronger impact on specialty care physicians than PCP's. The insured population is impacted by uninsurance in their community through a reduction in the number of available providers. Results also suggest that the improvement in the insured population rate influences professional providers through Medicaid expansion by providing additional payment options, thus advancing physician compensation. These conclusions are consistent with multiple published studies that professional providers are drawn to locations where the demand for their services is sufficient to support their practice along with economic and personal amenity considerations. Guided by the principles of network theory, a robust healthcare infrastructure utilizes alliances and partnerships to increase insurance enrollment. Results suggest that public health infrastructure strength using PHAB accreditation as the proxy is significantly associated with improving medical insurance enrollment rate. Outcome data also suggests that Medicaid expansion is a more significant factor than accreditation. However, stronger county public health infrastructures in non-expanded states can help close the uninsurance gap with a greater improvement in the county-level medical insurance enrollment rate.

Given the results suggesting a statistically significant association between Medicaid eligibility expansion and physician supplies, states that have not expanded Medicaid may wish to reconsider this option. The benefits include increasing access to healthcare by attracting professional providers to their community but also a reduction in

charity and uncompensated care. Additionally, improving provider availability contributes to strengthening the public health infrastructure, and a mutual benefit emerges through collaborative efforts increasing insurance coverage within the community. The findings suggest that compensation incentives drive the professional components, and future policy initiatives should consider enhancements to physician fee schedules to distribute and balance resources. Compensation methods designed to attract essential professional providers to underserved communities should be included in reimbursement strategies. However, public program success should not only be measured by physician supply but be gauged by the actual participation in Medicaid at an equal level as other third-party insurances. Therefore, it is recommended that future Medicaid expansion initiatives include incentives to increase both availability and accessibility to both primary and specialty professional providers.

Lastly, with the 2020 Census results recently posted, communities should prepare to make adjustments to their strategic plans related to community healthcare infrastructures based upon the demographic changes noted in the outcome data. Population growth, aging, and greater diversity will contribute to critical changes in approaching the issue of uninsurance as contemplated in the upcoming decade.

## APPENDIX

### APPENDIX 1: U.S. States based Medicaid expansion status to 138% FPL, pre & post 1/2014

| State | Adopted & Implemented 1/2014 | Post 1/2014 Adoption Date | | Not Adopted |
|---|---|---|---|---|
| Alabama | | | | X |
| Alaska | | 9/2015 | | |
| Arizona | X | | | |
| Arkansas | X | | | |
| California | X | | | |
| Colorado | X | | | |
| Connecticut | X | | | |
| Delaware | X | | | |
| District of Columbia | X | | | |
| Florida | | | | X |
| Georgia | | | | X |
| Hawaii | X | | | |
| Idaho | | 1/2020 | | |
| Illinois | X | | | |
| Indiana | | 2/2015 | | |
| Iowa | X | | | |
| Kansas | | | | X |
| Kentucky | X | | | |
| Louisiana | | 7/2016 | | |
| Maine | | 1/2019 (Retro to 7/18) | | |
| Maryland | X | | | |
| Massachusetts | X | | | |
| Michigan | | 4/2014 | | |
| Minnesota | X | | | |
| Mississippi | | | | X |
| Missouri | | 8/2021 (Retro to 7/21) | | |
| Montana | | 1/2016 | | |
| Nebraska | | 10/2020 | | |
| Nevada | X | | | |
| New Hampshire | | 8/2014 | | |
| New Jersey | X | | | |
| New Mexico | X | | | |
| New York | X | | | |
| North Carolina | | | | X |
| North Dakota | X | | | |
| Ohio | X | | | |
| Oklahoma | | 7/2021 | | |
| Oregon | X | | | |
| Pennsylvania | | 1/2015 | | |
| Rhode Island | X | | | |
| South Carolina | | | | X |
| South Dakota | | | | X |
| Tennessee | | | | X |
| Texas | | | | X |
| Utah | | 1/2020 | | |
| Vermont | X | | | |
| Virginia | | 1/2019 | | |
| Washington | X | | | |
| West Virginia | X | | | |
| Wisconsin | | | | X |
| Wyoming | | | | X |

Note: The Medicaid eligibility expansion status in the above table is based on U.S. Centers for Medicaid and Medicare as of August 2021.

**APPENDIX 2 - Ten Essential Public Health Services**

| | |
|---|---|
| 1. | Assess and monitor population health status, factors that influence health, and community needs and asset |
| 2. | Investigate, diagnose, and address health problems and hazards affecting the population |
| 3. | Communicate effectively to inform and educate people about health, factors that influence it, and how to improve it |
| 4. | Strengthen, support, and mobilize communities and partnerships to improve health |
| 5. | Create, champion, and implement policies, plans, and laws that impact health |
| 6. | Utilize legal and regulatory actions designed to improve and protect the public's health |
| 7. | Assure an effective system that enables equitable access to the individual services and care needed to be healthy |
| 8. | Build and support a diverse and skilled public health workforce |
| 9. | Improve and innovate public health functions through ongoing evaluation, research, and continuous quality improvement |
| 10. | Build and maintain a strong organizational infrastructure for public health |

CDC: Essential Public Health Services (Revised, 2020)

Note: Originally released in 1994 and revised 2020, the 10 Essential Public Health Services provide a framework for public health to protect, promote and improve health within the community.

**APPENDIX 3** – **<u>Seven Foundational Capabilities</u>**

| | |
|---|---|
| 1. | Assessment/Surveillance |
| 2. | Emergency Preparedness and Response, |
| 3. | Policy Development and Support, |
| 4. | Communications, |
| 5. | Community Partnership Development, |
| 6. | Organizational Administrative Competencies |
| 7. | Accountability/Performance Management. |

Note: Public Health National Center for Innovation 2021(phnci.org)

VITA

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| | |
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PUBLICATIONS AND PRESENTATIONS

Parrino, R E M (1990) American Public Health Association 118th Annual Meeting, October 3, 1990 "*The Hillsborough County Medicaid Demonstration Project*" Co-authored and presented with Lois La Civita Nixon, Ph.D. USF College of Public Health

Parrino, R E M (1990) *Transfer center can control, manage admissions*, Healthcare financial management: journal of the Healthcare Financial Management Association, 44(9), 40-45

Parrino, R E M (1990) *Tracking in-house accounts receivable can identify potential problems*, Patient accounts, 13(9), 2-2.

Parrino, R E M (1991) *Precautions minimize payment risks with foreign patients*, Patient accounts, 14(10), 2-7.

Parrino, R E M (1992) *Integrated business office can boost cash flow*, Healthcare financial management: journal of the Healthcare Financial Management Association, 3-1

Parrino, R E M (1996) *Exploring patient account processing alternatives*, Patient accounts, 19(2), 2.

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